Job security and long-term projects: The role of dismissal barriers

Gary Charness, Ramón Cobo-Reyes, Natalia Jiménez, Juan A. Lacomba and Francisco Lagos

December 4, 2013

Abstract

This article analyzes experimentally three different types of labor contracts. The two first types of labor contracts are the standard period-by-period contract and the permanent one. We propose a new type of contract (automatic renewal) in which workers are re-hired if they satisfied the effort level required by the firm. Another novel aspect of our experimental design is that workers have the chance of investing money in a long-term project in order to increase their profits. We find two main results: i) the dismissal barriers in the labor contracts seem to provide a safer institutional setting to undertake long-term projects more successfully; and ii) those workers engaged in a long-term project provided higher effort levels. In sum, we find a strong relationship between what happens inside the labor market (worker's performance) and what happens outside the labor market (long-term projects).

JEL Classification: J41, J3, C9, D01.

Keywords: Incomplete contracts, long-term relationships, automatic renewal, workers' stability, investment, and experiments.

Contact information: Gary Charness, Department of Economics, 2127 North Hall, University of California, Santa Barbara, CA 93106-9210, charness@econ.ucsb.edu, Ramón Cobo-Reyes, Departamento de Teoria e Historia Economica, University of Granada & Globe, Campus Cartuja, s/n, Granada E-18071, Spain, ramonc@ugr.es, Natalia Jiménez, Departamento de Teoria e Historia Economica, University of Granada & Globe, Campus Cartuja, s/n, Granada E-18071, Spain, natjj@ugr.es, Juan A. Lacomba, Departamento de Teoria e Historia Economica, University of Granada &Globe, Campus Cartuja, s/n, Granada E-18071, Spain, jlacomba@ugr.es, Francisco Lagos, Departamento de Teoria e Historia Economica, University of Granada &Globe, Campus Cartuja, s/n, Granada E-18071, Spain, fmlagos@ugr.es

1. Introduction

There is an inter-relationship between many situations *inside* the labor market and decisions made *outside* the labor market. For instance, McDonald (2000), Adsera (2004), De la Rica and Iza (2005), Blossfeld et al. (2005) and Hondroyiannis (2010) show how the economic uncertainty inside the labor market has a significant negative impact on fertility decisions since responsible parents have children only when they are able to financially support a family. Haurin and Gill (1987), Haurin (1991), Robst et al. (1999) and Diaz-Serrano (2005) also find an unequivocal negative effect of labor-income uncertainty on the propensity to own one's own home. The economic intuition behind this evidence is that for decisions outside the labor market such as buying a house or having children, individuals take into account both their present and their projected future job situation.

For this reason, attaining a strong degree of stability in employment has been one of the historical main aspirations of the working population. Indeed, one of the main goals of trade unions is to achieve some kind of employment protection legislation (EPL) that introduces dismissal barriers in the labor market.[1] However, from the employer's perspective, insurmountable dismissal barriers may lead to a lack of incentives for high productivity; a familiar example is the behavior of many academics after being awarded tenure. In fact, even if a worker has the intrinsic motivation to work hard, this may be undermined by peer pressure, as other workers may be unhappy with workers who provide too much effort without incentives. This leads to the question of whether there is an optimal level or form of dismissal barrier.

In this sense, this article aims to analyze experimentally both how labor market uncertainty affects decisions outside the labor market and *vice versa*, i.e., how decisions outside

[1] Dismissal barriers arise, for example, in the presence of employment protection legislation (EPL), where hiring a worker beyond approbation period triggers barriers to dismissal, or in the case of relationship-specific investments that accrue over time and raise firing costs (see Mincer, 1962).

the labor market influence behavior in the labor market. Our work is applicable both to many European labor markets and to public-sector employment in the U.S.

Our experimental framework is similar to that of Brown, Falk, and Fehr (2004), in which firms and workers in a labor-market setting can endogenously form long-term relationships. Firms offer contracts involving a wage and a desired effort, and workers, after accepting a contract, choose any feasible effort irrespective of the level contractually agreed upon. With the aim of investigating the interrelationship between decisions inside and outside the labor market, we introduce an additional stage (outside of the labor market) labeled *the investment stage*. For the sake of simplicity, in this stage workers decide only whether or not to undertake a *long-term project*. If a worker chooses to do so in a given period, he must pay a fixed periodical amount from then on. This project will end only when he cannot afford this fixed amount (either he becomes unemployed or his salary does not allow him to pay the fixed amount). To capture the importance of the job stability on the subjects' decisions of undertaking long-term projects, we make the profitability of the project depend crucially on the job situation. Only if subjects become employed at least eight consecutive periods does the project yield positive profits.

To analyze how the features of the labor market affect the investment decisions, we consider three different treatments. In the *baseline* treatment, there is no dismissal barrier. Firms can always end a labor relationship after any period. In the *permanent* treatment, adapted from Falk, Huffman and MacLeod (2008), there is a dismissal institution present in the market, such that only the worker can end a relationship once the firm chooses to hire the worker in two consecutive periods. In addition, once workers are protected against dismissal, firms cannot reduce their wages.[2] We also introduce a novel intermediate treatment in which the worker's performance is rewarded with the automatic renewal of his contract, contingent upon satisfactory

[2] This feature is implemented to rule out de facto dismissal by reducing wages to zero.

performance.[3] A worker must be re-hired if he provides an effort level equal or higher than the effort demanded by the firm. In this case, the worker earns the right to get an offer in the next period from the same firm with at least the same wage.[4] This permits job security while retaining incentives.

Thus, our design allows us to analyze how some crucial decisions that people must make outside of the labor market (to undertake or not a long-term project) affect labor-market behavior (workers' performance and hiring strategies of firms) and vice versa. We also examine how the inter-relationship between *outside* and *inside* decisions changes the labor market with respect to the presence and form of dismissal barriers.

The main result is that those workers engaged in a long-term project provided higher effort levels controlling for some relevant variables such as wages. In order to check the robustness of this result, we replicate the three treatments removing the investment stage. Results show that workers provided higher effort levels in the treatments in which they had the option of investing in a long-term project. That is, when workers had the possibility of investing in a project, they perceived additional incentives to enhance their performance.

Regarding the effect of the dismissal barriers on investment decisions, we find that they make subjects more reluctant to undertake an investment project. Dismissal barriers appear to act as a reference point for workers, in the sense that most seem to wait to be protected against dismissal before investing. This ocurrs primarily in the *automatic* treatment. Indeed, workers in that labor market had considerably more successful investments.

Regarding the effect of the dismissal barriers on the labor market, results also show that firms perceived it to be more risky to activate *permanent* dismissal barriers than *automatic* ones,

[3] Previous experimental literature has found that rewarding performance is an effective incentive device to increase efficiency (see, among others, Fehr, Gächter, and Kirchsteiger, 1997, and Fehr, Klein, and Schmidt, 2007).

[4] Examples for automatically renewable contracts can be found in sports; in many cases contracts are automatically renewed if the sportsman plays a previously fixed number of matches.

generating a lower number of one-shot interactions and a larger number of long relationships in this latter treatment than in the other two treatments.

In addition, given the clause in the *automatic* treatment that ensured workers that they would be rehired whenever they provided the effort level demanded by firms, we find that the distance between the desired and the actual effort was significantly smaller than in the *baseline* treatment. In fact, workers were willing to match the effort level demanded much more frequently in the *automatic* treatment. Moreover, half of the time workers provided the highest effort level. Overall, we find that the presence of automatic dismissal barriers increase firms' profits and does not decrease workers' earnings, thus leading to more efficient outcomes.

In summary, the findings of this article shed light in two different directions: *Inside to outside* and *outside to inside* of the labor market. In the first direction, we find how dismissal barriers in the labor market may provide a safer institutional setting to undertake long-term projects more successfully out of the labor market. In the opposite direction, we find that the possibility of undertaking long-term projects outside the labor market positively affects workers' performance in the labor market.

We know of only a few experimental studies on repeated interactions in the labor market; none of these considers how the presence of dismissal barriers affects the decision of undertaking long-term projects. Brown, Falk and Fehr (2004) study how long-term relationships between trading parties can emerge endogenously in the absence of third party enforcement of contracts. Brown, Falk and Fehr (2010) examine how the emergence of relational contracts changes in a market with excess demand for labor. Falk, Huffman and MacLeod (2008) focus on how permanent dismissal barriers affect contract enforcement, and on how the impact of these dismissal barriers depends on other institutional features, such as availability of bonus pay. Altmann, Falk, Grunewald and Huffman (2013) give evidence of how involuntary

unemployment and segmentation of labor markets may appear as a consequence of contractual incompleteness.

The remainder of the paper is organized as follows. We describe the experimental design and procedures in Section 2. The main results are reported in Section 3. We offer some discussion in Section 4 and we conclude in Section 5.

2. Experimental design

The experiment was conducted at the University of Granada with 221 participants, who were recruited via posters in the Faculty of Economics. All sessions were run in the lab, using Z-Tree software (Fischbacher, 2007). No one was allowed to participate in more than one session. At the end of the instructions (see Appendix B), all subjects had to complete a questionnaire in order to be sure that everybody understood the experiment. On average, each person received about 20€ for a one-hour and thirty minutes session.

In our experiment, we chose to have stated effort rather than real effort such as stuffing envelopes or solving mazes. There is a view in some circles that stated effort is not representative of the field environment, since there is no true labor involved. However, there are reasons to utilize stated effort. For one, it is possible to control the cost or disutility of effort by using stated effort.[5] Charness and Kuhn (2011) provide a more in-depth discussion of the issue or stated and real effort. There is little experimental evidence regarding differences in behavior with these different approaches; in fact, we are only aware of one such study. Charness, Cobo-Reyes, Lacomba, Lagos, and Perez (2012) find no qualitative difference in worker behavior across stated effort and real effort. We chose stated effort for both the convenience and the feasibility of controlling the cost of effort. While we cannot claim with certainty that the results with real effort would differ qualitatively, we see no reason to believe this would be the case.

[5] In fact, we are familiar with one study (Gross and Guo, 2012) that attempted to use typing as a form of real effort. However, the participants all enjoyed the work and typed as much as they could regardless of the treatment.

Our experiment consisted of three treatments. Each treatment is a different type of labor contract: No Barrier (NBT1), Permanent Barrier (PT1) and Automatic Renewal (AT1). There were 18 periods in each session of each treatment.

Table 1. Treatments, sessions and subjects

Treatment	*Sessions*	*Subjects*
NBT1	4	68
ATT	4	68
PT1	5	85
	13	221

No Barrier Treatment (NBT1): An individual period involved two phases. In the first phase firms had the opportunity to submit private and public offers. Public offers stipulated a wage, a desired effort and the firm's identification number (ID). All workers and firms could see public offers. For private offers, firms had to additionally provide a worker's ID number. Only the worker to whom the ID number belonged could see private offers. Firms could make as many private and public offers as they wanted during the market phase that lasted 150 seconds. Firms and workers could reach at maximum one trade agreement per period. Thus, if a worker accepted a firm's offer, all remaining offers submitted by that firm were immediately removed from the market. Also firms were kept constantly informed about which workers (the ID) had already accepted a contract, so as to avoid firms making a private offer to a worker that was no longer available.

If a firm and a worker agreed on a contract, they entered a second phase in which the worker chose how much effort to provide. As desired efforts were not binding, workers only observed firm's desired efforts but chose whichever effort level they preferred.

Repeated transactions with the same trading partner were possible because subjects had fixed identification numbers (ID) and contract offers could be addressed to specific ID numbers.[6] Therefore, a firm could make offers to the same worker in consecutive periods and, if the worker accepted the offers, a long-term relationship was established.

Permanent Treatment (PT1): The only difference with respect to NBT1 is that in this treatment a firm was compelled to offer a contract to a specific worker (private contract) providing that this worker had accepted a *private* offer from that firm in *two consecutive periods*; one might consider this to be a probationary period.[7] In this case, only the worker could end the relationship. In the contract offered to the worker, the wage had to be at least as large as the wage offered in the last private offer. Whenever the worker did not accept the private firm's offer, the firm's obligation to offer a contract to this worker ceased.

Automatic Treatment (AT1): The only difference from PT1 is that under the automatic renewal procedure, a firm only had the obligation to offer a contract to a specific worker whenever this worker made an effort *higher or equal to the desired effort* requested by the firm in a *private contract* of the previous period. That is, if in period t, the firm made a private offer to one specific worker, and the worker's actual effort is at least as firm's desired effort, then the firm was compelled to offer a private contract to this worker in period $t+1$. In the private contract offered to the worker the wage had to be at least as large as the wage offered in the last private offer.[8]

[6] People were given a sheet with a summary table in which they could record all information of each trading period (wage, desired and actual effort, contract type, trading partner's ID, own profits, and partner's profits).
[7] In other words, if a worker accepted a private offer from a firm in period t, and then accepted a second private offer by the same firm in period $t+1$, the dismissal barrier took effect from period $t+2$ on.
[8] With this constraint workers may obtain at least the same "labor conditions" whenever they provide the effort desired by their employers.

The investment stage

Here we add a stage in an attempt to capture how workers' stability in the labor market is related to other important outside decisions such as buying a house (close to our design) or perhaps even having children. In this stage, workers were the only participants. After obtaining their profits in the labor market, they faced an investment decision. Firms knew the existence of the investment stage but did not know which workers had invested. Workers chose whether to invest a certain fixed amount of their profits (10 points) in a project. In order to obtain positive revenues from the investment project, workers needed to *invest for at least 8 consecutive periods*. Hence, workers could only initiate an investment project before period 12.[9] Once a worker had initiated an investment project, this could result in negative revenues if the worker was unable to pay the required 10 points, either due to unemployment or low earnings in at least one of the seven subsequent periods.[10] Workers had the opportunity of investing again in a new project if their previous investments had finished.

Parameters, Information and Payoff functions

All market sessions had 7 firms and 10 workers, to simulate conditions in which unemployment is present. The material payoffs for the firm, π_F, and for the worker, π_W, were given respectively by the functions:

$$\pi_F = \begin{cases} 10e - w & \text{if a contract offer was accepted} \\ 0 & \text{if no contract offer was accepted} \end{cases}$$

$$\pi_W = \begin{cases} w - c(e) & \text{if a contract offer was accepted} \\ 5 & \text{if no contract offer was accepted} \end{cases}$$

[9] After period 11, the number of consecutive periods the worker could invest is less than 8, so that any investment would be lost.

[10] For simplicity subjects were not allowed to save points for future periods. Thus, they are only allowed to invest 10 points from their profits in the current period.

where e is the effort level provided by the worker, w is the wage offered by the firm, $c(e)$ represents the cost of effort function, and 5 was the unemployment profit in the case that a worker did not engage in a relationship. The desired effort level and the actual effort level chosen by the worker could take on integer values between 1 and 10. The rank for the wage was [1,100]. The effort cost function is shown in Table 2.[11]

Table 2. Effort levels and costs of effort

Effort *e*	1	2	3	4	5	6	7	8	9	10
Cost *c(e)*	0	1	2	4	6	8	10	12	15	18

Denote by t_{invest} the number of consecutive periods in which a worker invests. Then, the workers' payoff function from the investment stage, π_{invest}, is:

$$\pi_{invest} = \begin{cases} t_{invest} * (15 - 10) & \text{if } t_{invest} \geq 8 \\ -t_{invest} * 10 & \text{if } t_{invest} < 8 \end{cases}$$

Payoff functions for workers and firms, including the effort cost function, were common information. Participants were aware that the market would last 18 periods. It was feasible to form bi-lateral reputations, since firms learned about the effort choices of workers with whom they traded, but did not observe effort choices in interactions in which they were not a part.[12]

3. Results

This section is divided into two different parts. We first analyze subjects' behavior inside the labor market focusing (for each treatment) on: i) the type and length of the labor relationships, ii) the wages, iii) the effort levels and iv) the profits for both firms and workers.

[11] Note that the cost function is increasing and convex.
[12] Firms received information at the end of the period about worker's ID and effort.

Next, we examine subjects decisions out of the labor market. We focus on how the labor-market structure affects investment decisions and how labor conditions may determine its success.

3.1. Decisions inside the labor market

In this section we discuss outcomes in the PT1 and AT1 treatments in relation to those in the NBT1 treatment and in relation to each other.

No Barrier Treatment

We find that the mean effort level across periods is 5.34. The high effort levels come mainly from long-term relationships in which a firm and a worker choose to engage in a sequence of two or more consecutive private contracts with each other. The second row in Table 3 shows that workers provide higher effort levels when they are engaged in a long-term relationship (7.58) than when they are not (4.32), with $Z = 2.888$, $p = 0.002$.[13] This behavior could reflect the threat of not being rehired motivating workers to provide higher effort. One element of the higher wage is that workers' profits are significantly larger when they are engaged in long-term (38.81) than when they are in short-term relationships (31.07), with $Z = 2.238$, $p = 0.013$. A second element is that having a long-term relationship reduces the possibility of becoming unemployed.

The last row in Table 3 shows that long-term relationships are also profitable for firms. Even though firms offer significantly larger wages to workers (50.01 vs. 36.51 for long-term and short-term relationships, respectively, with $Z = 2.238$, $p = 0.013$), higher effort levels provided by workers not only compensate these higher salaries but also generate significantly larger profits for companies (25.36 vs. 6.43 for long-term and short-term relationships, respectively, with $Z = 3.765$, $p = 0.000$).

[Table 3 here]

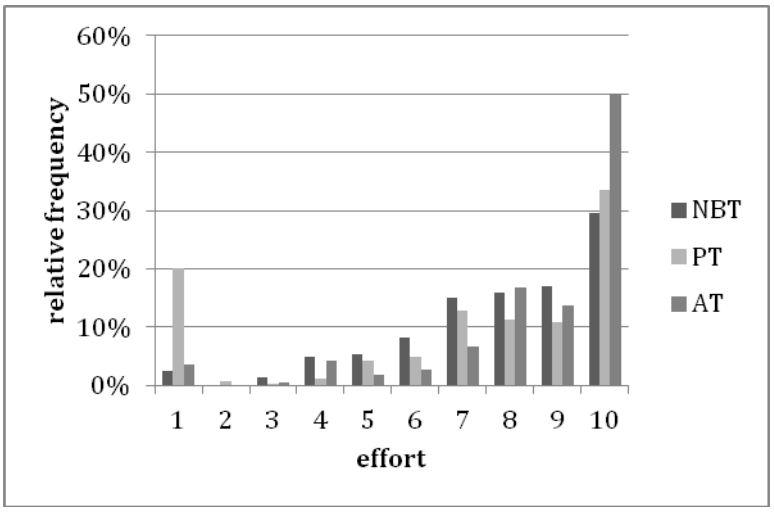
[13] Here and throughout the paper (unless otherwise indicated), statistical tests are one-tailed (rounded to three decimal places) and each observation is comprised of the average for an individual over all periods.

Permanent Treatment

We next present the main consequences of introducing *permanent* dismissal barriers that, once triggered, prevent firms from firing workers independently of their performance. At first glance, it seems that the introduction of dismissal barriers does not create a negative incentive effect on workers' performance. Table 3 shows that the average effort levels in PT1 and NBT1 are very similar in long-term relationships (6.92 and 7.58, respectively, with $Z = 0.192$, $p = 0.848$, two-tailed test).

Nevertheless, as shown in Figure 1, workers are more prone to shirk in permanent automatic long-term relationships. While in NBT1 workers provided the lowest effort level only 2% of the time, this percentage rises to 20% with permanent dismissal barriers.

Figure 1: Distribution of effort levels in long-term relationships



Note: We consider a long-term relationship to be when a firm and a worker engage in a private contract for at least 2 consecutive periods.

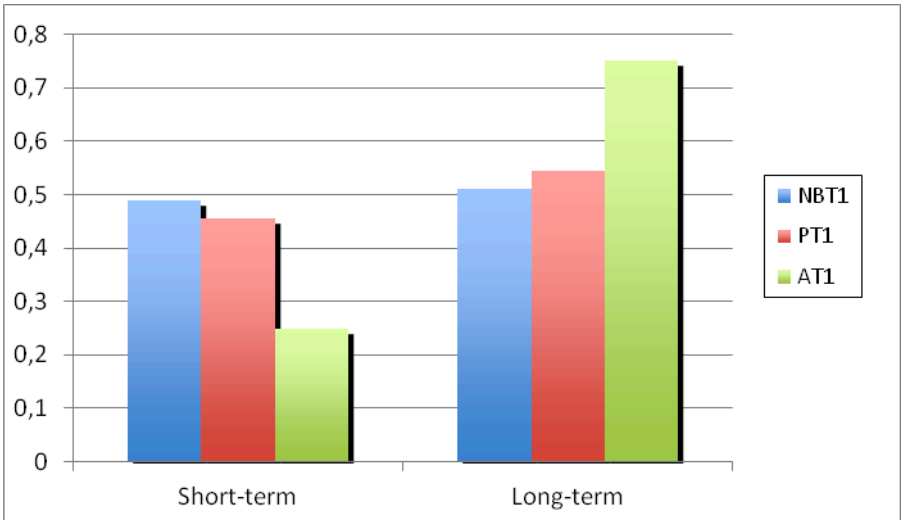
Even though in PT1 the workers provide the minimum effort level 20% of the time, firms are not worse off with permanent dismissal barriers. As Table 3 shows, firms' profits are not significantly lower in PT1 than in NBT1 (10.97 vs. 14.67 for PT1 and NBT1, respectively, $Z = 0.595$, $p = 0.552$, two-tailed test). Finally, as one would expect, workers' profits are (somewhat) larger in PT1 than in NBT1 (37.19 and 33.36, respectively, with $Z = 1.782$, $p = 0.037$). These

larger profits for workers could be due to the fact that, although in short-term relationships workers' profits are very similar (33.65 and 31.07 for PT1 and NBT1, respectively, Z = -0.355), in long-term relationships profits for workers are significantly larger in PT1 than in NBT1 (45.14 and 38.81, respectively, $Z = -2.161$, $p = 0.015$).

Automatic Treatment

In this treatment, dismissal barriers are triggered, period-to-period, whenever workers fulfill the level of effort demanded by firms in a private contract. Thus, workers should provide an effort level that matches companies' desired effort to ensure being rehired in the next period. This condition makes the dismissal barrier less risky for firms in the AT1 treatment than in the PT1 treatment (since in PT1, once workers have achieved a permanent contract and are not obliged to provide any specific effort in order to keep their job).

Figure 2: Frequency of the length of the relationships



Note: We consider a long-term relationship to be when a firm and a worker engage in a private contract for at least 2 consecutive periods.

A consequence of introducing *renewable* dismissal barriers is that it changes the distribution of the labor relationships. Figure 2 shows the length of the relationships grouped into two categories: one-shot (short-term) interactions and relationships of two periods or more

(long-term). The most relevant issue comparing PT1 and AT1 is that 54% of the trades in PT1 were in long-term relationships compared to 75% in AT1. Pairwise statistical tests find that the rate in AT1 is significantly different than the rate in PT1 ($Z = 2.654$, $p = 0.004$) and is also significantly different than the rate in NBT1 ($Z = -3.670$, $p = 0.000$). There is no difference between the rates in NBT1 and PT1 ($Z = -0.651$, $p = 0.515$, two-tailed test).

Result 1: *Automatic dismissal barriers are triggered more frequently and as a consequence the distribution of the relationship length changes. The automatic clause generates a larger number of long relationships than contracts in the other conditions.*

Given the clause that ensures workers are rehired whenever they provide the effort level demanded by firms and the large percentage of long-term relationships arisen in AT1, we find that the distance between the desired and the actual effort is significantly smaller than in the other two treatments.[14] Moreover, workers are willing to match the effort level demanded much more frequently in this treatment. We observe that in 80.6% of private contracts (300 out of 372) workers provide an effort level at least as high as the effort desired by firms in AT1. This result contrasts with 42.3% (132 out of 312) in NBT1 or 45% (189 out of 420) in PT1. Pairwise tests on worker-level data find that the rate in AT1 is significantly different than the rates in both NBT1 and PT1 ($Z = -4.224$, $p = 0.000$, and $Z = 4.088$, $p = 0.000$, respectively), but that there is no difference between the rates in NBT1 and PT1 ($Z = 0.007$, $p = 0.994$, two-tailed test).

If firms (reasonably) anticipate that the presence of *renewable* dismissal barriers will lead workers to provide the desired effort level with a high probability, firms should request a higher effort level than in NBT1. Results confirm this conjecture.[15] Indeed, results show that firms demanded the maximum effort level in private contracts almost half of the time (175 out 352), compared to less than one-third of the time (91 out of 288) in NBT1 ($Z = -2.761$, $p = 0.003$). In

[14] In AT1 the average gap between desired and actual effort is 1.32, while in NBT1 it is 2.14. This difference is statistically significant ($Z = -2.582$, $p = 0.005$). The difference in the average gap between AT1 and PT1 is also significant ($Z = 2.642$, $p = 0.004$).

[15] Results in Table 3 show that desired effort levels (8.52 and 7.82 for AT1 and NBT1, respectively) are significantly higher in AT1 than in NBT1 ($Z = 2.041$, $p = 0.021$, one-tailed test with individual-level data).

addition, when firms demanded the maximum effort level (10) in private offers, workers provided it on average 67.72% of the times in AT1, while the maximum effort level was provided 22.24% of the times in NBT1 ($Z = 3.163$, $p = 0.008$).[16]

The dynamic generated by the automatic dismissal barriers (i.e., firms requesting a higher effort level and workers providing an effort level closer to what is desired) explains why effort levels are larger in AT1 than in NBT1 and PT1.[17] Differences between average effort levels are statistically significant between AT1 and PT1 (6.61 vs. 5.34) and between AT1 and NBT1 (6.61 vs. 5.41).[18] In fact, as can be seen in Figure 1, the maximum effort level is provided 50% of the time in AT1 compared to only 30% of the time in NBT1.

Result 2: *The presence of automatic dismissal barriers generates higher effort levels than in the other condition contracts. Firms request higher effort levels and workers reduce the gap between desired and actual effort. In addition, with renewable dismissal barriers, half of the time workers provided the maximum effort level.*

In order to examine in more depth the determinants of effort, we use a GLS random effects model in which the dependent variable is the effort level provided by the worker. As explanatory variables we consider: i) *Private*, dummy variable which takes value 1 if the effort is provided with a private offer and 0 otherwise, ii) *Protected contract*, a dummy variable which takes the value 1 if the effort is provided when the worker was protected against dismissal and 0 otherwise, iii) *Wage*, the wage received by the worker, iv) *Desired effort*, the effort requested by the firm, v) *Cumulative unemployment*, the cumulative unemployment rate of the worker, that is, the number of periods the worker has been unemployed and vi) *Cumulative profits*, the cumulative profits obtained by the worker. We include three other variables in order to analyze

[16] For this analysis of worker's behavior in private offers, we only focus on the comparison between AT1 and NBT1. We exclude PT1 since workers could have two different motivations when they receive a private offer. If workers have not reached a permanent position they could have incentives to match the effort level demanded by the company. However, once they achieve the permanent position this incentive could disappear. This fact could distort the comparison with AT1 and NBT1.

[17] Moreover, even controlling for the wages, Table A in Appendix shows that the effort levels are larger in AT1 than in NBT1.

[18] For the comparison between AT1 and PT1, we have $Z = 2.493$, $p = 0.006$; for the comparison between AT1 and NBT1, we have $Z = 2.417$, $p = 0.008$.

the effect of decisions made outside the labor market on the effort provided: vii) *Cumulative failed projects*, the number of past investment projects that generated negative revenues for the worker, viii) *Long-term projects*, a dummy variable which takes value 1 if the worker has initited an investment project and 0 otherwise and ix) *Protected*project*, an interaction term which captures the situation in which the worker invests when he is protected against dismissal.

Table 4. Regressions on Effort levels (by treatment)

Variable	(1) NBT1	(2) AT1	(3) AT1	(4) AT1	(5) PT1	(6) PT1	(7) PT1
Private	1.270*** (0.207)	1.014*** (0.285)	4.178*** (0.474)	5.272*** (0.357)	0.502** (0.218)	4.153*** (0.301)	4.152*** (0.282)
Protected contract			1.288*** (0.347)			-0.914** (0.373)	
Wage	0.085*** (0.005)	0.072*** (0.008)			0.086*** (0.006)		
Desired effort	0.122*** (0.027)	0.292*** (0.052)			0.135*** (0.031)		
Cumulative unemployment	-0.015 (0.017)		-0.194*** (0.052)	-0.224*** (0.053)		-0.172*** (0.050)	-0.202*** (0.049)
Cumulative profit	0.001*** (0.0003)		0.001*** (0.0004)	0.001*** (0.0003)		0.002*** (0.0006)	0.001*** (0.0005)
Cumulative failed Projects	-0.209** (0.093)		-0.010 (0.371)	0.130 (0.378)		0.095 (0.313)	0.204 (0.316)
Long-term projects	0.420** (0.176)	0.832*** (0.231)	1.104*** (0.269)			1.012** (0.416)	
Protected*project				0.853*** (0.241)			-0.601* (0.357)
Constant	-0.090 (0.116)	0.017 (0.042)	2.490*** (0.387)	2.620*** (0.380)	0.198 (0.122)	2.197*** (0.346)	2.363*** (0.342)
R-squared	0.826	0.846	0.686	0.679	0.704	0.424	0.424
N	720	720	467	467	900	591	591

These are GLS regressions with random effects, clustered by subject. Standard errors are in parentheses. ***, **, and * indicate significance at p = 0.01, 0.05, and 0.10, respectively, two-tailed tests.

Results in Table 4 show that "private" has a positive and significant effect on effort. Private offers in NBT1 could foster workers' beliefs in a firm's contingent renewal policy,

increasing their incentives to provide more effort. In AT1, the positive effect of "private" is not due to workers' beliefs but rather to the clause that ensures being rehired if workers match the effort level demanded by the firm. Notice that in PT1, although "private" also has a positive and significant effect on efforts, specification (6) shows that once workers are protected against dismissals, they significantly reduce their efforts. This suggests that the positive effect of "private" comes mainly from the first private offer received by the worker. Contrary to PT1, "protected contract" has a positive and significant effect on efforts in AT1. This result indicates that a dismissal barrier contingent on effort levels is an effective device for improving workers' performance.

As in previous studies (see for example, Fehr, Kirchsteiger and Riedl, 1993; Brown, Falk and Fehr, 2004 or Charness et al, 2012) wages have a positive and significant effect on effort. In the same line, "desired effort" encourages higher effort levels on average.

We observe that "cumulative unemployment" has a negative effect on effort. One possible explanation for this result could be the following. If a worker is unemployed for a large number of periods, he might wish to compensate for low past earnings and will reduce the effort level provided once he gets a contract. Notice that this negative effect is significant when there is the possibility of obtaining a protected contract (in AT1 and PT1) but it is weaker in NBT1. "Cumulative profits" has a positive and significant effect on the effort level provided by the worker. This suggests that workers improve their performance when they receive high earnings.

Regarding wages, we see that there are statistically-significant differences in wages between AT1 and NBT1 (49.20 and 42.13 for AT1 and NBT1, respectively, $Z = 2.081$, $p = 0.019$). However, differences are not statistically significant between AT1 and PT1 (49.20 and 47.03 for AT1 and PT1, respectively, $Z = 0.533$, $p = 0.297$). Regarding profits, firms in AT1

increase significantly their earnings compared to PT1 and NBT1. The data show that firms earn on average 22.85 in AT1, 14.67 in NBT1 and 10.97 in PT1.[19]

The renewable dismissal barriers seem not to substantially affect worker earnings with respect to the other two treatments. Although workers' profits are larger in PT1 than in AT1 and larger in AT1 than in NBT1 (37.19 in PT1, 34.78 in AT1 and 33.36 in NBT1), these differences are not significant ($Z = 0.966$, $p = 0.167$, for the comparison between PT1 and AT1 and $Z = -0.510$, $p = 0.305$, for the comparison between AT1 and NBT1).

If we consider social efficiency (total profits) without the investment stage, results show that automatic dismissal barriers lead to a better outcome than in the other treatments. The average total payoffs are 46.00 and 46.45 in NBT1 and PT1 respectively, compared to 55.89 in AT1. The differences between NBT1 and AT1 and between AT1 and PT1 are statistically significant ($Z = 2.383$, $p = 0.017$ and $Z = 2.501$, $p = 0.012$, respectively, two-tailed tests).

Result 3: *The presence of renewable dismissal barriers does not decrease workers' earnings but it does greatly increase firms' profits and total earnings, leading to a more efficient outcome.*

3.2. Decisions outside the labor market

Our experimental design allows workers to make decisions *outside* the labor market, specifically to undertake long-term projects. Since the success of these projects crucially depends on keeping a job for at least eight consecutive periods, we group the labor relationships, for the three different institutions, into two categories: Relationships of one to seven periods and relationships of eight periods or more. Treatment AT1 is the labor institution that generates the largest percentage of long-lasting relationships (at least eight consecutive periods), 56% versus 34% in PT1 and 19% in NBT1.[20] These data seem to indicate that, a priori, the best (worst) scenario to undertake a long-term project would be AT1 (NBT1).

[19] Comparisons give $Z = 2.704$, $p = 0.004$ for AT1 versus NBT1, and $Z = 3.652$, $p = 0.000$ for AT1 versus PT1.
[20] The comparison between AT1 vs. NBT1 gives Z = 5.391, p = 0.000, and the comparison between AT1 vs. PT1 gives $Z = 3.119$, $p = 0.001$).

3.2.1 Investment decisions

Table 5 gives a general view of workers' behavior regarding the investment decision. Specifically, it shows the percentage of workers who undertook an investment project, the total number of investments initiated and the percentage of successful projects.[21] It also shows these variables disaggregated by the type of contract (public or private) workers had when they chose to undertake the investment. Finally, Table 5 shows the number of projects initiated when the worker is protected from being fired and the average workers' profits from the investment.

Table 5. Investment decisions

Category	NBT1	PT1	AT1
Workers investing	75%	48%	55%
Investments initiated (% success)	41(29%)	37 (38%)	25 (68%)
Investments initiated with public contract (% success)	19 (21%)	18 (11%)	6 (17%)
Investments initiated with private contract (% success)	22 (36%)	19 (63%)	19 (84%)
Investments initiated with protection (% success)	--	9 (100%)	18 (83%)
Average workers' profits from investment	1.33	16.25	43.86
N (workers)	40	50	40
N (firms)	28	35	28

Standard deviations are in parentheses. Note that in PT1 there were five sessions, rather than four.

Although we have seen that the worst scenario to undertake long-term projects is NBT1, the percentage of subjects who decided to invest was much larger in this treatment, where there was no possibility of being protected against dismissal (see Table 5). In NBT1, 75% of subjecs initiated an investment project while only 48% and 55% did so in PT1 and AT1, respectively.[22] In other words, people were somewhat *less* likely to invest in a project when there were clauses of dismissal barriers in the labor market.

[21] We define an investment project as successful if the subject investing obtained positive earnings from it.
[22] Differences are statistically significant for the comparison between NBT1 and PT1 ($Z = 2.584$, $p = 0.005$) and the one between NBT1 and AT1 ($Z = 1.863$, $p = 0.031$), but not between PT1 and AT1 ($Z = 0.656$, $p = 0.255$).

One possible explanation for this result could be that while in AT1 the dismissal barriers appear to act as a reference point for workers, in the sense that most of them seem to wait to be protected against dismissal to invest, in NBT1 this reference point is absent. Success rates are low with public contracts, but much higher in PT1 and AT1 with private contracts. In the latter case, the success rate is an impressive 84%. So private contracts appear to be a driver of investment success, so that it may be that workers wait until they have a such a stable situation in order to undertake the investment project. For AT1, the number of investment projects undertaken with a private contract is significantly larger than with a public contract ($Z = 2.714$, $p = 0.003$). Moreover, 16 out of 22 workers (72.7%) waited to undertake an investment project until they achived a protected contract in AT1.

The previous explanation for subjects' behavior might be not applicable to PT1. In this case, although workers also have the opportunity to obtain a permanent job, the conditions for getting it are much harder than in AT1. If subjects believe that it will be very difficult to reach a permanent contract, they will not wait until they will have obtained it to undertake a project (unlike the AT1 treatment). Results in third and fifth lines in Table 5 show that only 9 out of 37 investments are initiated when subjects had a safe position and 18 out of 37 projects were initiated with a public contract. These results seem to support the idea that workers perceive it to be very difficult to reach a permanent job, so most of them undertake their investment projects without waiting for a safer position.

On the other hand, this fact does not explain why the number of investments is so reduced in PT1 in comparison to NBT1. One possible explanation may be that workers anticipate that firms are reluctant to establish a long-term relationship. In NBT1, subjects know that there is no way of getting a permanent job, but workers could believe that there is a possibility of getting a private offer from the same company for several periods. In PT1, as offering a private contract to the same worker for two consecutive periods creates the

obligation for the company of rehiring the worker, companies might be reluctant to do this kind of offer. Workers may anticipate this and think that it is more difficult to have a long-term relationship with the same firm, leading to a lower percentage of workers initiating an investment project.

When we focus on the timing at which these investments were undertaken, we see that in NBT1 and PT1 most investments were initiated with a public contract (61% in NBT1 and 75% in PT1); in contrast, these were mostly initiated with a private contract (69%) in the AT1 treatment. In the last periods, most investments were undertaken with a private contract (72%, 100% and 92% in NBT1, PT1 and AT1 respectively). Having a contract from a private offer increases the probability of undertaking an investment project in all three treatments by 9.24, 27.70, and 10.60 percentage points in NBT1, PT1 and AT1, respectively.

Both results are quite intuitive. If workers assign a larger probability to the fact of having a contract in subsequent periods, they will undertake the investment project. Thus, a private contract could be seen as a signal of a greater probability of being rehired, leading to a greater probability of investing.[23] With a protected contract, assigning this high probability is straightforward.

Result 4*: The presence of dismissal barriers in the labor market drives workers to undertake investment projects more selectively.*

3.2.2 Investment success rates

Turning to the success rate, Table 5 shows that in there is a much higher percentage of successful investment projects in AT1 (68%) than in NBT1 (29%) or PT1 (38%). Differences are statistically significant for the comparison between AT and NBT1 (Z = 3.052, p = 0.001) and between PT1 and AT1 (Z = 2.311, p = 0.010), but not for across NBT1 and PT1 (Z = 0.797). As

[23] In fact, in AT1 a private offer could mean (if worker provides the desired effort demanded by the company) a protected contract.

expected, success rates were very high when workers had achieved a protected position when initiating an investment, 100% in PT1 and 87% in the AT1 treatment.

The higher success rates in AT1 naturally leads to larger profits from the investment project. Table 5 shows that whereas in NBT1 and PT1 workers' average profits are 1.33 and 16.25, respectively, in AT1 profits mushroom to 43.86. Differences are statistically significant between AT1 and NBT1 ($Z = 3.008$, $p = 0.001$) and AT1 vs PT1 ($Z = 1.775$, $p = 0.038$) but not between NBT1 and PT1 ($Z = -0.986$). Thus, results show that when worker have the unilateral ability to automatically renew their contracts, they earn much more with their investments.

Result 5*: The presence of renewable dismissal barriers in the labor market generates more successful investments outside the labor market.*

3.2.3 Effect of long-term projects on the decisions inside the labor market

In this subsection we analyze the relationship between the decision to undertake an investment project and behavior in the labor market. To the extent that our data show a link between investment and dismissal barriers, this may have important ramifications for labor policy. Since long-term investments would seem to be particularly beneficial for society, it is worthwhile to encourage these; reducing uncertainty by having appropriate dismissal barriers may be a fruitful approach.

In our regressions in Table 4, we introduced three variables regarding the long-term project the workers could undertake outside the labor market: *long-term project*, *cumulative failed projects*, and *protected*project*, an interaction term capturing the situation in which the worker is investing when he has a protected contract. The coefficient of *long-term projects* is positive and statistically significant for all three treatments. When workers are invested in a long-term project outside the labor market, their increase their effort. The intuition behind this result seems clear. In order to earn positive profits from the project the worker must be employed at least for eight consecutive periods. As the probability of being rehired is increasing with the

effort level, workers may have additional incentives to raise their efforts in order to maximize the probability of getting a contract in subsequent periods.

This intuition does not hold in PT1, where a contract may be protected regardless of effort choices. In fact, protected workers have incentives to reduce their effort levels to increase their profits (as indicated by the negative and significant coefficient of *protected*project* on column 7 of Table 4). Nevertheless, this negative effect is more than compensated for by the increase in level efforts of workers without a protected contract nevertheless undertaking an investment project, since the total effect of investing is positive on effort levels (as indicates the covariate *long-term projects* in column 6 of Table 4).

Result 6: *When workers invest in a long-term project out of the labor market, they improve their performance inside the labor market.*

3.3 Treatments without possible investment.

In order to check whether the main results obtained regarding the labor market still hold when there is no long-term project in which to invest, we replicate the three previous treatments removing the investment stage. Specifically, we run two sessions per treatment (17 subjects per session): No-Barrier Treatment without investment (NBT2), Permanent Treatment without investment (PT2) and Automatic Treatment without investment (AT2).

[Table 6 here]

Table 6 summarizes the main variables in the treatments without the investment stage. The last two rows show that, as in the treatments with the investment stage, the existence of automatic dismissal barriers changes the distribution of the length of the relationship, generating a lower number of one-shot interactions and a larger number of long relationships.[24] Similarly, in treatments without investment, the presence of automatic dismissal barriers also leads firms to

[24] Differences are statistically significant (Z = -3.154, p = 0.008; Z = -1.081, p = 0.280, two-tailed test; Z = 2.629, p = 0.005) for the comparisons between NBT2 and AT2, NBT2 and PT2, and AT2 and PT2, respectively.

request higher effort levels and workers to reduce the gap between the desired and actual effort, thus providing higher effort levels. Effort levels in AT2 are significantly larger than in NBT2 (5.66 versus 3.39, $Z = 2.800$, $p = 0.003$). Desired effort levels in AT2 are significantly larger than in NBT2 (8.08 vs. 6.65, $Z = 2.781$, $p = 0.003$).[25]

Table 7. Regressions on the effect of the investment stage on effort levels (by treatment).

Variable	(1) NBT1 & NBT2	(2) AT1 & AT2	(3) AT1 & AT2	(4) PT1 & PT2	(5) PT1 & PT2
Private	1.035*** (0.190)		1.364*** (0.233)	0.627*** (0.176)	
Protected contract			1.236*** (0.284)		0.442* (0.238)
Wage	0.068*** (0.005)	0.081*** (0.005)		0.070*** (0.004)	
Desired effort	0.205*** (0.043)	0.350*** (0.052)	0.499*** (0.055)	0.073* (0.041)	0.373*** (0.038)
Cumulative unemployment	-0.145*** (0.039)	-0.051 (0.044)	-0.210*** (0.045)	-0.041 (0.037)	-0.145*** (0.045)
Cumulative profit	0.001 (0.0004)	0.0002 (0.0004)	0.001** (0.0004)	0.001 (0.0004)	0.002*** (0.001)
Investment	0.861*** (0.292)	0.629* (0.364)	0.024 (0.359)	1.211*** (0.333)	1.249*** (0.407)
Constant	1.437*** (0.510)	0.802 (0.687)	1.400** (0.698)	2.475*** (0.583)	3.513*** (0.669)
R-squared	0.599	0.541	0.484	0.479	0.254
N	744	743	743	869	869

These are GLS regressions with random effects, clustered by subject. Standard deviations are in parentheses. ***, **, and * indicate significance at p = 0.01, 0.05, and 0.10, respectively, two-tailed tests. In each contract condition (NBT, AT and PT), we include observations from both the corresponding treatment in which the investment stage is present and the treatment in which it is not. The dummy investment is 1 when the investment stage is present and 0 when the investment stage was eliminated.

In order to analyze whether the possibility of investing has some influence on workers' effort levels, Table 7 shows the results of a GLS random-effects model in which the dependent

[25] Moreover, differences between the desired and the effort level provided by the worker are significantly lower in AT2 than in NBT2 (z = 2.229, p = 0.026, one-tail test).

variable is the effort provided by workers. Note that in order to study the effect of the investment stage, we include observations from both treatments with and without the investment stage in the regressions in Table 7. As explanatory variables we introduce: i) *private*, a dummy variable that takes the value 1 if the effort is provided with a private offer and 0 otherwise, ii) *protected contract,* a dummy variable that takes the value 1 if the effort is provided when the worker was protected against dismissal and 0 otherwise, iii) *wage,* the wage received by the worker, iv) *desired effort,* the desired effort demanded by the firm, v) *cumulative unemployment,* the cumulative unemployment rate of the worker, that is, the number of periods the worker has been unemployed and vi) *Cumulative profits,* the cumulative profits obtained by the worker. We also include a dummy variable, *Investment*, which takes value 1 if the worker is participating in a treatment with investment stage and 0 otherwise.

Econometric results show that workers provide larger effort levels in treatments where they have the option of investing in a long-term project. [26] This result holds for NBT, PT and AT.[27] When workers can invest in a project, they have additional incentives to increase their effort levels. One factor is that providing a high effort level increases the probability of being rehired, generating longer relationships that could be more profitable since it increases the possibilities of investing successfully. In fact, we find that the existence of the investment stage changes the distribution of the length of the relationship, generating a lower number of one-shot interactions and a larger number of long relationships. A second factor is that the investment stage as a potential second source of income gives workers room to be more generous towards firms. Regarding the profits, fourth and fifth rows of Table 6 show that, similar to treatments

[26] As can be seen in specifications (2) and (3), the dummy investment has only marginal or no statistical significance. The main reason is that "investment" is highly correlated with "protected contracts". In NBT and PT, investment has a positive effect on workers' effort. However, in AT there is a crowding-out effect because this positive effect is ruled out by the incentives to increase the effort provided by a "protected" contract.

[27] NBT, PT and AT refer to the three different labor institutions regardless the investment stage. That is, NBT encompasses the case of a labor market with no dismissal barriers both with and without investment stage. Similarly, PT (AT) encompasses the case of a labor market with permanent (automatic) dismissal barriers both with and without investment stage.

with the investment stage, the presence of renewable dismissal barriers does not decrease workers' earnings but it does increase firms' profits. In fact, while in NBT2 and PT2 firms' profits are negative, in AT2 these profits turn into positive.

So the additional impetus of the investment seems to be enough to either generate more trust on the part of the firms or to inspire more effort provision by the worker. It seems that giving a worker a share in the future yields dividends for the firm, while the worker earns roughly the same amount as in our main treatments, although additional investment earnings are possible. As shown in Table 6, short-term relationships generate negative profits for firms. Most of the relationships when there is no investment stage are short-term. As we have seen, the fact that there is no investment possibility generates a lower effort level. Lower effort levels decrease the probability that a worker will be rehired, leading to more short-term relationships and to lower firms' profits.

Result 7: *The presence of the investment stage leads workers to provide larger effort levels. As a consequence, the distribution of the relationship length changes, generating a lower number of one-shot interactions and a larger number of long relationships respect to the cases in which the investment stage is absent.*

4. Conclusion

Having a strong degree of stability in employment has been one of the historical main aspirations of the working population. Trade unions have pursued employment protection as a mechanism to help achieve this stability. We study the effect of dismissal barriers on both performance and productivity in the labor market and worker willingness to get involved in projects that require periodic investment over a considerable amount of time. There are two polar cases. In environments such as the private sector in the U.S., dismissal is typically on an at-will basis, so that insecurity about future employment is likely to deter such investment. At the other extreme, automatic dismissal barriers (present to some degree in many European labor markets),

provide little or no incentive for workers to perform at a high level. This may have a very adverse affect on worker productivity and firm profitability.

In this article, we propose a middle way: renewal dismissal barriers that are based on recent performance.[28] We find that the presence of renewable dismissal barriers in the labor market has two relevant consequences. First, workers respond with much greater productivity with renewal dismissal barriers than with either no dismissal barriers or irrevocable ones when their employment is contingent upon reasonable performance. Thus, renewal dismissal barriers lead to much greater firm profits and total earnings than do either other institution. Secondly, workers achieve greater labor stability. The larger number of long-term relationships corresponds to a higher effort level and, as a consequence, greater profits for firms. With regard to workers, although the larger labor stability does not improve significantly their labor earnings, it allows them to make better decisions out of the labor market. That is, workers undertake more successful investments. So it appears that contingent renewal gives safeguards that permit long-term investments while preserving incentives for high productivity. A caveat here is that contract renewal is based on performance and in our design performance is equal to effort levels. However, in field settings the effort level is not observable and may differ from performance. Thus, a dismissal-barriers contract might be applied in settings where effort is highly correlated with performance such as sports contracts (an example previously mentioned). It remains an open question how the introduction of the performance as a function of effort levels (perhaps with some error) will influence behavior in both the labor market and the investment scenario.

Our results suggest that instituting renewable dismissal barriers is a policy that may well prove beneficial. Of course, while the intuition seems clear, this is only one study and so this can only be a preliminary conclusion. Certainly more research is needed on this important issue for society.

[28] Firms should be cautious when choosing the threshold workers have to reach in order to get their renewal. If this threshold is very high, workers might feel that it is very difficult to reach the goal. This fact could discourage workers from trying to reach the threshold, leading to lower effort levels and lower firms' profits.

References

Adsera, A. (2004) "Changing fertility rates in Developed countries: The impact of labor market institutions" Journal of Population Economics 17: 17-43

Altmann, S., Falk, A., Grunewald, A. and D. Huffman (2013) "Contractual incompleteness, unemployment and labor market segmentation" Review of Economic Studies, forthcoming

Blossfeld, H.P., Klijzing, E., Mills, M. and K. Kurz (2005) "Globalization Uncertainty and Youth in society" London/New York Routledge

Brown, M, Falk, A. and E. Fehr (2004) "Relational contract and the nature of market interactions" Econometrica 72(3): 747-780

Brown, M, Falk, A. and E. Fehr (2010) "Competition and relational contracts: The role of unemployment as a disciplinary device" Journal of the European Economic Association 10(4): 887-907

Charness, G. and P. Kuhn (2011) "Lab Labor: What Can Labor Economists Learn in the Lab?" Handbook of Labor Economic 4: 229-330

Charness, G., Cobo-Reyes, R., Lacomba, J. Lagos, F. and J. Perez (2012) "Social comparisons in wage delegation: Experimental evidence" mimeo

Charness, G., Cobo-Reyes, R., Jimenez, N., Lacomba, J. and F. Lagos (2012) "The hidden Advantage of delegation: Pareto improvement in a Gift-Exchange Game" American Economic Review 102: 2358-2379

De la Rica, S. and A. Iza (2005) "Career planning in Spain: do fixed term contracts delay marriage and parenthood?" Review of the Economics of the Household 3: 49-73

Diaz Serrano, L. (2005) "On the negative relationship between labor income uncertainty and homeownership: risk aversion vs. credit constraints" Journal of Housing Economics 14(2): 109-126

Falk, A., Huffman, D. and B. MacLeod (2008) “Institutions and contract enforcement” NBER Working paper 13961

Fehr, E., Gachter, S. and G. Kirchsteiger (1997) “Reciprocity as a social enforcement device: Experimental evidence” Econometrica 65(4): 833-860

Fehr, E., Kirchsteiger, G. and A. Rield (1993) “Does fairness prevent marker clearing? An experimental investigation” Quarterly Journal of Economics 108(2):437-459

Fehr, E., Klein, A. and K. Schmidt (2007) “Fairness and contract design” Econometrica 75(1): 121-154

Fischbacher, U. (2007) “Z-Tree: Zurich Toolbox for Ready-made Economic Experiments” Experimental Economics 10(2): 171-178

Gross, T. and Guo, C. (2012), “Wage Inequality and Fairness,” mimeo.

Haurin D. and H.L. Gill (1987) “Effects of income variability on the demand of owner-occupied housing” Journal of Urban Economics 22(2): 136-150

Hondroyiannis, G. (2010) “Fertility determinants and Economic Uncertainty: An assessment using European panel data” Journal of Family and Economic Issues 31(1): 33-50

McDonald, P. (2000) “Gender equity in theories of fertility transition” Population and Development Review 26(3): 427-439

Mincer, J. (1962) “On the job training: Cost, returns and some implications” Journal of Political Economy 70: 50-79

Robst, J., Deitz, R. and K. McGoldrick (1999) “Income variability, uncertainty and housing tenure choice” Regional Science and Urban Economics 29(2): 219-229

Appendix A

Table A: GLS Random Effects on Effort levels

	(1) NBT1 vs. AT1	(2) NBT1 vs. AT1	(3) NBT1 vs. PT1	(4) NBT1 vs. PT1	(5) AT vs. PT1	(6) AT1 vs. PT1	(7) AT1 vs. PT1
Private	1.155*** (0.164)	1.869*** (0.201)	0.811*** (0.150)	1.721*** (0.171)	0.778*** (0.167)	1.651*** (0.197)	
Permanent contract							0.507*** (0.177)
Wage	0.079*** (0.005)		0.085*** (0.004)		0.082*** (0.005)		0.093*** (0.006)
Desired effort	0.208*** (0.030)	0.533*** (0.023)	0.141*** (0.021)	0.484*** (0.020)	0.200*** (0.029)	0.521*** (0.023)	0.206*** (0.035)
Investment	0.570*** (0.147)	0.839*** (0.167)		0.301* (0.177)		0.525*** (0.202)	
Cumulative unemployment		-0.047** (0.019)	-0.035** (0.015)	-0.045** (0.019)		-0.058*** (0.020)	
Cumulative profit		0.002*** (0.0003)	0.001** (0.0003)	0.001*** (0.0003)		0.001*** (0.0003)	
Cumulative fail		-0.113 (0.119)		0.044 (0.126)		0.127 (0.181)	0.195 (0.196)
NBT1	-0.458*** (0.142)	-0.583*** (0.153)	0.286* (0.147)	0.104 (0.246)			
AT1					0.778*** (0.208)	0.788*** (0.240)	1.066*** (0.234)
Constant	0.280*** (0.083)	0.363*** (0.127)	-0.019 (0.115)	0.237 (0.173)	-0.172 (0.125)	-0.017 (0.167)	-0.373** (0.163)
R-squared	0.834	0.771	0.748	0.651	0.768	0.697	0.758
N	1440	1440	1620	1620	1620	1620	1058

These are GLS regressions with random effects, clustered by subject. Standard errors are in parentheses. ***, **, and * indicate significance at p = 0.001, 0.05, and 0.10, respectively, two-tailed tests.

Table 3. Average effort levels, wages and profits

Category	NBT1	PT1	AT1
Average desired effort level	7.82 (1.33)	8.22 (1.05)	8.52 (1.08)
Average effort level provided	5.34 (2.27)	5.41 (2.19)	6.61 (2.42)
Average effort level with long-term relationships	7.58 (1.48)	6.92 (2.71)	7.98 (1.84)
Average effort level with short-term relationships	4.32 (1.98)	5.26 (1.81)	4.72 (1.95)
Average wages	42.13 (13.32)	47.03 (15.98)	49.20 (18.52)
Average wages with long-term relationships	50.01 (13.23)	56.01 (11.88)	53.62 (18.60)
Average wages with short-term relationships	36.51 (13.95)	41.59 (14.22)	37.76 (13.83)
Average worker earnings	33.36 (7.34)	37.19 (11.29)	34.78 (13.60)
Average worker earnings with long-term relationships	38.81 (9.40)	45.14 (9.08)	40.06 (13.50)
Average worker earnings with short-term relationships	31.07 (7.50)	33.65 (9.70)	28.17 (9.55)
Average firm earnings	14.67 (11.10)	10.97 (13.69)	22.85 (9.44)
Average firm earnings with long-term relationships	25.36 (11.23)	13.17 (21.96)	27.78 (11.15)
Average firm earnings with short-term relationships	6.43 (8.35)	10.44 (11.11)	9.25 (11.26)
Average total earnings	46.00 (18.20)	46.45 (17.48)	55.89 (19.15)
Average total earnings with long-term relationships	64.00 (11.34)	58.31 (21.68)	66.80 (14.16)
Average total earnings with short-term relationships	38.02 (16.29)	45.52 (14.60)	41.13 (15.97)

Notes: We define a long-term relationship as when a firm and a worker engage in a private contract for at least 2 consecutive periods. Standard deviations are in parentheses. ***, **, and * indicate significance at p = 0.001, 0.05, and 0.10, respectively, two-tailed tests.

Table 6. Average effort levels, wages and profits without possible investment stage

Category	NBT2	PT2	AT2
Average desired effort level	6.65 (1.07)	7.00 (1.98)	8.08 (1.42)
Average effort level provided	3.39 (1.47)	3.59 (2.25)	5.66 (2.55)
Average wages	34.81 (14.48)	42.06 (23.41)	47.44 (18.85)
Average worker earnings	31.30 (9.32)	35.91 (11.54)	34.96 (13.48)
Average firm earnings	-0.06 (9.54)	-2.45 (8.97)	15.71 (10.67)
Average total earnings	30.12 (12.19)	31.58 (18.36)	48.32 (31.58)
% long-term relationships	9%	20%	55%

Notes: We define a long-term relationship as when a firm and a worker engage in a private contract for at least 2 consecutive periods. Standard deviations are in parentheses. ***, **, and * indicate significance at p = 0.001, 0.05, and 0.10, respectively, two-tailed tests.

Appendix B

Instructions for the Automatic Treatment with investments (AT1)[29]

1. In order to assure anonymity you have been randomly assigned a code (yellow card). At the beginning of the experiment you will receive an initial endowment of 5€. During the experiment, you can earn a higher amount of money by accumulating points. The amount of earned points will depend on your decisions and on the other participants'decisions.

2. All points that you earn during the experiment will be exchanged into Euros at the end of the experiment. The exchange rate will be 45 points = 1€. At the end of the experiment you will be paid by cash and in private.

3. There will be 17 participants, who will be divided into 2 groups: buyers and sellers. In this experiment there are 10 sellers and 7 buyers.

4. You will either be a buyer or a seller throughout the experiment. All participants have received an identification number, which they will keep throughout the experiment.

5. The experiment consists of 18 periods. In each period, buyers and sellers have to make decisions. In the following, we describe in detail how you can make your decisions in each period.

6. **Phase 1: The Trading Phase**. Each period starts with a trading phase. During the trading phase each buyer can reach a trading agreement with one seller. Buyers can submit several trading offers to sellers. As a seller you can accept one and only one of the offers submitted to you in each period. During the trading phase you will see the following screen (seller trading screen).

    a. The trading phase lasts 150 seconds. When this time elapses, the trading phase is over. Hereafter, no further offers can be submitted or accepted for this period.

    b. There are two types of offers: private and public offers.

        i. Private offers

        Each buyer has the opportunity to submit private offers to a specific seller. The selected seller will be informed about these offers and this seller alone can accept them. No other seller or buyer is informed of these offers. The offer of a buyer will contain the following information: the identification number of the buyer who submitted the offer, the price of the good, and the desired quality of the good. If the seller wants to accept a private offer, he must click on the button "accept offer".

[29] For our experimental procedures we follow the instructions by Falk, Huffman and MacLeod (2008). The instructions were slightly modified according to the treatment.

ii. Public offers

Each buyer also can submit public offers. All sellers are informed of these offers and any seller can accept them. The offer of a buyer again contains the identification number of the buyer who submitted the offer, the price of the good and the desired quality. This information is also displayed to all sellers and all buyers. If a seller wants to accept a public offer he must follow the same procedures as with private offers (click on the button "accept offer").

c. Each seller can reach only one trading agreement in each period. Once a seller has accepted one offer he cannot accept any further offers.

d. All buyers have to observe the following rules when submitting trading offers:

The price offered by the buyer may not be lower than 0 or higher than 100:

$$0 \leq \text{price} \leq 100$$

The desired quality of the buyer may not be below 1 or higher than 10:

$$1 \leq \text{desired quality} \leq 10$$

e. As long as no offer has been accepted by a seller, the buyer can make as many public and private offers as he wishes. Each offer submitted by a buyer can be accepted at any time during the trading phase.

f. Each buyer can reach only one trading agreement in each period. Once an offer of a buyer has been accepted he will be notified which seller accepted it. As each buyer can reach only one trading agreement in each period, all other offers for the buyer will be automatically cancelled.

g. Once all 7 buyers have entered a trade agreement or after 150 seconds have elapsed, the trading phase is over.

h. Buyers have no obligation to submit a trading offer, and sellers have no obligation to accept a trading offer.

7. **Phase 2: Determination of the Product Quality**. Following the the trading phase, all sellers who have reached a trading agreement then determine which product quality they will supply to their corresponding buyers.

a. The desired quality by the buyer is not binding for the seller. The seller can choose the exact quality desired by his/her buyer, but also a higher or lower product quality.

b. In order to choose the actual product quality, the seller must enter the value for the quality in the field "Determine the actual product quality" and press the "ok" button to confirm the choice. As long as the seller has not pressed "ok" he can alter his choice.

c. The product quality that you choose must be an integer between 1 and 10.

$$1 \leq \text{actual product quality} \leq 10$$

8. The seller's income:

   a. If a seller has not reached a trading agreement during a trading phase he earns an income of 5 points for that period.

   b. If a seller has accepted a trading offer, his income depends on the price he accepted and the product quality he chose to deliver. His income will be calculated as follows:

   $$\text{Seller's income} = \text{Price} - \text{production costs}$$

   c. The higher the quality of the good, the higher the production costs are. The production costs for each product quality are displayed in the table below:

Quality	1	2	3	4	5	6	7	8	9	10
Production Costs	0	1	2	4	6	8	10	12	15	18

   d. The seller's income is therefore higher, the lower the quality. Furthermore, his income is higher, the higher the price offered by the buyer is.

9. The buyer's income:

   a. If a buyer does not reach a trading agreement during a trading phase he earns an income of 0 points for that period.

   b. If one of his trading offers is accepted, his income depends on the price he offered and on the quality supplied to him. The income of your buyer will be determined as follows:

   $$\text{Buyer's income} = 10 * \text{product quality} - \text{price}$$

   c. Therefore the higher the quality, the higher the buyer's income. At the same time his income is higher, the lower the price is.

10. The income of all buyers and sellers are determined in the same way. Each buyer can therefore calculate the income of his seller and each seller can calculate the income of his buyer.

11. Please note that buyers and sellers can incur losses in each period. These losses would have to be paid from your initial endowment or from earnings in other periods.

12. You will be informed of your income and the income of your buyer/seller on an "income screen". On the screen (see below) the following will be displayed. The buyer or seller with whom you traded, the price the selller offered, the desired quality by the buyer, the product quality supplied by the seller, and the income for the buyer and the seller in this period.

13. Please enter all the information in the documentation sheet supplied to you. After the income screen has been displayed, the respective period is concluded. Thereafter the trading phase of the following period starts. Once you have finished studying the income screen please click on the "next" button.

14. **Additional rule: "Right to get an offer"** There is one more rule to consider. If in a private offer a seller delivers a quality level at least as high as that desired by the buyer, then the seller enjoys the "right to get an offer" in the next period. That is, the buyer is obligated to offer a private contract to this seller in the next period.

    a. If the previous condition happens in a public offer, the right to get an offer is not established.

    b. The "right to get an offer" means that in the next period the buyer must make the seller an offer that is available as soon as soon as the trading phase begins. This offer consists of a price and a desired quality. The price must be at least as high as the one in the previous period.

    c. In addition to this offer, the seller with this "right" will also see the other public and private offers, which have been offered to him and the other sellers. This seller can accept the offer of "his" buyer or any other offer that has been made (private or public) by other buyers.

    d. As long as this seller has not decided which offer to select, "his" buyer cannot make another offer to this or another seller. This means that this seller can accept the offer of "his" buyer as long as the seller has not declined it (and trading time has not elapsed).

    e. The buyer will be informed about the seller's decision. If the seller accepts another buyer's offer, "his" buyer is free to make offers to other sellers. As long as the seller has not decided, all "his" buyer can do is waiting and observing the market.

    f. If the seller accepts the offer of "his" buyer and the seller again delivers a quality of the product at least as buyer's desired quality, then the buyer is again compelled to offer another private contract to this seller in the next period. If and only if the seller does not satisfy the quality of the product requested by the buyer or the seller accepts the offer of another buyer does the right to receive an offer

expire. This means that the right to receive an offer can only be terminated by the seller.

g. An example concerning the right to receive an offer. Assume that buyer 4 and seller 7 have reached an agreement in period 2, based on a private offer, and seller 7 has provided higher quality than was requested by the buyer. From period 3 on, seller 7 then enjoys the right to receive an offer. This means that buyer 4 has to make seller 7 an offer in the third period before the trading period begins. If seller 7 accepts and he again satisfies the desired quality by the buyer, then in period fourth, seller 7 again enjoys the right to receive an offer. That is, whenever a seller satisfies at least the desired quality requested by the buyer, the seller will enoy the right to get an offer in the next period.

15. **Phase 3: The investment phase:** This phase is only for sellers. Buyers do not have this investment phase. Buyers are aware of the investment stage for sellers but they do not know whether a seller has undertook an investment project or not. The conditions to undertake an investment project are the following ones:

    a. The seller may decide whether to initiate a project in any period prior to period 12. After period 12, it is no longer possible to initiate an investment project .

    b. The seller must have reached a trade agreement with a minimum profit of 10 points in the same period in which he decides to initiate an investment project .

    c. The cost of the project is 10 points per period invested. Therefore, the seller must reach trade agreements with a minimum profit of 10 points in every period he is investing. Otherwise, the project ends. The project also automatically ends the first period in which the seller does not reach a trading agreement.

    d. If a seller decides to initiate a project, it should last at least eight consecutive periods in order to get positive profits.

    e. If the project lasts at least eight consecutive periods, net profits will be:

        Project costs = 10 * number of periods investing

        Project returns = 15 * number of periods investing

        Net profit of the project = 5 * number of periods investing

    f. That is, the more consecutive periods (8 or more) that the project lasts, the higher the net profit from the investment project. For example, if a seller initiates a project in period 5 and this ends in period 15, this would mean a net profit of 55 points (5 net points for each of the 11 periods that the project is active).

    g. If the project lasts less than 8 periods , net profits will be:

        Project costs = 10 * number of periods investing

Project returns = 0

Net profit of the project = -10 * number of periods investing

h. That is, if the project lasts less than 8 consecutive periods, it will imply losses to the seller. For example, if a seller initiates a project in period 5 and this ends in period 10, it will mean a net loss of 60 points (10 points for each of the six periods that the project is active).

16. The experiment will not start until all participants are completely familiar with all the procedures. In order to be sure that this is the case, we kindly ask you to solve the exercises below.

17. Before starting the experiment, buyers and sellers will participate in two practice periods. These trial periods will not be added to the result of the experiment and therefore will not be remunerated.

Questionnaire

Just to be sure that you understand the instructions you have to solve a very simple test. When everyone in the room has answered correctly the test, we will start the experiment.

Question 1: A seller accepts an offer of a buyer with both a price of 60 and a desired quality of 9. The seller chooses to provide a quality of 9. Please, fill in the answers:

Seller's income = ____ Buyer's income = ____

Question 2: A seller accepts an offer of a buyer with both a price of 50 and a desired quality of 8. The seller chooses to provide a quality of 4. Please, fill in the answers.

Seller's income = ____ Buyer's income = ____

Question 3: Suppose a seller has accepted a public offer of a buyer in period 5. The buyer desires a quality of 8 and the seller delivers a quality of 9. a) Will the seller enjoy the right to get an offer in period 6? And if the offer was private, will the seller enjoy the right to get an offer in period 6? Please, circle the right answer.

a) Yes No

b) Yes No

Question 4: Suppose a seller has decided to invest in a project in period 7 and she reaches trading agreements from period 7 to period 13 with a minimum profit of 10 points in each period. However, in period 14, she does not get any trading agreement. What is the profit of the investment? Please, fill in the answers:

Project costs = _____

Project returns = _____

Net profit of the project = _____

Question 5: Suppose a seller has decided to invest in a project in period 9 and she reaches trading agreements from period 9 to period 17 with a minimum profit of 10 points in each period. However, in period 18, she does not get any trading agreement. What is the profit of the investment? Please, fill in the answers:

Project costs = _____

Project returns = _____

Net profit of the project = _____