

# Empirical Determinants of Intertemporal Choice

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**Abstract:** We study the empirical determinants of intertemporal choice by analyzing a unique decision Croatian retirees made recently about whether to accept an immediate pension payment or a larger stream of delayed payments. Individual decisions are correlated in sensible ways with income, liquidity constraints, longevity expectations, and other covariates. Attitudes toward government also matter: those less confident that the government will honor its commitments are more likely to take the immediate stream of payments. Those who believe it is important to receive “the full amount due, no matter how long it takes” are substantially more likely to take the delayed payments.

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The canonical consumption-based model, dating back to at least Samuelson (1937), captures the determinants of intertemporal decisions primarily through a single parameter—the discount rate. Discount rates are not directly observable, and many studies have attempted to measure implicit discount rates, with widely varying results. For example, whereas several efforts to measure discount rates from surveys and experiments have found evidence of very low (and even negative) discount rates,<sup>1</sup> several econometric studies of actual behavior have estimated discount rates that are extremely large.<sup>2</sup> Barsky et al. (1997) note that “one possible explanation of the finding of high subjective discount rates in the econometric work is the difficulty of controlling for features of the economic environment facing agents, such as liquidity constraints and the need for precautionary savings.” A closely related focus of this literature is to examine how discount rates vary with various demographic characteristics such as income, education, and race.<sup>3</sup> Many of these studies, however, have been hampered by methodological concerns, ranging from sample selection, the hypothetical nature of the choice (in the case of some surveys and experiments), and a host of omitted variables.

In this paper, we provide new evidence on the empirical determinants of intertemporal decisions and how they vary across the population. We examine an exogenously imposed and economically large intertemporal decision made by a large

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<sup>1</sup> See, for example, Barsky et al. (1997), Loewenstein (1987), Loewenstein and Prelec (1991, 1992), and Loewenstein and Thaler (1989).

<sup>2</sup> Warner & Pleeter (2001) find discount rates from 0 to more than 30 percent. See also Hausman (1979) and Lawrence (1991). Sawmick (1998) estimates the distribution of rates of time preference from wealth data and finds wide dispersion, ranging from negative to more than 20 percent.

<sup>3</sup> Studies that have examined how discount rates vary across the population include Gilman (1976), Black (1984), and Lawrence (1991). These studies find that discount rates decline with income, education, and age, and that blacks have higher discount rates than whites do. Sawmick (1998) shows that the distribution of rates varies with age and income. Warner and Pleeter (2001) find that military officers exhibit lower discount rates than enlisted personnel do, that blacks exhibit a higher discount rate than whites do, and that discount rates decline with education.

fraction of the entire retired population of Croatia. As the result of a 1998 ruling by the Constitutional Court of Croatia, the government was ordered to make substantial payments to retirees, and thereby compensate them for an unconstitutional benefit cut that had occurred during, and immediately after, the war in the former Yugoslavia in the early- to mid-1990s. In late 2005, eligible retirees were offered a one-time, irrevocable choice (described in more detail below) between a more immediate and a more deferred payment stream. Although the deferred payment option offered a nominal internal rate-of-return in excess of 26 percent relative to the more immediate payment option, approximately 70 percent of retirees chose the latter.

We empirically examine the determinants of this choice using micro data from a nationally representative survey that we designed and fielded for this purpose in the period from late 2008 to early 2009. This setting has several advantages over the prior literature. First, like Warner and Pleeter (2001), who examine the separation choices made by about 65,000 U.S. military personnel in the early 1990s, we are able to examine *actual* choices over an amount of money large enough to be quite meaningful to the typical retiree (on average, the monetary value of the settlements was roughly equivalent to a year of household income for the average Croatian retiree). Thus, our study does not suffer from the bias that may arise when studying hypothetical decisions over small stakes, an issue that plagues many experimental studies.

Second, because the policy decision about the size of this repayment and the population to receive it was determined by a Constitutional Court decision and a subsequently passed law, we have a fairly clean experimental setting that is not contaminated by concerns about self-selection. This is in contrast to Warner and Pleeter

(2001), who analyze the intertemporal decision made only by those who opted to separate voluntarily from military service, a group that may differ from those who chose to continue military service.<sup>4</sup>

Third, we examine a much broader range of determinants than any prior study. Through data collected from a comprehensive survey, we combine economic, demographic, preference, and attitudinal variables, while also controlling directly for factors that have hampered many previous studies, such as liquidity constraints. Past studies have found, for example, that younger individuals and individuals with less income are less likely to defer consumption (i.e., they exhibit a higher discount rate). However, factors such as liquidity constraints, bequest motives, health, and financial literacy (often not available in the data used in prior studies) are correlated with age and income, and are also potentially important factors in intertemporal decisions in their own right. Our data allow us to disentangle carefully the effects of many correlated, though distinct, characteristics and attitudes upon intertemporal choice.

Fourth, we use our setting to measure the extent to which survey-based measures of inter-temporal preferences can predict an important, real-world intertemporal choice. In particular, we test how a hypothetical choice between money today and money in the future is correlated with an individual's actual choice, and whether the predictive power of that hypothetical choice varies with the individual's financial sophistication and experience.

Finally, our survey also allows us to explore a number of potential explanations, including respondents' beliefs about the economic environment and attitudes toward

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<sup>4</sup> Warner and Pleeter (2001) did account for this sample selection in their empirical methodology.

government, neither of which would have been observable from administrative data alone. As we show below, several of these factors are quantitatively quite important. Gauging the importance of these economic-environment and attitudes-toward-government variables is an essential step toward understanding how individuals might respond to an intertemporal tradeoff of cash flows offered by the government.

We find that the willingness to defer payments in this setting correlates with a number of demographic characteristics in sensible ways. For example, we find that individuals are more likely to take the deferred payment (and thus exhibit a lower discount rate) if they are younger, have children, express a bequest motive, and are in good health. We also show that they are more willing to defer if they have higher income and are not liquidity-constrained. We further show that individuals take the broader macroeconomic environment into consideration: those more concerned about future inflation and those more concerned about the possible devaluation of the Kuna (the Croatian currency) were more likely to take the immediate payment option.

We also find that, at least in this choice setting, hypothetical choices like those used in many survey settings are not predictive of the actual choices for most of the population. Specifically, we elicit from the respondents the rate of return they would require to be willing to invest their money with a highly reputable bank if it meant not being able to access the money for one year. Responses to this question are not significantly correlated with the actual payment choice, except for those individuals who are not liquidity constrained and who are more financially sophisticated (measured as having savings, particularly savings in foreign currencies). Put differently,

our proxy for the rate of time preference is informative of the actual behavior only for the subset of individuals who have had actual experience with saving decisions.

We then turn to an analysis of factors related to attitudes toward government. We begin with an analysis of political risk, a factor several authors document in the context of the U.S. Social Security system (e.g., Luttmer and Samwick, 2011; Shoven and Slavov, 2006). Our results are consistent with a role for political risk: individuals who exhibit a lower level of confidence in the government are substantially more likely to choose the more immediate payment option. We find this using both a positively framed and a negatively framed question about the likelihood of the government making good on its payment commitments.

Working in the opposite direction (i.e., in favor of encouraging individuals to take the delayed payout) is a strong desire to receive the “full amount they were owed no matter how long it takes.” Consistent with the psychological importance of reference points in the decision-making process (Shefrin and Statman, 1979), these individuals appear to have harbored strong feelings about the importance of getting back the full nominal amount due.<sup>5</sup> Our results indicate that individuals who believed it is important to get the full amount due no matter how long it takes were 27 percentage points more likely to accept the deferred payment option, and that most of them reported that they would have chosen the deferred option even if payouts were hypothetically extended to a 10-year (rather than a 6-year) horizon. To address concerns about measurement error and endogeneity, we show that this finding is robust to using an individual’s region of

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<sup>5</sup> The focus on nominal amounts is also in line with the findings of Odean (1999), who finds that stock investors seem to exhibit loss aversion around the nominal amount paid for a stock.

birth as an instrument for the desire to be made whole.<sup>6</sup> The economic importance of this desire is quite substantial. Our results suggest that, if no one had regarded “being made whole” an important consideration, the fraction choosing the delayed payout option would have fallen from 31% to only 12% of the affected population.

Although the institutional details of our setting are specific to Croatia, the findings are of much more general interest. Nearly every developed country faces long-term shortfalls in the financing of old-age entitlement programs. This has led some countries to consider ways of allowing participants voluntarily to opt out of a portion of their benefits in exchange for a private account.<sup>7</sup> Knowing which individual characteristics are correlated with a willingness to accept a substantial reduction in the present value of benefits in order to receive payments early is important for understanding both the fiscal and distributional implications of such proposals. This is also true at the sub-national level: the underfunded status of many of the U.S. public defined benefit pension plans has led to an erosion in confidence that benefits will be paid. For example, Novy-Marx and Rauh (2009) calculate that state public pensions are under-funded by \$3.23 trillion. The presence of political risk in such systems may lead participants in these systems to discount future benefits at a higher rate (e.g., Luttmer and Samwick, 2011; Shoven and Slavov, 2006). If so, the cost of these programs may exceed the perceived value to the participants, and offering lump-sum options in return

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<sup>6</sup> Our instrument is motivated by Guiso, Sapienza, and Zingales (2004) and Brown et al. (2008), both of which show that an individual’s region of birth can have long-lasting effects on attitudes later in life—in our context, attitudes toward the government. Our instrument is also motivated by work in the public administration and organizational behavior literatures.

<sup>7</sup> In the U.S., for example, the 2001 President’s Commission to Strengthen Social Security proposed allowing individuals to redirect part of their payroll taxes into personal accounts in exchange for a future reduction in their defined benefit income from Social Security.

for a substantial actuarial reduction in the present value of benefits may be a plausible path to reform. Indeed, exactly this approach has been taken over the past year by a number of large private sector defined benefit plans, including General Motors. Understanding the distributional implications of such options requires an appreciation of who is most likely to choose the expedited payout.

This paper proceeds as follows. Section 1 provides background on the Croatian pension repayment plan. Our research methodology and summary statistics are presented in Section 2. Section 3 presents empirical results, and Section 4 concludes.

## **1. Background on the Croatian Pension Choice**

After declaring its independence from the former Yugoslavia in 1991, Croatia became embroiled in a war until it signed the Dayton peace agreement with Bosnia & Herzegovina and Serbia in 1995. During this period, the Croatian government operated under considerable pressure and with a scarcity of resources as it faced the need to finance the war effort, the effects of war destruction, a severely challenged economy, as well as a simultaneous transition toward a market economy and democracy in the post-communist era. Under these circumstances, one of the steps the government undertook at the time to secure additional resources was altering the manner in which public pension benefits were calculated. Essentially, the change in the benefit took the form of a switch from wage-indexing to price-indexing of benefits, which had the effect of lowering the amount of money retirees had received. This alteration was in place from late 1993 to the end of 1998, at which point wage-indexing resumed.

Shortly after the Dayton peace agreement was signed in 1995, organized groups representing the interests of affected pensioners filed a series of lawsuits questioning the constitutionality of this pension change. In 1998, the Constitutional Court of Croatia agreed that the benefit change was unconstitutional and ruled that the government must reimburse retirees for the benefit shortfall. However, the Court did not prescribe how this remediation program was to be implemented. Six years of political negotiations followed, with legislation finally being passed on July 21, 2004.

The 2004 legislation stipulated that retirees should receive the difference between what they were owed under the law and what they had actually received, along with interest. The payments were to be made from an investment fund established solely for this purpose, with funding guaranteed by the state. The amount of payment owed to most retirees was substantial: for a large share of retirees, it was roughly a year or more of household income. Table 1 shows the distribution of the pension repayment amount for the full sample, as well as by income groups (both the pension repayment amount and the income level are self-reported). We find that, as expected, higher-income individuals are owed a higher pension-repayment amount because they likely had bigger pensions to begin with. Further, the pension repayment amount roughly equates to a year of household income for the typical respondent. For example, among respondents in the 2,000-4,000 Kuna monthly income bracket (annual income of 24,000 to 48,000 Kuna), both the median and mean pension repayment amounts are around 36,000 (about \$7,000 U.S. dollars, as measured at the time of the survey).

Another year had passed before the manner of the payment and the payment options were fully developed. Finally, in December 2005, approximately 430,000

individuals (about one-tenth of the overall population of Croatia) were given a choice between two payout options. Individuals who chose option A were promised four semi-annual payments—totaling 50% of the nominal value of the calculated amount owed—that were to commence in mid-2006 and terminate in December 2007. Those who chose option B were promised six annual payments—totaling 100% of the nominal calculated amount owed—that were to commence in December 2007 and terminate in December 2012. Table 2 presents the breakdown and timing of the payments that would be made under option A (the more immediate payments) and option B (the more deferred payments) for someone with a pension repayment amount of 60,000 Kunas.

As shown in the bottom row of Table 2, the break-even discount rate that equates these two payment streams is approximately 26.6%. Despite the high nominal return from choosing option B, about 71% of participants chose option A, the earlier, smaller stream of payments.<sup>8</sup> To put this nominal 26.6% return into perspective, we consider how this relates to inflation and to other rates of return available to Croatian citizens at the time. Post-war inflation has been relatively stable, reaching a high of approximately 8% in 1998, and hovering around 4% for much of the past decade. However, this period of relatively low and stable inflation is coming on the heels of a period of extremely high inflation. Thus, while the 26.6% nominal return corresponds, *ex post*, to a very high real return, it will be important to control for heterogeneity in individual views about inflation risk (accomplished by using our survey instrument, as discussed below). The 26.6% return is also quite high in comparison with other savings instruments (Figure 1).

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<sup>8</sup> As reported by Večernji List on June 27, 2007, 299,910 retirees received their third payment under Option A in late June 2007. As reported by Večernji List on December 16, 2008, 123,321 retirees received their second payment under Option B in mid-December 2008.

In the years around the time of the pension choice, rates on certificates of deposit (CDs), savings, and government bonds—be they denominated in Kunas or in foreign currencies—were substantially below 26.6%. Thus, by virtually any measure, the internal rate of return provided by delaying pension payments was substantial.<sup>9</sup>

## **2. Research Methodology and Summary Statistics**

Fielding our own survey of retirees was both necessary and desirable for two primary reasons. First, Croatia does not have a nationally-representative, household data set that could be used for this purpose, and Croatian privacy laws rendered administrative data unavailable. Second, all of the data needed for this study (e.g., pension choice, demographic data, and, particularly, data on liquidity constraints, preferences, attitudes toward government, and the like) would not have been included in standard data sets even if they had existed.

We hired a Croatian survey agency PULS (affiliated with the U.S. Gallup polling organization) to conduct our own survey of retirees concerning their pension choice. This survey was fielded from mid-November 2008 to mid-January 2009, at a time the pension choice was still fresh in the respondents' minds: those who had chosen option A (the more immediate payment option) would have just about received their final payment, whereas those who had chosen option B would have been early in the repayment process. The survey, designed to be representative of the affected population

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<sup>9</sup> Given the high internal return on deferral, a natural question is why a formal market for financial intermediation of these benefits did not arise. A more patient investor (such as a financial institution) would have had an incentive to provide pensioners with money up front in return for receiving the deferred payments, thus earning this exceptionally high return. Such institutional arrangements were explicitly outlawed in the legislation creating this program. Of course, retirees could have made such arrangements informally and privately with family members (such as children), suggesting that it is important to control for whether the pensioner had children in our regression analysis.

and fielded accordingly, asked the respondents detailed questions about their pension choice, demographics (e.g., age, income, gender, family status), and a range of questions to assess knowledge, beliefs, and attitudes about economic and financial matters.

We collected 2,619 survey responses. Of these, 1,818 respondents, or 69.4% of the sample, had selected option A, whereas 801 respondents, or 30.6% of the sample, had selected option B. These proportions match the division of choice within the population almost exactly (69.4% of the sample opting for option A, compared to 70.9% of the full population). This suggests that our sampling was representative and that individuals reported their pension choices truthfully.

The primary dependent variable for our analysis is a binary variable, “OptionPicked,” set equal to one if the respondent selected option B (the larger, more deferred payouts) and equal to zero if the respondent selected option A (the smaller, more immediate payouts). If one were to interpret the choice of the repayment plan as driven solely by a comparison of one’s discount rate to the internal-rate-of-return (an interpretation that, as discussed below, is an over-simplification), those with the dependent variable value of 1 (i.e., those who chose option B) should be viewed as having a discount rate below 26.6%, whereas those with the value of 0 (i.e., those who chose option A) should be viewed as having a discount rate in excess of 26.6%.

We regress this binary variable against a range of covariates.<sup>10</sup> Given our definition of the dependent variable, a positive coefficient associated with a covariate should be interpreted as an increased willingness to defer consumption (i.e., a lower

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<sup>10</sup> For ease of interpretation, we report the coefficients from a linear probability model. Non-linear binary choice models yield very similar marginal effects.

discount rate), whereas a negative coefficient should be interpreted as a decreased willingness to defer consumption (i.e., a higher discount rate).

In Table 3, we report the summary statistics for the key covariates that we include in our regressions of the pension repayment choice (our regressions also include 24 indicator variables depicting the individual's county of residence within Croatia, as well as 10 indicator variables for the ethnicity of the individual, none of which we tabulate in the table). For purposes of this summary table, as well as our later regressions, we group variables into seven categories and present them in distinct panels: (A) rate of time preference and risk aversion; (B) income, wealth, and liquidity constraints; (C) education, financial literacy, and financial self-assessments;<sup>11</sup> (D) family structure and other demographics; (E) health and longevity; (F) views about macroeconomic factors; and (G) beliefs concerning attitudes toward government.<sup>12</sup>

The tabulations presented in the table suggest that our survey respondents exhibit substantial heterogeneity in terms of their attitudes towards risk, their financial condition, their education and financial literacy, health status, and their views about inflation and exchange rate fluctuations. For example, just over two-fifths of individuals

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<sup>11</sup> The three questions at the bottom of Panel C measure the respondents' numeracy. We asked a *Simple Interest Compounding Question*: how much will be in the bank account at the end of two years if the initial balance is 10,000 and the interest rate is 5% with no withdrawals. An answer of "More than 11,000" is recorded in the tables as "Correct", while a response of "Exactly 11,000" is recorded in the tables as "Almost Correct." We also asked a *Simple Inflation Question*: how much they can buy a year from now if the interest rate is 2% and inflation is 3%. An answer of "Less than today" is recorded in the tables as "Correct", while a response of "Exactly as much as today" is recorded in the tables as "Almost Correct." Finally, we asked a *"Doubling" Compounding Question*: how long it takes an account to double in value at an annual interest rate of 10%. We group answers to this question in the tables as either a response of 5-10 years or "Wrong" (responses of less than 5 years or more than 10 years).

<sup>12</sup> Individuals were asked to respond to most questions on a scale of "1" to "5," with "1" typically representing "not at all important" and "5" typically representing "extremely important." We collapse these five potential responses into three categories: "Not Important" (responses "1" or "2"), "Moderately Important" (response "3"), and "Very Important" (responses "4" or "5").

have savings (defined as owning a savings account or a certificate of deposit) either in the local currency (Kuna) or a foreign currency (e.g., Euro), and just over one-quarter have more than a high-school education. Roughly one-half of respondents reported an immediate need to pay for something as a very or extremely important factor in their repayment decision, while one-quarter reported that it was not important.

There is substantial heterogeneity in terms of attitudes toward government. For example, whereas 32% of respondents state that they were very confident at the time of their choice that the government would make all payments, 36.9% were not at all confident. Roughly 3 of 5 individuals felt it was very important that they receive all the money owed no matter how long it takes, while one out of five placed no importance on this factor. Given the myriad of factors involved in making an intertemporal choice, we turn to regression analysis to sort out their relative importance.

### **3. Empirical Analysis of the Determinants of Intertemporal Choice**

In this section, we regress the pension repayment choice against a large number of variables of interest. Our dependent variable is an indicator variable equal to 1 if the respondent selected pension repayment option B (the more deferred payment stream) and 0 if the respondent picked option A (the more immediate payment stream). We estimate a linear regression by OLS with robust standard errors (effects are nearly identical if we use a Probit with marginal effects evaluated at the mean of the independent variables). For convenience, we multiply all coefficients in the table by 100 so that they can easily be interpreted as percentage points. All of the variables presented in the summary statistics table (Table 3) are included in the regression, with explanatory

variables organized into the same seven groups for ease of readability and exposition. In addition, we include in the full-specification regression 24 indicator variables capturing the respondents' county of residence,<sup>13</sup> as well as 10 indicator variables for the respondents' ethnicity (e.g., Croat, Serb, Muslim/Bosniak). Results of our primary specification are reported in Table 4.<sup>14</sup>

### *3.1 Rate of Time Preference and Risk Aversion*

We begin by discussing the correlation between whether an individual decided to defer consumption (i.e., selected repayment option B) and a proxy measure of an individual's pure rate of time preference. We next estimate a time preference parameter in a manner similar to Kirby et al. (1999) and Chabris et al. (2008).<sup>15</sup> We describe a situation in which the individual has received 20,000 Kunas<sup>16</sup> and is given a choice between keeping the money and doing with it as they please, or depositing the money with an "extremely reputable bank as a CD for one year, so that you will be promised a certain annual interest rate, but will not be able to touch the money until the year expires." We then ask "If you would be willing to make such a deposit, what interest rate would the extremely reputable bank need to offer to pay you so that you would prefer to deposit the 20,000 Kunas as a CD for one year, rather than keep it and do with it as you please?" If respondents did not provide a meaningful response (i.e., they

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<sup>13</sup> The county-of-residence indicators are jointly statistically significant in the regression at the 1% level.

<sup>14</sup> We lose a total of 129 observations from our original sample of 2,619 because of missing values for certain variables included in our regression, resulting in a final sample size of 2,490.

<sup>15</sup> Kirby et al. (1999) and Chabris et al. (2008) ask subjects to choose between "smaller, immediate reward (SIR) and a larger, delayed reward (LDR)" (e.g., "Would you prefer \$54 today, or \$55 in 117 days?"). Additional questions vary the reward sizes and the time period of delay.

<sup>16</sup> At the time of the survey, this amount was worth just under \$4,000 U.S. dollars. Also, it is equal to approximately one-third of the average annual wage in Croatia, and to about three-quarters of the average annual pension in Croatia.

responded that they did not know), we took them through a branching series of responses, asking whether they would deposit the money at various rates (5%, 10%, 15%, and 25%) to approximate their rate of time preference for a one-year bank deposit. Respondents were also allowed to answer that “[T]here is absolutely no way I would do it,” that is, that there is no rate at which they would take out the one-year CD.

Indeed, 29% of the respondents indicated that there was “no rate” at which they would be willing to give up current access to the money for a higher future return, suggesting that these individuals had a very high rate of discount. Of the 71% of respondents who provided a rate (initially or through the “branching” questions), the mean and median rates were 8.7% and 7%, respectively, with a quarter of this group demanding an interest rate of 10% or more and a tenth of this group demanding an interest rate of 15% or more. Therefore, there is substantial heterogeneity: whereas a large fraction of the respondents report having a very high discount rate (i.e., would not save at any rate), one-quarter of the respondents would postpone consumption for a year for a bank-deposit return of 5% or less, while about one-third would do so for a return in the 6-10% range. Thus, for those who provided a one-year interest rate, most of the responses received were in the range of the actual Kuna-denominated CD rates present in the decade preceding the pension-repayment choice (Figure 1).

As indicated in Panel A of Table 4, this proxy for the pure rate of time preference is not significantly correlated with the choice of pension payments (the coefficient is small in magnitude, -0.1, and is not statistically significant). There are at least two possible reasons for this lack of significance: (1) because of the context of our question (investing in a bank CD), our time preference measure may be very noisy for those with

limited investment experience, and (2) liquidity constraints may have confounded our measure, as had been hypothesized in the context of understanding the difference in estimated rates of time preference between the experimental and empirical literatures.

Further analysis is supportive of both of these reasons. In Figure 2, we report the coefficients from a modified version of our baseline regression in which we interact the time preference question with variables that capture these effects. The first bar represents the coefficient from Table 4, that is, the baseline coefficient on our rate of time preference question that shows the change in likelihood of selecting option B resulting from a one-percentage point change in the rate of time preference. Subsequent bars show the effect of the rate of time preference for various subgroups, each obtained from a separate regression.

To test for liquidity constraints, we ask respondents to rate on a scale from 1 (not at all important) to 5 (extremely important) the importance of the following statement in influencing their decision: "An immediate need for money to help pay some expenses, such as debts, medical expenses, bills, home or apartment repairs or renovation, replacement of major appliances, or similar, for self, family, or friends." One quarter of the respondents answered that liquidity constraints were not important (answers "1" or "2"), while one-half of the respondents answered that liquidity constraints were very or extremely important (answers "4" or "5"). For individuals who rated liquidity constraints as not important, the coefficient on our measure of their subjective rate of time preference is significant, although the economic magnitude is small. A higher rate is associated with a lower likelihood of picking the deferred payment option; a one-percentage point increase in the subjective rate of preference is

associated with a 0.4 percentage-point decline in the likelihood of picking option B (statistically significant at the 10-percent level). For the more liquidity constrained respondents, the thought of deferring the pension repayment may not be considered a possibility under any rate of return and, therefore, their rate of time preference is not correlated with their decision (we discuss the direct effects of liquidity constraints, as well as the interaction of liquidity constraints with other factors, below).

For respondents who have savings, a trait shared by just over two-fifths of the sample respondents, we find that having a higher discount rate is also associated with a significantly lower probability of choosing the more deferred payout option (option B). As shown by the third bar in Figure 2, a one percentage-point increase in the discount rate is associated with a statistically significant 0.6 percentage-point reduction in the likelihood of choosing option B. For those who do not have savings (and, thus, for whom our question is less salient), there is no relation. If we condition on individuals who have savings in a foreign currency (such as Euro) and, thus, are likely to be more financially sophisticated, a one percentage-point increase in the discount rate is now associated with a highly significant 0.9 percentage-point reduction in the likelihood of choosing option B. As shown in the final bar, the coefficient increases further to a 1.1 percentage-point reduction for the subsample of those who have savings in a foreign currency and for whom liquidity constraints are not important. Although these effects are all statistically significant, they are fairly small in magnitude in light of the important role that the rate of time preference plays in theoretical models of intertemporal choice.

In short, we find that our proxy for the pure rate of time preference is modestly informative only for those individuals for whom it is most salient. These findings are reminiscent of other research that has indicated the importance of focusing on the sub-population for which a particular measure may have more meaning. For example, Malloy, Moskowitz, and Vissing-Jørgensen (2008) show that consumption-based asset pricing models perform better when focused on the consumption risk of stockholders, rather than that of the overall population. In a different context, Brown (2001) shows that forward-looking utility-based measures of the value of guaranteed income are significantly correlated with annuity choice for individuals with longer planning horizons, but not for those who are more myopic.

We also control for risk aversion in Panel A of Table 4, but do not find any significant correlation with the pension payment choice.

### *3.2 Income, Wealth, and Liquidity Constraints*

In Panel B of Table 4, we report the effects of various economic factors, many of which are very consistent with the predictions generated by standard models of intertemporal choice. We find that, consistent with prior research, respondents with higher income and more wealth exhibit lower discount rates (as manifested by a greater likelihood to accept the deferred payments). Specifically, we find evidence of income and wealth gradients: middle- and higher-income individuals are each almost 7 percentage points more likely to defer payments than low-income individuals are.

For reasons of cultural sensitivity, we did not ask directly for measures of overall net worth. Instead, we asked a series of “yes/no” questions about ownership of specific types of assets. While many of these measures (e.g., ownership of real estate, mutual

funds, bonds) are not significant, we do find that individuals who own stocks are more likely to defer payments, as are individuals with higher pension repayment amount (i.e., more money at stake in the option A/B decision). Stock owners are 4.7 percentage points more likely to pick the deferred payment option than those who do not own stock are, while a doubling of the pension repayment amount is associated with a 1.7 percentage-point increase in the likelihood of selecting the deferred payment stream (given the coefficient of 2.5 on the log of the pension repayment amount).

In discussing the fact that econometric studies of behavior and experimental/survey results come to very different conclusions regarding discount rates, Barsky et al. (1997) note that “one possible explanation of the finding of high subjective discount rates in the econometric work is the difficulty of controlling for features of the economic environment facing agents, such as liquidity constraints and the need for precautionary savings.” The fact that our income measures and stock ownership measure are negatively correlated with discount rates is consistent with such a liquidity-constraint explanation. We also measure liquidity constraints through the direct question described in Section 3.1. The bottom part of Panel B of Table 4 suggests that individuals who rate liquidity constraints as very important are 18.6 percentage points more likely to take the immediate payment option than the individuals who rate it as unimportant are.

### *3.3 Education, Financial Literacy, and Self-Assessments*

As shown in the first row of Panel C, education, a potential proxy for financial literacy, is only weakly related to payout choice. Specifically, individuals with more than a high school education are 3.1 percentage points more likely to choose option B

than those with a high school education or less are, although this effect has a  $p$ -value of 0.11 and, therefore, is not significant at conventional levels.

The literature has emphasized that overall education is not a perfect proxy for financial literacy, and that financial literacy has a direct effect on influencing financial decision-making (e.g., Lusardi and Mitchell, 2007a, 2007b). Thus, in addition to the overall education level, we also include numerous measures of financial literacy drawn from the extant literature. None of these measures (e.g., education or work experience in accounting, economics, or finance; self-reported assessment of numeracy; simple compound interest and inflation questions) are significantly correlated with the deferral decision, nor are they jointly significant ( $p$ -value = 0.50).

### *3.4 Family Structure and Other Demographics*

We find that family structure matters. As shown in Panel D, there is a high degree of within-couple correlation in the choice. For those couples in which both spouses had made a pension choice, there is a 51 percentage-point difference in the probability of choosing option B depending on whether one's spouse chose A or B. Of course, the high within-couple correlation should *not* be interpreted as a causal relation, but, rather, as the likely outcome of a joint household decision. Nonetheless, we control for this in all specifications, although the coefficients on other variables are virtually unchanged if we exclude the spouse's choice.

We also find that the presence of children in the household makes it 8.5 percentage points more likely that one will choose the higher-return, deferred payment option. There are at least two possible reasons for this finding. First, this is consistent with a view that those with children may have bequest motives (and thus the higher

total payments are more attractive, especially given that children are qualified to receive the payments if the pensioner dies before the full series of payments has been received). Consistent with this notion, we further find that those who indicated that leaving money to heirs is very important to them were 8.5 percentage points more likely to pick option B relative to those for whom this was not an important consideration in their choice. Second, because of the inheritability of these payments, children and parents could engage in an informal exchange whereby the children could loan to the parents the amount promised through option A (or an even higher amount) early on, and then get paid back from the deferred payments, thus earning the high internal return.

We also note that among those for whom receiving the most money while they were still alive was very important were 5.2 percentage points more likely to take the more immediate payment option (less likely to pick option B) relative to those for whom this was not important.

### *3.5 Health and Longevity*

Individuals rationally discount the future not only because of the pure rate of time preference, but also because they recognize that they may not live long enough to receive payments. This is a particularly relevant consideration in a sample of elderly individuals such as pensioners. Indeed, in standard consumption models, one can think about discounting by the sum of the pure discount rate and the mortality rate. However, in most studies of discount rate behavior, researchers have not had access to information about longevity expectations aside from a respondent's age, which does not encapsulate within-cohort heterogeneity in mortality expectations.

In our survey, we find that beliefs about health and life expectancy (as reported in Panel E of Table 4) are quite important determinants of the intertemporal choice. First, for each additional year of age at the time the pension repayment choice was made, an individual is one percentage point less likely to defer consumption. Even after conditioning for age, individuals who rated their own health as good or excellent relative to peers were significantly more likely to defer payments. In addition, those who were not confident at the time of the choice that they would live at least 7 years (the time required to receive all payments under option B) were 8-9 percentage points more likely to take immediate payments. This suggests that there is substantial heterogeneity in health and longevity expectations within age groups, and that this heterogeneity is important for understanding intertemporal decision-making.

### *3.6 Macroeconomic Factors*

Given Croatia's political and economic history, a natural concern that pensioners might have had was whether the government would be committed to maintaining the purchasing power of the promised future stream of benefits. Simply put, in their lifetimes, Croatian retirees eligible for compensation have "seen it all" – war and its related destruction (twice), high inflationary periods lasting several years, featuring years with annual inflation exceeding 100% and accompanied by "stabilization" attempts and recession (multiple times), and hyperinflation during the pre-war and war period of the late 1980s and early 1990s. However, as discussed earlier, the decade prior to the pension repayment choice was marked by fairly mild inflation.

Our survey asked individuals "at the time you were making your A or B choice, how high did you think that annual inflation would be (that is, by how much would

prices rise each year) over the period of the next several years from that time?" They were given several choices (0-4%, 5-8%, 9-12%, 13-16%, more than 16%), which we collapsed into three ranges (0-8%, 9-16%, more than 16%). Whereas only 2% of sample respondents expected inflation to be more than 16% per year, these individuals were 10.3 percentage points less likely to choose the deferred payment option than those who believed it will be 8% or less per year were.

Croatia is a relatively small, open economy, and even average citizens are aware of the importance of maintaining the Kuna's purchasing power relative to other currencies (especially the Euro). Thus, we also asked "at the time you were making your A or B choice, what was your opinion about the movement of the Kuna relative to the Euro over the period of the next several years from that time?" Those who thought that the Kuna would decline relative to the Euro were 4.5 percentage points less likely to take the deferred payment option.

### *3.7 Attitudes Toward Government*

#### *3.7.1 Confidence that the Government will Honor its Payment Commitment*

Croatia's political history, including the very event that led to this study (the government's decision to renege partially on pension promises), makes Croatia a fruitful environment in which to study political risk. Through our informal discussions with Croatian retirees prior to fielding our survey, it became clear that there were important differences in the population regarding the extent to which they had confidence that the government will actually "make good" on its commitment to make all future payouts. Such skepticism is understandable because the initial basis of the Constitutional Court decision that led to the pension choice in the first place was that

the government essentially had reneged on part of its promised pension payments to retirees in the early- and mid-1990s. Thus, some retirees continued to express a degree of skepticism about whether the government would be willing or able to follow through on these payments for the life of the program.

To the extent to which individuals did not exhibit strong confidence that future payments indeed will be made, they may have behaved *as if* they were discounting the future more steeply. Such behavior would have numerous economic and policy implications, especially in closely related contexts, in which future pension benefits for current workers are perceived as risky. For example, if political risk prompts individuals not to fully value future benefits, then public services could be more expensive to provide because the political risk would limit the extent to which the cost of pension benefits is offset by lower wage costs. A political discount could also increase labor supply distortions and thus create efficiency costs if it reduces the perceived linkage between current taxes paid and expected future benefits (Summers, 1989). Another implication of a “political risk premium” is that a public pension system might be able to reduce its long-run liabilities by offering individuals an opportunity to exchange future benefits for (more steeply discounted) near-term benefits. Luttmer and Samwick (2011) provide evidence of a willingness to accept reduced benefits in the U.S. context where, using survey data, they estimate that, on average, U.S. households would be willing to forego 4 to 6 percent of their scheduled Social Security benefits to remove the associated political uncertainty. Our study advances this idea by examining the extent to which these factors related to a real and economically meaningful choice that was exogenously imposed on the entire eligible retiree population in Croatia.

We tested for the influence of political risk in two ways that differ primarily in terms of whether the issue was raised in a more positive or a more negative frame. In the more positive frame, we asked individuals “at the time you were making your A or B choice, how confident were you that the government would make all of the payments to all the retirees who selected option B?” They were given a 5-point scale, where 1 was “not at all confident” and 5 was “extremely confident.” We find that this has a quantitatively and statistically important effect on people’s decisions. Those who rated this factor as a 4 or 5 on the confidence scale (grouped into the “very confident” category in the table) were 14.7 percentage points more likely to choose the delayed payout option than those who expressed little confidence in the Croatia government’s ability to make all the payments it promised were.

We also asked a more negatively-framed question. Specifically, in our list of factors that respondents were asked to rate in terms of importance in their decision-making (a 5-point scale, on which 1 is “not at all important” and 5 is “extremely important”), we asked respondents to rate the importance of a “concern that the government might not honor its commitment to pay out all of the money owed.” We find that, even after controlling for the confidence question above, the importance of this factor also has a significant effect. Those who rated this concern as a 4 or 5 on the importance scale (grouped into the “very important” category in the table) were 7.5 percentage points more likely to choose the more immediate payment option than those who rated it as not an important factor were.

A natural concern about these two political-risk questions is that individuals may have answered them on the basis of the beliefs they held *at the time of the survey*, rather

than *at the time of the choice* (as we asked them to do). The evidence, however, is consistent with respondents taking the “at the time you were making your A versus B choice” request seriously while responding to our survey. We are able to test this hypothesis because approximately one-half of our respondents had been interviewed before the Croatian Postal Bank (HPB), the entity that administered the payments, announced and paid out the second B payment, and the other half of our respondents were interviewed after the second B payment had been deposited.<sup>17</sup> If individuals’ responses reflected their beliefs at the *time of the survey*, the reported confidence in receiving *all* the payments should have increased after the second payment of the six payments had been announced and deposited (i.e., when surveyed, respondents who had seen 1/6 of all payments under option B made would likely have had less confidence in all of the payments being made than those who had seen 2/6 of payments made). However, a comparison of the distribution of responses to the questions regarding confidence in all the B payments made and concern about government reneging on its promises offered by those interviewed before the announcement of the second payment to those interviewed after the second payment reveals no change.<sup>18</sup> This is consistent with individuals answering based on their confidence in government *at the time of choice*.

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<sup>17</sup> The Croatian Postal Bank (HPB) announced the second payment under Option B on December 16, 2008 and deposited it in retirees’ accounts on December 17, 2008; 46.3% of the sample was interviewed before December 16 and 48.6% of the sample was interviewed after December 17.

<sup>18</sup> Of those interviewed after only one B payment had been made, 30.5% were very confident all six of the B payments would be made, while 38.0% were not confident this would happen. Of those interviewed after two of the B payments had been made, 33.6% were very confident all six of the B payments would be made, while 36.0% were not confident (with none of these figures statistically different across the two groups). Similarly, of those interviewed after only one B payment had been made (two had been made), 43.6% (44.8%) rated the concern that government might not honor its commitment as very important, with 26.4% (26.0%) rating that concern as not important.

A second concern is that individuals might have engaged in *ex-post* rationalization of their decision to take the early payment. That is, after seeing the government follow through on the earliest payments of the deferred-payment option, individuals may have come to believe they had made a mistake in choosing the more immediate payment option and thus, *ex post*, have rationalized their decision by blaming a lack of trust in government. This *ex-post* justification hypothesis could potentially explain the coefficients obtained on our two political-risk variables: *Choice Time Confidence All B Payments Will Be Made* and *Concern Gov't Might Not Honor Its Commitment*. There are two reasons, however, why we do not believe this possibility is driving our results. First, if embarrassment about making the “wrong” choice were a factor, one might expect some of the individuals who had chosen option A simply to state incorrectly that they had chosen option B instead. However, as noted earlier, the sample proportion matches nearly exactly the proportion of the population that chose option A versus option B (and this further holds whether people were interviewed before or after the second B payment was announced and deposited). Second, if individuals were more likely to regret their decision and blame the government as it became clearer that all the deferred payments would actually be made, we would expect that the magnitude of the coefficient on our confidence in government measures would increase after the second payment was made. However, this is not the case: in unreported analyses, the coefficients on *Choice Time Confidence All B Payments Will Be Made* and *Concern Gov't Might Not Honor Its Commitment* are virtually indistinguishable between those who took the survey before or after the second payment was made.<sup>19</sup>

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<sup>19</sup> Among survey respondents interviewed before the second B payment was announced, those who

### 3.7.2 The Importance of Receiving “What is Owed No Matter How Long It Takes”

Another issue that came out of our pre-survey qualitative research was that a sizeable fraction of respondents expressed a strong desire to be “made whole no matter how long it takes.” Qualitatively, it appeared that these individuals were placing tremendous weight on receiving the full *nominal* amount they were owed, suggesting that the nominal value owed served as an important reference point. Averting this sense of loss seemed more important to these individuals than the specific timing of the payments or the present value of the payments. Our qualitative research, carried out prior to our survey, suggests that this factor is tightly linked with the fact that it was the government who had originally failed to pay people what they were due, and the fact that they now wanted the government to make them “whole” again.

To test for this possibility, we asked individuals to rate on a 5-point scale the relative importance of the factor “desire that the full amount of the debt that you were due would be paid out, no matter how long it took.” Three-fifths of the population ranked this factor as very important (4 or 5 on a 5-point scale), while less than one-fifth rated it as not important to them (1 or 2 on a 5-point scale).

As shown at the bottom of Table 4, Panel G, those who believed that receiving the full amount due no matter how long it takes is very important were 27 percentage points more likely to take the deferred payment relative to those who believed this is

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expressed they were very confident at the time of choice that all B payments would be made were 16.6 percentage points more likely to select option B than those who were not confident of this, while that figure was 13.3 percentage points for those interviewed after the second B payment was made. The *p*-value of the difference between these two coefficients is an insignificant 0.40. The difference in the coefficient on *Concern Gov't Might Not Honor Its Commitment*, based on when the individual was interviewed, is also small in magnitude and highly insignificant. These results were obtained from augmenting our baseline regression in Table 4 with an interaction of our political-risk variables with whether the individual was interviewed after the second B payment was made.

not important. To give a sense for the economic magnitude of this attitude, if the entire population had shifted from their current beliefs regarding the importance of receiving the full amount due no matter how long it takes (i.e., 61% believing this is very important and 13% believing this is moderately important) to everyone believing this is not an important consideration, the selection of the deferred-payment option B would have fallen from 30.6 percentage points to 11.7 percentage points (the light grey portion of the leftmost bar in Figure 3). Put another way, a move from everyone believing “being made whole” is not important to the actual distribution of beliefs observed in the sample (i.e., 61% believing it is very important and 13% believing it is moderately important) increases the selection of option B by 18.9 percentage points. Indeed, this effect is larger than virtually any other variable in our regression.

To the extent that this focus on the full amount owed is important, it ought to be the case that the individuals for whom this was an important factor are fairly insensitive to the internal return offered by the choice of option B over A. Even if the payments were spread out over a longer period of time, thus lowering the internal rate of return, the individuals focused on receiving the full nominal amount should still desire option B. A confounding factor, of course, is that the median age of the individuals our sample is 68 and, if the payment were spread out over too long of a period, they might be concerned that they would not receive the full amount due while still alive. The remaining bars of Figure 3 illustrate these effects by also making use of a question that asks individuals what pension choice they would have made if the payments had been spread over 10 years instead of 6 years (which implies a 16.6% rate of return, down from 26.6%).

In this hypothetical, 10-year deferral scenario, 17.4% of individuals would pick the deferred money (the “being made whole” component, calculated as above, accounts for 12.2 percentage points or 70% of this total). Part of the decline in the selection of the deferred-payment stream likely reflects that many of our respondents might be concerned about whether they would still be alive at the end of the payment stream. To help account for this, the right-half of Figure 3 shows the results of the actual 6-year deferral and the hypothetical 10-year deferral for respondents who would be no more than 70 years old when they would receive their final payment under the deferred-payment stream. For this younger population, 39% actually selected option B, and 31.6% would have selected option B even if payments had been spread out longer. The “being made whole” component, calculated from regression estimates in the same way it was in the leftmost bars, is nearly identical in the two scenarios, even though the second scenario (i.e., deferred payments spread out over 10 years) results in a much lower implicit return from deferring payments. Thus, for this segment of the population, the nominal reference point is a very important factor in explaining the choice of option B.

We recognize that our question is a noisy proxy for whether the individual is focused on the nominal reference point. As a result, that measurement error may cause attenuation bias. Potentially biasing in the opposite direction is the possibility that we may have the causality reversed, that is, that individuals who chose the delayed option subsequently report their desire to be made whole as an *ex-post* rationalization (although, given that their choice appeared to have provided a 26% return, it is not clear why they would feel the need to rationalize it).

To address both of these potential concerns, we turn to an instrumental variables strategy. Our strategy builds on the work of Guiso, Sapienza and Zingales (2004) and Brown et al. (2008). These studies show that an individual's region of birth can have long-lasting effects on attitudes later in life. Our instrument is also motivated by the "paradox of distance" in the public administration literature. Frederickson and Frederickson (1997, 187) define this paradox by stating that "while people trust and even revere those government officials who are near at hand, they believe that government officials who are far away are lazy, incompetent, and probably dishonest." Consistent with this, Schminke, Cropanzano, and Rupp (2002) find that proximity to the highest level of the organization affects one's sense of the fairness of the decisions made by that organization.

We make use of the fact that individuals born in Central Croatia (the part of the country centered around the capital, Zagreb) would likely have different views about the importance of receiving what they are due from the government than individuals in outer regions of Croatia would. The use of this instrument is grounded in the administrative division of Croatia, as well as the Croatian historical linguistic map (i.e., Central Croatia has a different dialect than the outlying areas do). Our conjecture is that this physical and cultural separation from the center of government in Zagreb causes more of a concern about being "wronged" by the government and a greater focus on wanting to get back everything they are owed in nominal terms (i.e., to "be made whole"). With the plethora of characteristics we already include in our regression of payment choice, including controls for county of *current* residence, measures of income and wealth, education and financial literacy, age and bequest motives, ethnicity and

religiosity, and health status, our identifying assumption is that *birth* region affects the choice of whether to defer pension repayment only through the attitudes toward the government nurtured there.

Thus, we construct a simple binary instrument based on whether individuals were born in Central Croatia or in the outlying areas (Figure 4). For perspective, 44% of Croatians in our survey were born in Central Croatia.

In Panel A of Table 5, we report the results of our first-stage regression of a binary indicator variable for whether “receiving the full amount due no matter how long it takes” is rated as very important against our binary indicator of region of birth. The results show that individuals born in Central Croatia were 7 percentage points less likely to indicate that it is important to receive the full amount owed than individuals born outside of Central Croatia were. This coefficient is virtually unchanged when we include the full set of other explanatory variables from our earlier regression, including a full set of 24 indicator variables for the county in which the respondent *currently* lives, underscoring that this effect is orthogonal to all the other factors influencing the pension choice. In the second stage, we find that the instrumented effect of “being made whole” is statistically significant, with a coefficient of 57, even larger than our baseline case (consistent with measurement error biasing our estimates downwards).

The 2SLS results provide confirming evidence that a desire to receive the full, nominal amount due has a very strong effect on the pension choice. As it turned out, in this case, this factor works in the direction of pushing individuals toward what might plausibly be considered, at least *ex post*, the better financial choice. In other words, a focus on the nominal amount owed, rather than the recognition of the high internal rate

of return, is arguably the most powerful explanation offered by those who chose the delayed payout, yet this focus on the nominal amount owed is not observable in the usual household data sets.<sup>20</sup>

### *3.7.3 How Government Attitudes Interact with Liquidity Constraints*

We have shown in earlier sections that the liquidity-constrained individuals are more likely to take the early payment option. Taking this notion further, however, one might expect that if a person is highly liquidity constrained, then it may simply be an “unaffordable luxury” to be concerned about trust in government or being made whole. If so, the regressions estimated on the entire sample may have overstated the effect of government attitude variables in the liquidity-constrained population, and understated the effects on those who were unconstrained. We address this possibility through the addition of interactions of the government attitude variables with our measure of liquidity constraints described in Section 3.1.<sup>21</sup> As a reminder of the importance of the direct effect of liquidity constraints, we note that only 22 percent of liquidity-constrained individuals choose the deferred-payment option B (these individuals represent 51% of the sample that cited liquidity constraints as a very important factor in their pension repayment choice), whereas option B was selected by 40 percent of

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<sup>20</sup> The inclusion of variables concerning macroeconomic expectations (Panel F in Table 4) and government attitudes (Panel G in Table 4) into the specification increases the overall explanatory power of our regressions by nearly one-third (the adjusted R-squared increases from 0.24 in a regression that includes only Panels A through E to 0.31 in the regression that also includes Panels F and G). Although these variables add substantial explanatory power, their exclusion does not create significant omitted variable bias for the variables typically included in standard data sets. Specifically, the inclusion or exclusion of these macroeconomic and political variables does not substantially change the coefficients on the variables in Panels A through E across the two specifications.

<sup>21</sup> In the interest of space, we do not report an entire new table with these interactions, but instead report the relevant new coefficients in the text to follow.

unconstrained individuals (the portion of the sample who considered liquidity constraints to be of only moderate or of no importance in their decision).

The results of these interactions indicate that many of the attitudes toward government have a much stronger effect on the pension-repayment choice for individuals who are not liquidity constrained. For example, a concern about government not honoring its commitment has no relation with the pension-repayment choice for liquidity constrained individuals, but is highly significant and large in magnitude for those who are not liquidity constrained (with the difference between the two groups significant at the 1-percent level).<sup>22</sup> The interaction term on the other political-risk question, confidence that all B payments will be made, is not significant, although a joint test clearly indicates that the combination of these two political-risk measures differs between constrained and unconstrained individuals (p-value = 0.05).

Turning to a desire to be made whole no matter how long it takes, we find that the interaction term with liquidity constraints is also highly significant. For the population that is not liquidity constrained, a very strong desire to be made whole is associated with a 34.2 percentage-point increase in the likelihood of selecting the deferred payments. This point estimate falls to 19.4 percentage points for the liquidity-constrained subsample (with the difference in coefficients statistically significant at the 1-percent level).

Thus, liquidity constraints are not only a direct determinant of intertemporal decisions, but also affect the relative importance of attitudes toward government. In

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<sup>22</sup> Among the population that is not liquidity constrained, those who expressed that a concern that the government might not honor its commitment is very important are 13.4 percentage points less likely to take the deferred payment option (coefficient = -13.4, SE = 3.0). For those who are liquidity constrained, this coefficient is an insignificant 0.6 percentage points (SE = 3.6).

essence, these results suggest that liquidity constraints severely limit the ability of an individual to take deferred payments, even when an exceptional rate of return of 26 percent is offered and the individual expressed no concern about government renegeing on its commitment.

#### **4. Summary and Conclusions**

In this paper, we empirically examine the determinants of individuals' discount rates. We exploit a unique policy change in Croatia whereby retirees were given the choice between two payment streams to compensate them for past underpayments from the pension system. One option offered more immediate payments, while the other offered a more deferred payment structure (with an internal rate of return of more than 26% compared to the first option). Our use of micro-level survey data enables us to examine a wide range of possible determinants of this choice, including proxies for beliefs about various types of political risk.

We find that the payment stream choice is strongly correlated with a wide range of explanatory variables. As one might expect, those with higher income and wealth, and those not facing liquidity constraints exhibited lower discount rates and, thus, were more willing to accept deferred payment from the government. Family structure and health were also important in this intertemporal tradeoff. Those with children and self-reported strong bequest motives were much more likely to accept a deferred pension repayment option, while those who were older and reported poor health were more likely to accept the significantly lower amount of money up front.

Unique to this study, we also examine the role beliefs concerning various types of political risk play in individuals' decision-making. In particular, we find that the individuals with low confidence in the government's ability to make all the payments promised are much more likely to select a more immediate, reduced payment stream.

Another important consideration the respondents expressed is the desire to "be made whole," that is, to receive the full (nominal) amount owed, no matter how long it takes. Three-fifths of pensioners regarded this consideration as very important to them. The prevalence of this desire, and the intensity with which it was felt, is estimated to have increased the proportion of the population opting for the deferred-payment plan by the government (which paid out the exact nominal amount owed to the pensioners, but spread it out over many years) from only 12% of the affected population to 31%.

Although Croatia's recent political history differs from that of the U.S. and many other nations, the findings of this study have direct relevance for debates over public pension systems in the U.S. and elsewhere. The presence of political risk may lead participants in these systems to discount future benefits at a higher rate than would be predicted otherwise by the standard socioeconomic determinants of intertemporal decision-making. This suggests that many retirees may view as attractive a government program offering pensioners a lump-sum payment rather than a promised stream of benefits (even if offered at a substantial discount in present-value terms from the government's perspective). An important offsetting factor, however, is the extent to which individuals assign importance to the nominal value of the promises made.

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**Table 1: Summary Statistics of Pension Repayment Amount by Household Income**

This table provides the distribution of the pension repayment amount owed to households in the survey, broken down by the self-reported income range of the household. Amounts are in Kuna (the Croatian currency). At the time of the survey, one Kuna was worth about \$0.19 U.S. dollars.

	<b>10th</b>	<b>25th</b>	<b>Median</b>	<b>75th</b>	<b>90th</b>	<b>Mean</b>
<b>Full Sample</b>	12,000	25,000	38,938	50,000	66,000	39,668
<b>Lower Income (less than 2,000 Kn/month)</b>	4,250	9,400	16,650	24,000	43,000	20,936
<b>Medium Income (2,000 to 4,000 Kn/month)</b>	14,000	26,000	36,000	47,280	56,000	36,851
<b>Higher Income (4,000 Kn/month or more)</b>	18,000	32,000	43,000	60,000	78,000	46,598

**Table 2: Hypothetical Example of Payments Under Two Pension Repayment Options**

This table illustrates the breakdown and timing of the payments that would be made under option A (the more immediate payments) and option B (the more deferred payments) for a pension repayment amount of 60,000 Kunas. For reference, our survey was fielded between mid-November 2008 and mid-January 2009.

	<b>Option A</b>	<b>Option B</b>
mid July 2005	Government announces it will offer A/B choice	
late December 2005	Decision-making time	
late June 2006	7,500	
late December 2006	7,500	
late June 2007	7,500	
late December 2007	7,500	10,000
late June 2008		
late December 2008	Survey fielded mid-November 2008—mid-January 2009	
late June 2009		
late December 2009		10,000
late June 2010		
late December 2010		10,000
late June 2011		
late December 2011		10,000
late June 2012		
late December 2012		10,000
<b>Total paid:</b>	<b>30,000</b>	<b>60,000</b>
<b>Discount rate that equates the present value of the two payout streams</b>	<b>26.6%</b>	

**Table 3: Summary Statistics for Key Variables, in Percent Unless Stated Otherwise**

<b>Panel A: Rate of Time Preference and Risk Aversion</b>		<b>Panel C: Education, Financial Literacy, and Financial Self-Assessments</b>	
<i>Not Willing to Deposit for 1 Year (no CD)</i>		<i>Education</i>	
Willing (no CD=0)	71.2	High School or Less	71.6
Not Willing (no CD=1)	28.8	More than High School	28.4
<i>Deposit Rate for 1 Year (if willing to deposit, in %)</i>		<i>School Exposure to Acc., Bank., Bus., Econ., Fin.</i>	
10th	5	Not at All	46.1
25th	5	A Little	24.3
Median	7	A Lot	27.4
75th	10	Don't Know	2.2
90th	15	<i>Job Exposure to Acc., Bank., Bus., Econ., Fin.</i>	
Mean	8.7	Not at All	43.4
<i>Risk Level Regarding Income Gamble</i>		A Little	22.9
Take No Gamble	52.9	A Lot	30.0
Take Gamble 2x Income for 10% Loss	9.9	Don't Know	3.7
Take Gamble 2x Income for 30% Loss	15.2	<i>Extensive Financial Calculations Picking A or B</i>	
Take Gamble 2x Income for 50% Loss	8.8	Not Extensive	57.6
Don't Know	13.1	Moderately Extensive	22.1
<i>Self Perception of Inclination to Take Risk</i>		Very Extensive	11.0
Not Willing	59.6	Don't Know	9.3
Moderately Willing	25.4	<i>Good at Calculations</i>	
Very Willing	12.2	Not Good	6.3
Don't Know	2.8	Moderately Good	31.8
<b>Panel B: Income, Wealth, and Liquidity Constraints</b>		Very Good	59.9
<i>Living Standard Relative to Average Retiree</i>		Don't Know	2.0
Below	20.8	<i>Good at Everyday Finance</i>	
About the Same	54.8	Not Good	5.0
Higher	20.6	Moderately Good	11.3
Don't Know	3.8	Very Good	80.3
<i>Income (Croatian Kuna/month)</i>		Don't Know	3.4
Lower Income (less than 2,000)	9.1	<i>Financial Skill Relative to Others</i>	
Medium Income (2,000 to 4,000)	46.4	Worse than Others	4.2
Higher Income (4,000 or more)	44.5	About the Same as Others	56.0
Lives With Children?	42.0	Better than Others	30.2
Family Helped?	31.6	Don't Know	9.6
<i>Owns...</i>		<i>Response to Simple Interest Compounding Question</i>	
House?	87.7	Completely Wrong	18.4
Savings in Croatian Kuna?	30.2	Almost Correct	23.8
Savings in Foreign Currency?	29.1	Correct	32.0
Savings in Kuna or Foreign Currency?	43.6	Don't Know	25.8
Vacation Home?	19.8	<i>Response to Simple Inflation Question</i>	
Rental Real Estate?	7.7	Completely Wrong	4.3
Other Real Estate?	31.6	Almost Correct	7.6
Stocks?	15.9	Correct	74.9
Mutual Funds?	3.4	Don't Know	13.2
Bonds?	0.9	<i>Response to "Doubling" Compounding Question</i>	
<i>Reported Pension Repayment Amount?</i>		Wrong	24.2
Did Not Report	18.2	Guessed 5-10 Years to Double at 10%	44.7
Reported Pension Repayment Amount	81.8	Don't Know	31.1
<i>Pension Repayment Amount in Kunas, if Reported</i>			
10th	12,000		
25th	25,000		
Median	38,938		
75th	50,000		
90th	66,000		
Mean	39,668		
<i>Immediate Need to Pay for Something</i>			
Not Important	25.2		
Moderately Important	19.9		
Very Important	51.4		
Don't Know	3.5		

**Table 3: Summary Statistics for Key Variables, in Percent Unless Stated Otherwise (Continued)**

<b>Panel D: Family Structure and Other Demographics</b>		<b>Panel F: Macroeconomic Risk</b>	
<i>Female?</i>	58.0	<i>Inflation Belief over Several Years at Choice Time</i>	
<i>Married at Time of Option Choice?</i>	71.1	Annual Inflation in 0-8% Range	43.6
<i>Spouse Picked A?</i>	18.9	Annual Inflation in 9-16% Range	11.6
<i>Spouse Picked B?</i>	8.0	Annual Inflation more than 16%	2.1
<i>Any Children?</i>	90.6	Don't Know	42.7
<i>How Important that Money Would go to Heirs</i>		<i>Exchange Rate Belief over Several Years at Choice Time</i>	
Not Important	19.6	Kuna Will Remain the Same or Appreciate Against Euro	51.3
Moderately Important	10.9	Kuna Will Depreciate Against Euro	21.7
Very Important	60.3	Don't Know	27.0
Don't Know	9.2	<b>Panel G: Political Risk and Being Made Whole</b>	
<i>Age at Time of Choice (in years)</i>		<i>Choice Time Confidence All B Payments Will be Made</i>	
10th	60	Not Confident	36.9
25th	63	Moderately Confident	29.1
Median	68	Very Confident	32.0
75th	71	Don't Know	2.1
90th	75	<i>Concern Government Might Not Honor Its Commitment</i>	
Mean	67.4	Not Important	26.1
<i>Important to Receive Most Money While Alive</i>		Moderately Important	22.1
Not Important	22.2	Very Important	44.4
Moderately Important	20.5	Don't Know	7.4
Very Important	49.8	<i>Desire to Receive Full Amount Due No Matter How Long it Takes</i>	
Don't Know	7.5	Not Important	17.0
<i>Formerly Employed State or Local Gov't?</i>	32.4	Moderately Important	13.6
<i>How Important is Religion in Your Life?</i>		Very Important	60.8
Not Important	21.6	Don't Know	8.6
Moderately Important	23.3		
Very Important	51.0		
Don't Know	4.0		
<i>Croat Nationality?</i>	87.6		
<b>Panel E: Health and Longevity</b>			
<i>Health Relative to Peers (Other Retirees)</i>			
Very Poor or Poor	22.4		
Average	45.0		
Good or Excellent	31.5		
Don't Know	1.2		
<i>Likelihood Alive 7+ Years Beyond Choice Time</i>			
Not Likely	21.8		
Moderately Likely	28.5		
Very Likely	33.9		
Don't Know	15.8		

**Table 4: Linear Regression of Decision to Select Option B (More Deferred Payment) for Pension Repayment**

The dependent variable is an indicator variable for whether the respondent selected pension repayment option B (the more deferred payment option). This variable is expressed as 0 if the respondent picked option A (more immediate payment) and 1 if the respondent picked option B. The linear regression is estimated by OLS, with robust standard errors. For convenience, we multiply all coefficients in the table by 100, so that they can easily be interpreted as percentage points. Ten indicator variables for ethnicity and 24 indicator variables for residence county are also included in the regression. The regression is estimated on 2,490 observations and the adjusted R-squared of the regression is 0.31. \*\*\*, \*\*, \* denote statistical significance at the 1-percent, 5-percent, and 10-percent levels, respectively.

<b>Panel A: Rate of Time Preference and Risk Aversion</b>			<b>Panel C: Education, Financial Literacy, and Financial Self-Assessments</b>		
	Coef.	SE		Coef.	SE
<i>Not Willing to Deposit for 1 Year (no CD)</i>	1.5	2.3	<i>Education</i>		
<i>Deposit Rate for 1 Year (0 if not willing, %)</i>	-0.1	0.2	More than High School	3.1	1.9
<i>Risk Level Regarding Income Gamble</i>			<i>School Exposure to Acc., Bank., Bus., Econ., Fin.</i>		
Take Gamble 2x Income for 10% Loss	-0.9	2.7	A Little	0.5	2.1
Take Gamble 2x Income for 30% Loss	-1.7	2.2	A Lot	3.1	2.5
Take Gamble 2x Income for 50% Loss	0.2	2.9	Don't Know	-5.4	5.2
Don't Know	-0.3	2.6	<i>Job Exposure to Acc., Bank., Bus., Econ., Fin.</i>		
<i>Self Perception of Inclination to Take Risk</i>			A Little	-3.0	2.2
Moderately Willing	0.5	1.9	A Lot	-3.4	2.3
Very Willing	-1.1	2.6	Don't Know	3.5	4.2
Don't Know	4.5	5.9	<i>Extensive Financial Calculations in Picking A or B</i>		
<b>Panel B: Income, Wealth, and Liquidity Constraints</b>			Moderately Extensive	-0.3	2.0
	Coef.	SE	Very Extensive	1.5	2.6
<i>Living Standard Relative to Average Retiree</i>			Don't Know	-5.2*	2.8
About the Same	0.4	2.1	<i>Good at Calculations</i>		
Higher	0.9	3.0	Moderately Good	-0.3	3.4
Don't Know	1.9	4.8	Very Good	0.5	3.4
<i>Income (Croatian Kuna/month)</i>			Don't Know	8.5	7.3
Medium Income (2,000 to 4,000)	6.6**	2.8	<i>Good at Everyday Finance</i>		
Higher Income (4,000 or more)	6.8**	3.3	Moderately Good	-2.7	4.4
<i>Lives With Children?</i>	1.8	1.7	Very Good	-5.8	3.9
<i>Family Helped?</i>	2.0	1.8	Don't Know	-11.1*	6.0
<i>Owns...</i>			<i>Financial Skill Relative to Others</i>		
House?	-1.1	2.4	About the Same as Others	-4.1	4.0
Savings in Croatian Kuna?	0.3	1.9	Better than Others	-3.0	4.2
Savings in Foreign Currency?	2.9	2.0	Don't Know	-1.3	4.7
Vacation Home?	2.5	2.2	<i>Response to Simple Interest Compounding</i>		
Rental Real Estate?	1.7	3.3	Almost Correct	2.2	2.5
Other Real Estate?	0.8	1.8	Correct	-0.4	2.3
Stocks?	4.7*	2.4	Don't Know	1.3	2.6
Mutual Funds?	1.1	5.0	<i>Response to Simple Inflation Question</i>		
Bonds?	3.2	12.5	Almost Correct	5.8	4.8
<i>Did Not Report Pension Repayment Amount</i>	20.4	12.7	Correct	6.1	3.9
<i>ln(Pension Payment Amount, if Reported)</i>	2.5**	1.2	Don't Know	4.2	4.5
<i>Immediate Need to Pay for Something</i>			<i>Response to "Doubling" Compounding Question</i>		
Moderately Important	-8.4***	2.6	Gessed 5-10 Years to Double at 10%	-0.0	2.0
Very Important	-18.6***	2.2	Don't Know	2.5	2.3
Don't Know	-1.0	5.2			

**Table 4: Linear Regression of Decision to Select Option B (More Deferred Payment) for Pension Repayment (Continued)**

<b>Panel D: Family Structure and Other Demographics</b>			<b>Panel F: Macroeconomic Risks</b>		
	Coef.	SE		Coef.	SE
<i>Female?</i>	-2.6	1.9	<i>Inflation Belief over Several Years at Choice Time</i>		
<i>Married at Time of Option Choice?</i>	3.6	2.2	Annual Inflation in 9-16% Range	-2.1	2.6
<i>Spouse Picked A?</i>	-17.3***	2.0	Annual Inflation more than 16%	-10.3*	6.2
<i>Spouse Picked B?</i>	34.1***	3.3	Don't Know	-2.3	2.0
<i>Any Children?</i>	8.5***	2.5	<i>Exchange Rate Belief over Several Years at Choice Time</i>		
<i>How Important that Money Would go to Heirs</i>			Kuna Will Depreciate Against Euro	-4.5**	2.1
Moderately Important	3.8	2.9	Don't Know	0.8	2.1
Very Important	8.5***	2.2			
Don't Know	0.4	3.0			
<i>Age at Time of Choice (in years)</i>	-1.0***	0.1			
<i>Important to Receive Most Money While Alive</i>					
Moderately Important	-6.6**	2.6			
Very Important	-5.2**	2.2			
Don't Know	-7.0*	3.7			
<i>Formerly Employed State or Local Gov't?</i>	0.1	1.7			
<i>How Important is Religion in Your Life?</i>					
Moderately Important	1.2	2.4			
Very Important	-0.5	2.2			
Don't Know	3.9	4.9			
<i>Ethnicity indicator variables</i>	<i>p-value = 0.25</i>				
<i>Residence county indicator variables</i>	<i>p-value = 0.00***</i>				
<b>Panel E: Health and Longevity</b>			<b>Panel G: Political Risk and Being Made Whole</b>		
	Coef.	SE		Coef.	SE
<i>Health Relative to Peers (Other Retirees)</i>			<i>Choice Time Confidence All B Payments Will be Made</i>		
Average	2.1	2.0	Moderately Confident	7.8***	1.9
Good or Excellent	5.5**	2.3	Very Confident	14.7***	2.1
Don't Know	5.2	7.5	Don't Know	-3.0	5.1
<i>Likelihood Alive 7+ Years Beyond Choice Time</i>			<i>Concern Government Might Not Honor Its Commitment</i>		
Moderately Likely	8.1***	2.2	Moderately Important	-2.2	2.4
Very Likely	9.3***	2.3	Very Important	-7.5***	2.0
Don't Know	5.7**	2.7	Don't Know	3.3	3.9
			<i>Desire to Receive Full Amount Due No Matter How Long it Takes</i>		
			Moderately Important	12.1***	2.7
			Very Important	27.2***	2.1
			Don't Know	8.5***	3.2

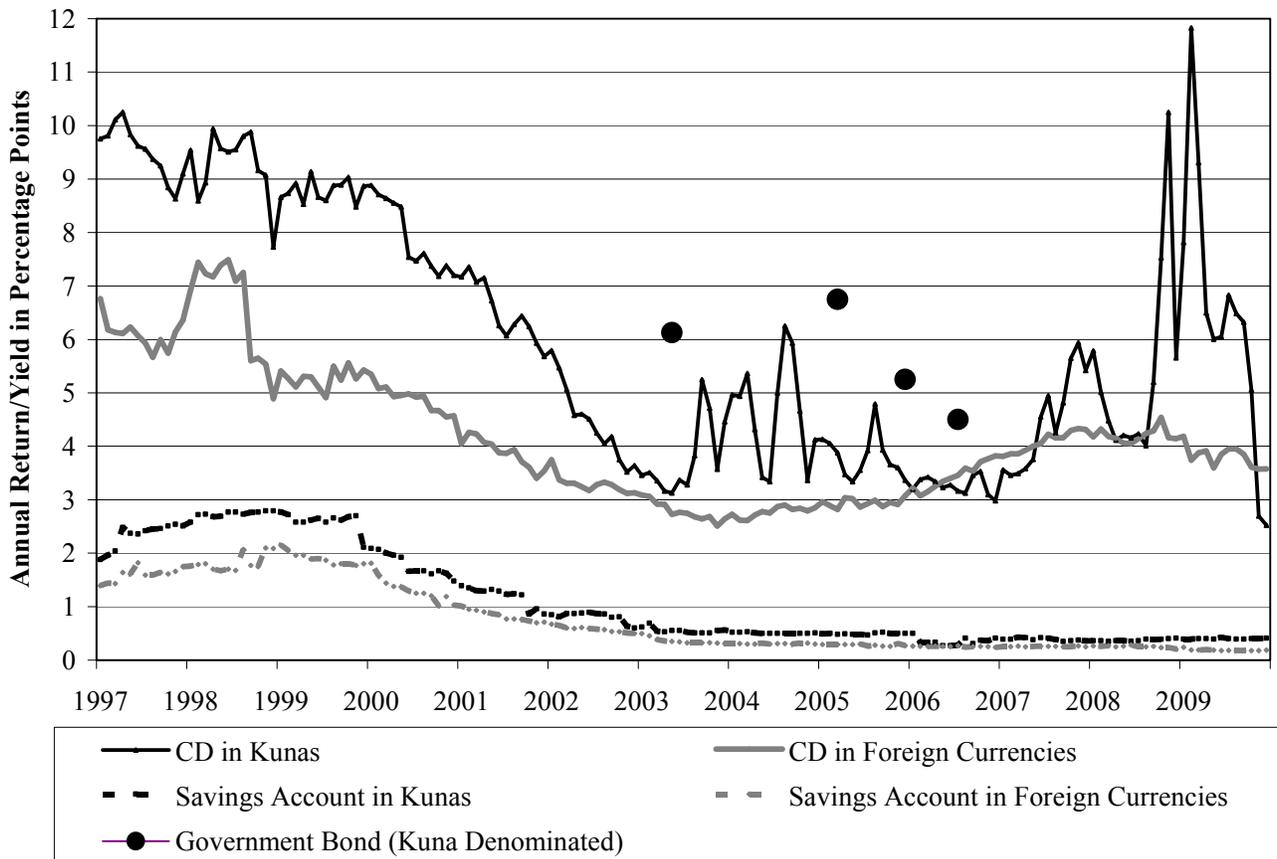
**Table 5: IV Regression of Pension Repayment Choice, Instrumenting for the Importance of “Receiving the Full Amount Due No Matter How Long it Takes” with whether was Born in Central Croatia**

This table presents the two-stage least squares regression of the pension repayment choice in which the importance of “receiving the full amount due no matter how long it takes” is instrumented with the birth region of the respondent (the first-stage regression). Precisely, in Panel A, whether “receiving the full amount due no matter how long it takes” is very important or not very important is related to whether the respondent was born in Central Croatia (that is, born in the capital, Zagreb, or surrounding counties – the region identified as Central Croatia). See Figure 4 for further details on the definition of Central Croatia. The first-stage regression in column (1) includes no other controls and the regression in column (2) includes all of the other explanatory variables included as determinants of the pension repayment choice (i.e., all of the other controls used in the regression from Table 4). In Panel B, the dependent variable of the second-stage (IV) regression is an indicator variable for whether the respondent selected pension repayment option B (the more deferred payment option). This variable is expressed as 0 if the respondent picked option A (more immediate payment) and 1 if the respondent picked option B. In column (3), the importance of receiving the full amount due is not instrumented for with being born in Central Croatia, whereas in column (4) it is. The linear regressions are all estimated by OLS or 2SLS, with robust standard errors. For convenience, we multiply all coefficients in the table by 100 so that they can easily be interpreted as percentage points. The regressions are all estimated on 2,490 observations. \*\*\*, \*\*, \* denote statistical significance at the 1-percent, 5-percent, and 10-percent levels, respectively.

Panel A: First-Stage Regression			Panel B: Second-Stage Regression		
	Dependent Variable: <i>Receiving the Full Amount Due No Matter How Long it Takes is Very Important</i>			Dependent Variable: <i>Select Pension Repayment Option B, the Deferred Payment</i>	
	(1)	(2)		(3)	(4)
Born in Central Croatia	-6.6*** (2.0)	-7.5*** (2.7)	Being Made Whole Very Important	20.9*** (1.8)	57.1* (32.7)
Other Controls?	No	Yes	Other Controls?	Yes	Yes
F-test of Instrument	11.3***	7.9***	Instrumental Variables?	No	Yes
No. of Observations	2,490	2,490	No. of Observations	2,490	2,490

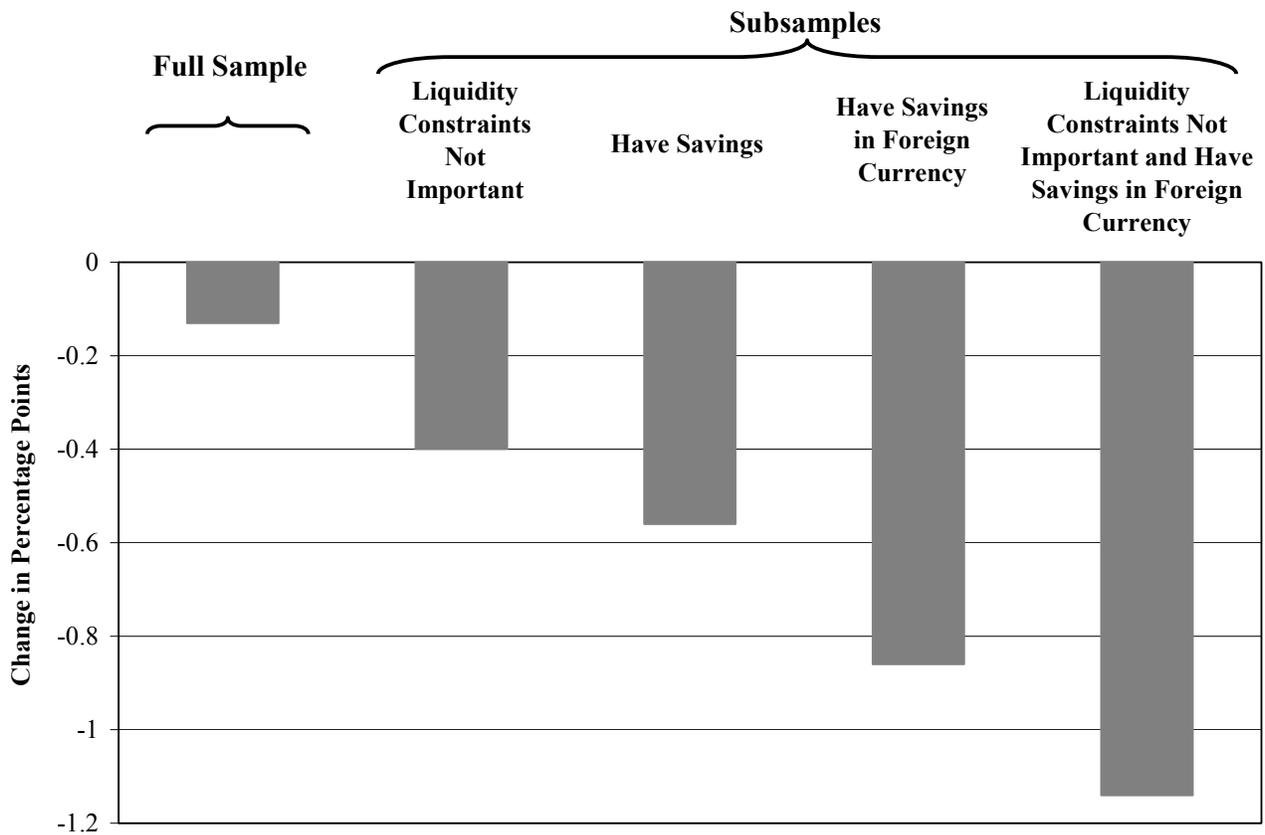
**Figure 1: Various Rates of Savings and Investments Returns in Croatia, 1997-2009.**

This figure presents various rates of savings and investment returns available in Croatia in the period from 1997 to 2009—rates on certificates of deposit (CDs), savings, and government bonds—be they denominated in Kunas or in foreign currencies.



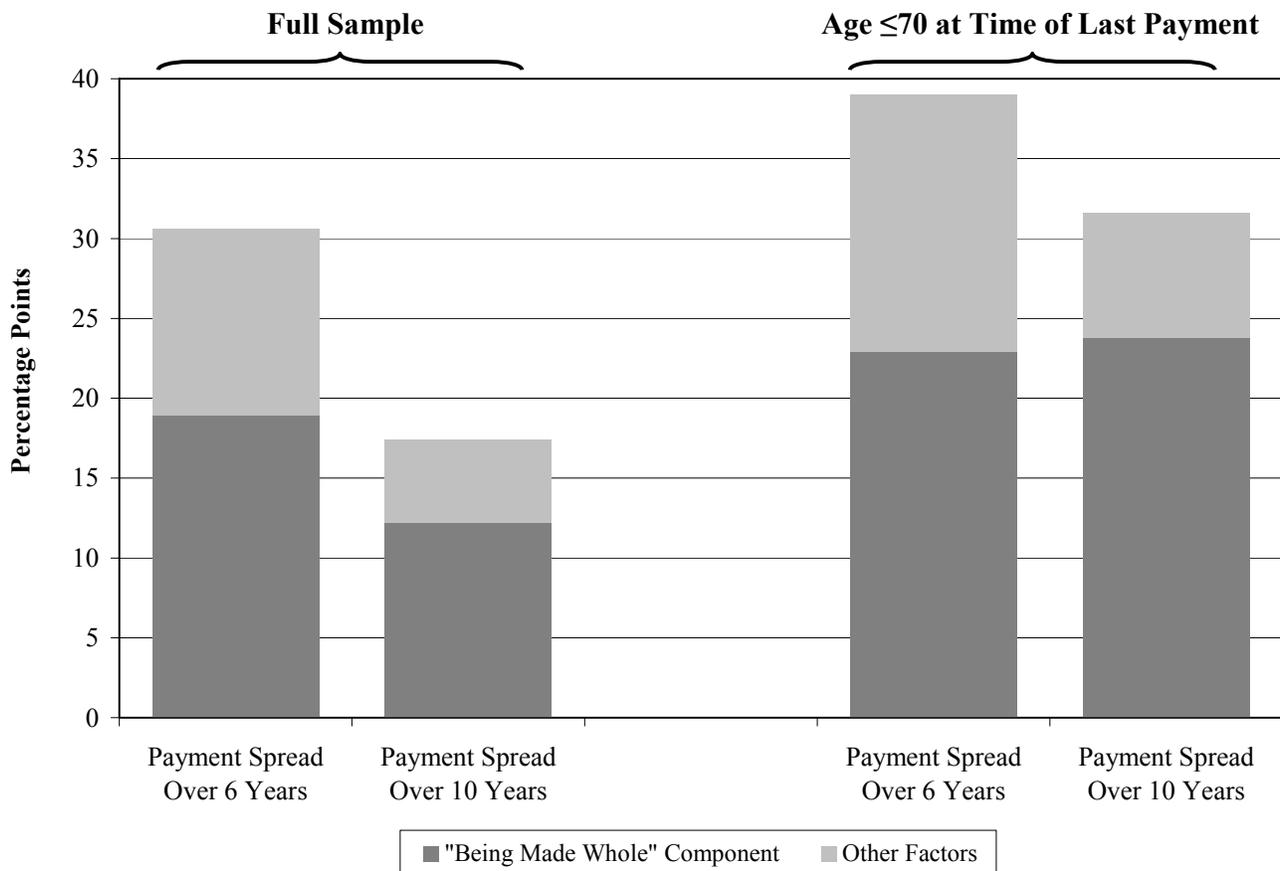
**Figure 2: Change in Likelihood of Selecting Option B (More Deferred Payment) Associated with a One Percentage-Point Increase in the Individual’s Stated Rate of Time Preference, by Subgroups.**

This figure reports the coefficients from a modified version of our baseline regression in which we interact the rate of time preference question with indicator variables for various subsamples. The first bar represents the coefficient from Table 4, that is, the baseline coefficient on our rate of time preference question that shows the change in likelihood of selecting option B (the deferred payments) resulting from a one-percentage point change in the rate of time preference. Subsequent bars show the effect of the rate of time preference for various subgroups, each obtained from a separate regression. The effect of the rate of time preference for the full sample is statistically insignificant from zero for the full sample, and is statistically different from zero for each of the various subsamples (p-values lower than 0.10).



**Figure 3: Actual Likelihood of Selecting Option B (More Deferred Payment) and Hypothetical Choice if Payments Spread Out Over 10 Years (Rather Than 6 Years).**

This figure provides a decomposition of how important the factor of “receiving the full amount due, no matter how long it takes” (i.e., “being made whole”) was in the selection of option B (the more deferred payment schedule). The “being made whole” component in the selection of option B is calculated as the difference between the percent selecting option B minus the percent that would have been predicted to select option B if the entire population had shifted from their current beliefs regarding the importance of receiving the full amount due no matter how long it takes to everyone believing that this is not an important consideration (using the Table 4 regression results). We perform this calculation for both the actual pension repayment choice, the first bar, as well as for responses to the hypothetical scenario of the B payments being spread out over 10 years, rather than the actual 6 years (the second bar). These decompositions are then repeated for a subsample of individuals who would be no more than 70 years old at receipt of the last B payment (the two rightmost bars).



**Figure 4: Map of Croatia (in White) with Central Croatia and Zagreb Highlighted.**

This figure provides a map of Croatia (the white area below), with the Central Croatia region highlighted with the wide black border. The county in Croatia that contains Zagreb, the capital of Croatia, is shaded with the diagonal lines.

