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NON-COGNITIVE ATTITUDES AND INDIVIDUAL OUTCOMES. SOME NEW INSIGHTS ON GENDER DIFFERENCES

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CO-AUTHORSHIP DISCLAIMER AND WORKING PAPERS

The first two chapters are a joint work with Maria De Paola. We equally contributed to the papers. From the first chapter we obtained the working paper circulated as: De Paola, M. and Gioia, F. (2013) "*Impatience and Academic Performance. Less Effort and Less Ambitious Goals*", University of Calabria, Working Paper n°2. The second chapter was presented at the XXVIII AIEL Conference.

The fourth chapter is a joint work with Maria De Paola and Vincenzo Scoppa. We equally contributed to the paper. From this chapter we obtained the working paper circulated as: De Paola, M., Gioia, F., and Scoppa, V. (2013) "*Overconfidence, omens and emotions: results from a field experiment*", University of Calabria, Working Paper n°3.

INTRODUZIONE[1]

Motivazione, affidabilità, pazienza, tenacia, attitudine verso il rischio e perseveranza, insieme alla dimensione cognitiva, sono determinanti importanti di vari outcome socio-economici. Dedicare scarsa attenzione a tale natura multidimensionale delle abilità individuali può fuorviare la ricerca economica e il disegno di interventi di politica economica.

Negli ultimi anni la ricerca economica ha dedicato un'attenzione particolare al contributo che altre discipline, soprattutto la psicologia, offrono alla spiegazione dei comportamenti individuali.

In ambito macroeconomico, si approfondiscono concetti tipici degli studi di psicologia, quali aspettative, motivazione o attitudini, che vengono utilizzati per spiegare reazioni a misure di politica economica, per chiarire alcuni aspetti della crescita economica o per approfondire gli effetti di cambiamenti nel ciclo economico. Inoltre, attributi comportamentali vengono utilizzati per caratterizzare le nazioni, le quali vengono considerate parsimoniose o dispendiose, bellicose o pacifiche, affidabili o irresponsabili.

Negli studi microeconomici, aventi come unità di analisi l'individuo, si assiste ad un crescente interesse da parte degli economisti nel ruolo che i tratti della personalità umana, originariamente studiati in ambito psicologico, esercitano nel raggiungimento di determinati outcome economici e sociali, quali, ad esempio, la scelta di un certo livello di investimento in capitale umano o di una certa tipologia di contratto di lavoro.

Benché molti aspetti della personalità umana siano influenzati dal processo cognitivo (Schulkin, 2007) e, nello stesso tempo, le abilità cognitive subiscano l'effetto di caratteristiche della personalità (Phelps, 2006), la nozione tipicamente utilizzata nella letteratura economica contrappone le abilità *cognitive*, definite dall'American

[1] La presente tesi è cofinanziata con il sostegno della Commissione Europea, Fondo Sociale Europeo e della Regione Calabria. L'autore è il solo responsabile di questa tesi e la Commissione Europea e la Regione Calabria declinano ogni responsabilità sull'uso che potrà essere fatto delle informazioni in essa contenute.

Psychological Association come "l'abilità di comprendere idee complesse, di adattarsi efficacemente all'ambiente, di imparare dall'esperienza, di intraprendere varie forme di ragionamento e di superare ostacoli grazie alla capacità di ragionamento e pensiero" (Neisser et al. 1996, Borghans et al. 2008), alle abilità *non cognitive*, intese come "capacità connesse alla personalità dell'individuo, attributi persistenti, non situazionali, del comportamento umano, quali autocontrollo, autodisciplina o coscienziosità" (Allport 1937; Thiel and Thomsen 2011).

Il legame esistente tra le due tipologie di abilità è documentato in diversi studi. In particolare, Dohmen et al. (2010) studiano il legame esistente tra le abilità cognitive, l'avversione al rischio e l'impazienza, riscontrando che coloro che hanno abilità cognitive maggiori sono più pazienti ed hanno un'avversione al rischio minore; le abilità cognitive, infatti, possono avere un forte impatto sul modo in cui gli individui effettuano le loro decisioni rendendo più facile comprendere il rischio cui si va incontro, facilitando l'integrazione di considerazioni sul presente e sul futuro e aiutando l'individuo a resistere ad impulsi emotivi come la paura del rischio o l'urgenza di consumo immediato.

La letteratura economica più recente annovera un numero crescente di studi che documentano l'importanza di abilità non-cognitive per diversi outcome economici. Molti di questi studi analizzano l'impatto di tali abilità sulle decisioni di investimento in capitale umano e sulle performance ottenute dagli studenti (Rochat and Demeulemeester, 2001; Duckworth and Seligman, 2005; Deke and Heimson, 2006; Duncan, et al. 2007; Borghans et al., 2008a; Castillo et al., 2011; Cadena and Keys; 2012). Altri evidenziano il contributo dei tratti della personalità nella spiegazione delle differenze negli outcome ottenuti sul mercato del lavoro (Feinberg; 1977; Kohn and Schooler, 1978; DellaVigna and Paserman, 2005; Drago, 2006; Van Huizen, 2010; Lee and Ohtake, 2012) e dei differenziali salariali (Heckman et al., 2006; Mueller and Plug, 2006; Heineck and Anger, 2010; Grove et al., 2011; Nyhus and Pons, 2012). Infine, le abilità non-cognitive sono fortemente correlate con molti outcome sociali tra cui la scelta di fumare, la probabilità di avere problemi con la giustizia, l'uso di droghe, l'immigrazione, la disgregazione del nucleo familiare e lo stato di salute dell'individuo (Fuchs, 1982; Komlos et al., 2003; Compton, 2009; Jaeger et al., 2010; Light and Ahn, 2010; Golsteyn et al., 2012).

Descrizione della tesi – La tesi contribuisce alla letteratura che studia il ruolo esercitato dalle abilità non-cognitive sia offrendo nuova evidenza riguardo alcuni effetti già osservati nella behavioural economics, sia esplorando nuove relazioni che suggeriscono direzioni per la ricerca futura. Essa è composta da due parti.

Nella prima parte (capitoli 1-2) si studia in maniera empirica la relazione tra le abilità non-cognitive ed outcome socio-economici. In questa parte, si focalizza l'attenzione su due preferenze economiche: l'impazienza e l'avversione al rischio, le quali svolgono un ruolo chiave nella determinazione degli outcome economici, così come mostrato dalla più recente letteratura sul tema (DellaVigna and Paserman, 2005; Saks and Shore, 2005; Drago, 2006; Caner and Okten, 2010; De Paola and Gioia, 2012; Golsteyn et al., 2012), e sono correlate l'una con l'altra (Castillo et al., 2011). Sia l'impazienza che l'attitudine verso il rischio sono misurate utilizzando risposte a domande ipotetiche. Il tasso di sconto di ogni individuo è calcolato usando la percentuale di una vincita monetaria disponibile l'anno successivo a cui l'individuo è disposto a rinunciare per ottenere immediatamente la somma residua. Il livello di avversione al rischio è calcolato utilizzando la disponibilità dell'individuo ad investire in un'ipotetica lotteria monetaria in cui c'è la stessa probabilità di raddoppiare la cifra investita o di perderne la metà.

Le preferenze intertemporali sono importanti in tutte le decisioni che implicano un trade-off tra costi e benefici che si realizzano in diversi momenti nel tempo poiché individui impazienti danno più valore ai costi immediati rispetto ai benefici futuri e, quindi, raggiungono outcome sociali ed economici che differiscono da quelli raggiunti da individui più pazienti. Tuttavia, il tasso di sconto può riflettere differenze nelle preferenze verso il rischio, pertanto, nello studiare il ruolo delle preferenze intertemporali, nella tesi si controlla anche per le preferenze individuali verso il rischio.

I primi due capitoli della tesi contribuiscono alla letteratura economica che studia il ruolo delle abilità non-cognitive nel definire gli outcome individuali. Tre sono i principali vantaggi delle analisi presenti in tali capitoli. In primo luogo, esse sono basate su misure dirette di preferenze intertemporali e verso il rischio, mentre le altre banche dati usate dai ricercatori spesso calcolano queste misure basandosi sul giudizio dell'intervistatore riguardo il comportamento dell'individuo che risponde al questionario somministrato. Secondariamente, nessuna delle due analisi soffre di problemi di causalità inversa perché le

misure di impazienza sono state calcolate prima della realizzazione del risultato di interesse. Infine, mentre la letteratura tipicamente focalizza l'attenzione su una delle attitudini, in entrambi i capitoli della tesi l'effetto delle preferenze intertemporali è calcolato controllando anche per l'attitudine verso il rischio. Purtroppo, così come avviene nella maggior parte della letteratura sulle abilità non-cognitive, nonostante il vasto numero di variabili di controllo disponibili in entrambe le analisi, non si può completamente escludere che i risultati siano influenzati da fattori non osservabili correlati sia con la misura di abilità non-cognitive che con la variabile rappresentante il risultato di interesse.

La seconda parte della tesi (capitoli 3-4) non soffre di questo problema. Infatti, in questa parte, si investigano le determinanti delle abilità non-cognitive cercando di individuare fattori esogeni che potrebbero influenzarle. In particolare, si cerca di contribuire alla letteratura che studia le differenze di genere osservate in vari contesti. Gli uomini e le donne differiscono in molti outcome socio-economici: la scelta del campo di studio, il profilo lavorativo, l'occupazione, i salari, la partecipazione alle elezioni a alle attività politiche (Turner and Bowen, 1999; Bertrand and Hallock, 2001; Blau and Kahn, 2006; Goldin et al., 2006; Fox and Lawless, 2008; Kanthak and Woon, 2013). Lo studio delle differenze di genere ha una lunga storia nel campo economico. Diverse sono le spiegazioni offerte dalla letteratura. La prima si fonda sul ruolo delle differenze di genere nelle abilità che porta ad auto-selezione nelle diverse posizioni lavorative (Polachek, 1981; Macpherson and Hirsch, 1995). La seconda spiegazione fa riferimento alla discriminazione sul posto di lavoro che si traduce in un diverso trattamento di uomini e donne con abilità identiche (Black and Strahan, 2001).

Una parte più recente della letteratura attribuisce le differenze di genere a differenze in attitudini e preferenze. In particolare, molti studi offrono evidenza di differenze di genere nelle attitudini verso la competizione, mostrando che le donne preferiscono non trovarsi in ambienti competitivi e tendono a rendere meno degli uomini quando competono, anche se riescono ad ottenere la stessa performance degli uomini in situazioni non competitive (Gneezy, Niederle, and Rustichini, 2003; Niederle and Vesterlund, 2007). Negli ultimi due capitoli della tesi, si cerca di contribuire a questa più recente tipologia di spiegazioni guardando all'esistenza di differenze di genere nell'abilità di lavorare sotto pressione derivante dal limitato tempo a disposizione e nel livello di overconfidence. A tal fine, si

mostrano i risultati di due esperimenti randomizzati, uno per ogni capitolo, condotti all'Università della Calabria con studenti iscritti alla Facoltà di Economia

Il **primo capitolo** (*Impatience and Academic Performance. Less effort and less ambitious goals*) esamina la relazione che esiste tra il livello individuale di impazienza degli studenti e la performance che essi ottengono durante i loro studi. Dato il trade-off intertemporale che le scelte di istruzione comportano, in quanto acquisire capitale umano richiede il costo immediato dell'impegno e genera benefici soltanto nel futuro, le preferenze intertemporali sono una determinante chiave di tali scelte. Ci si aspetta che gli individui impazienti investano meno in istruzione ed acquisiscano un capitale umano di bassa qualità.

In questo capitolo si studiano le performance di un campione di studenti universitari, suggerendo che, in un contesto universitario, l'impazienza influenza la performance accademica attraverso due canali: gli studenti più impazienti dedicano meno impegno allo studio e si prefiggono obiettivi meno ambiziosi in termini di voto minimo che vorrebbero ottenere agli esami. Di conseguenza, la relazione tra l'impazienza e il successo accademico può cambiare sulla base di come è misurata la performance accademica. L'impazienza influenza negativamente la performance accademica quando questa è misurata con indicatori che tengono in considerazione soprattutto la qualità del capitale umano accumulato, mentre ha un effetto meno chiaro sulle misure di performance accademica che si riferiscono soprattutto alla quantità di capitale umano accumulato, a causa dell'effetto contrastante con cui operano i canali descritti sopra.

Utilizzando dati estratti da un campione di 3,355 studenti universitari italiani iscritti a corsi di laurea triennali, emerge una forte relazione negativa tra l'impazienza e il voto medio ottenuto agli esami e l'impazienza e la probabilità di laurearsi con il massimo dei voti. Al contrario, una correlazione negativa ma non statisticamente significativa emerge tra le preferenze intertemporali degli studenti e il numero di crediti formativi acquisiti nei tre anni successivi all'immatricolazione e tra queste e la probabilità di laurearsi nei tre anni. Questi risultati sono robusti quando si inseriscono variabili di controllo per le caratteristiche del background familiare, per abilità cognitive e per l'attitudine individuale verso il rischio. Risultati simili emergono anche quando si controlla per indicatori della situazione

economica della famiglia dello studente. Inoltre, i risultati principali non cambiano quando si esprime l'impazienza con diverse forme funzionali per prendere in considerazione soltanto valori estremi o il tasso di interesse per prestiti alle famiglie presente nel momento in cui gli studenti hanno risposto all'indagine.

La presente analisi investiga anche se gli studenti impazienti si comportano razionalmente esaminando la relazione tra le preferenze intertemporali degli studenti e la decisione di abbandonare gli studi universitari. Emerge che gli studenti impazienti hanno maggiori probabilità di abbandonare gli studi intrapresi. Questo risultato continua ad emergere anche quando si restringe l'analisi considerando solo quegli studenti che, al momento dell'iscrizione all'università, hanno affermato di non avere alcun dubbio sulla loro scelta universitaria, di essersi ben informati prima di effettuare tale scelta e di essere abbastanza sicuri di riuscire a laurearsi nei tre anni stabiliti come durata legale del corso di studi. In questo campione ristretto, gli studenti che abbandonano gli studi intrapresi sono quegli studenti che hanno cambiato idea e deciso di non portare a termine un investimento in capitale umano che inizialmente era stato considerato fortemente buono. Pertanto, questa evidenza suggerisce un comportamento non coerente nel tempo.

Il **secondo capitolo** (*Does Patience matter for Marriage Stability? Some evidence from Italy*) esamina l'effetto del livello individuale di impazienza sulla decisione di porre fine alla relazione matrimoniale. Tre sono i principali trade-off che possono dare origine ad una tale decisione. Il primo accade prima del matrimonio, quando gli individui scelgono quanto impegnarsi nell'attività di ricerca di un partner: gli individui impazienti preferiscono investire meno nella ricerca di un compagno – e ridurre il loro "standard" di riserva –, in modo tale da evitare i costi immediati che tale attività implica; questo comporta una peggiore qualità iniziale del match che, a sua volta, aumenta le probabilità di divorziare. Inoltre, l'impazienza svolge un ruolo importante anche nella vita quotidiana dei coniugi, ricca di piccoli compromessi che tipicamente comportano costi immediati per i futuri benefici di una relazione lunga e stabile. Infine, quando una coppia sposata è colpita da uno shock che influenza l'equilibrio del matrimonio, la decisione su come affrontare tale shock si basa su considerazioni intertemporali, interessando pertanto il livello di impazienza dei coniugi. Gli individui più pazienti potrebbero essere più propensi a rimanere in una

relazione matrimoniale con dei problemi, sostenendo i costi immediati dello shock in modo tale da poter ottenere i benefici futuri derivanti da un miglioramento nella relazione matrimoniale. Al contrario, individui impazienti, che scontano molto il futuro, preferirebbero meno intraprendere attività con costi da sostenere nell'immediato e benefici da poter fruire soltanto in futuro.

La relazione tra l'impazienza e la decisione di divorziare viene analizzata empiricamente utilizzando i dati dell'Indagine Sui Bilanci Delle Famiglie Italiane forniti dalla Banca d'Italia. Per evitare i problemi di causalità inversa che possono emergere quando si usano misure di impazienza calcolate nello stesso momento in cui viene osservato lo stato civile, il campione viene ristretto alla componente panel degli individui per i quali si hanno osservazioni sia nel 2004 che nel 2010. Utilizzando tale campione si esamina se il livello di impazienza degli individui che erano sposati nel 2004, misurato nel 2004, influenza la probabilità di divorziare nell'intervallo temporale 2004-2010. Controllando per un vasto numero di caratteristiche individuali e familiari tese a catturare i guadagni derivanti da matrimonio e divorzio, emerge che un aumento di una deviazione standard nel livello di impazienza degli individui aumenta la probabilità di divorziare di circa un punto percentuale. I risultati sono robusti quando si stimano diverse specificazioni del modello e quando si includono diversi controlli.

Per studiare se i risultati trovati derivano dal fatto che individui più pazienti sono anche più avversi al rischio, si misura il livello individuale di avversione al rischio utilizzando una domanda dell'indagine del 2010 e si analizza la relazione tra le preferenze intertemporali e la stabilità del matrimonio controllando per l'attitudine verso il rischio. I risultati mostrano che, tenendo il livello di avversione al rischio costante, le preferenze intertemporali continuano ad influenzare la decisione di divorziare e gli individui più impazienti hanno più probabilità di interrompere la relazione matrimoniale. Inoltre, gli individui più avversi al rischio hanno una minore probabilità di divorziare.

Il **terzo capitolo** (*Who performs better under time pressure? Results from a field experiment*) studia l'esistenza di differenze di genere nella capacità di lavorare sotto pressione. Quando il tempo a disposizione per eseguire un compito è limitato, gli individui devono scegliere come gestirlo in modo tale da ottenere il miglior risultato possibile. La

capacità di lavorare sotto pressione derivante da vincoli temporali stringenti è molto importante in particolari tipologie di lavoro altamente qualificate, quali medico di emergenza, trader finanziario o manager. In questo capitolo si investiga se essere esposti ad un vincolo temporale stringente, in situazioni appartenenti alla vita reale, influenza la performance e se maschi e femmine differiscono nella capacità di gestire la pressione derivante dal tempo limitato. A tal fine viene condotto un esperimento con 113 studenti iscritti al corso di Economia del Personale all'Università della Calabria nell'anno accademico 2012-2013. A tali studenti viene data la possibilità di scegliere se sostenere l'esame finale nel modo tradizionale oppure in una nuova modalità loro spiegata. Tale nuova modalità d'esame consiste in due test intermedi, riguardanti rispettivamente la prima e la seconda metà del programma insegnato durante il corso, da valutare con domande sia numeriche che verbali. Per ogni test intermedio viene creato un gruppo di trattamento che deve sostenere il test con un vincolo temporale stringente, 35 minuti, ed un gruppo di controllo che sostiene l'esame con un vincolo temporale non stringente, 55 minuti. Gli studenti che decidono di prendere parte all'esperimento sostenendo l'esame finale nella nuova modalità vengono assegnati in maniera casuale a uno dei due gruppi e informati del tempo a loro disposizione per completare il relativo test; il gruppo di appartenenza viene cambiato per il secondo test in modo tale che ciascuno studente abbia a diposizione 35 minuti per un test e 55 per l'altro.

L'analisi mostra che dover completare il test con un vincolo temporale stringente riduce il voto che gli studenti ottengono al test, con un effetto più forte e più significativo per la componente verbale. Inoltre, le donne sembrano gestire meglio la pressione temporale persino nelle domande numeriche del test, che generalmente si ritiene favoriscano gli uomini. Essere esposti alla pressione temporale riduce la performance degli uomini di circa 6.64 punti, 3.6 dei quali si riferiscono alla parte numerica del test. Inoltre emerge che gli studenti con un voto di maturità più alto sono più propensi a scegliere la nuova modalità d'esame rispetto a quella tradizionale e che, una volta deciso di sostenere l'esame nella nuova modalità e conosciuto il gruppo assegnato, le donne sono meno propense ad assentarsi il giorno del primo test intermedio.

Il **quarto capitolo** (*Overconfidence, Omens and Gender Heterogeneity: Results from a Field Experiment*) focalizza l'attenzione sul livello di overconfidence degli studenti, cioè sulla loro tendenza a sovrastimare la loro abilità, conoscenza e la precisione delle proprie informazioni. L'overconfidence si manifesta con diverse intensità in base al genere - gli uomini sono più sicuri di sé delle donne -, è correlata negativamente con l'età e le abilità e dipende dal tipo di compito svolto. In questo capitolo si investiga se il livello di overconfidence degli studenti è influenzato da credenze superstiziose e da emozioni derivanti da tali credenze. A tal fine viene condotto un esperimento con 700 studenti italiani che vengono assegnati in maniera casuale a posti numerati durante il loro esame finale scritto. Vengono utilizzati particolari numeri, considerati fortunati o sfortunati in base a superstizioni diffuse, in modo tale da indurre stimoli positivi o negativi agli studenti. Al termine dell'esame viene chiesto agli studenti il voto che si aspettano di aver preso. I dati mostrano evidenza della presenza di oveconfidence tra gli studenti e permettono di identificare un fattore esogeno che influenza il livello di tale overconfidence: l'overconfidence degli studenti è positivamente influenzata dall'essere assegnati ad un numero considerato fortunato.

Inoltre, nell'analizzare l'esistenza di eterogeneità basata sul genere nell'effetto della superstizione sul livello di overconfidence degli studenti, emerge che uomini e donne reagiscono in modo diverso a numeri fortunati e sfortunati: le donne tendono ad aspettarsi un voto più basso quando vengono assegnate a numeri sfortunati ma non sono influenzate dall'essere assegnate a numeri fortunati; al contrario, gli uomini non sono influenzati dall'essere assegnati ad un numero sfortunato ma si aspettano voti più alti quando vengono assegnati a numeri fortunati. Nessun effetto emerge per la performance effettiva degli studenti. La robustezza dei risultati viene verificata stimando delle regressioni placebo.

Poiché recentemente l'economia sta attribuendo una crescente attenzione all'analisi di comportamenti che prima erano unicamente all'interno del dominio della psicologia e della sociologia, vi è la necessità di espandere i modelli economici per tenere conto delle caratteristiche più qualitative e non perfettamente osservabili degli individui. Senza includere tali caratteristiche psicologiche si corre il rischio di sopravvalutare l'effetto diretto

delle determinanti "tradizionali" di risultati socio-economici, e questo può portare a gravi conseguenze per i responsabili della politica economica.

La presente tesi studia come le preferenze e le attitudini degli individui contribuiscono alla spiegazione di due outcome socio-economici, ossia gli investimenti in capitale umano e la stabilità del matrimonio, e delle differenze di genere. I risultati in ogni capitolo possono offrire un contributo al disegno ottimale degli interventi di politica economica. In particolare, il primo capitolo (*Impatience and Academic Performance. Less effort and less ambitious goals*) mostra che l'impazienza è correlata negativamente con la performance accademica degli studenti e positivamente con la decisione di abbandonare il percorso di studi intrapreso. In base a tali risultati, gli individui potrebbero essere indotti ad intraprendere decisioni che incrementano il benessere attraverso politiche mirate a migliorare le abilità non cognitive (Heckman et al. 2010). Più in dettaglio, i risultati emersi mostrano la rilevanza dei programmi volti a insegnare agli individui l'arte della pazienza e dell'attesa intelligente. Un miglioramento nelle decisioni di investimento del capitale umano degli individui potrebbe anche essere raggiunto utilizzando schemi, come ad esempio gli incentivi monetari, che aumentano i benefici immediati di questi investimenti, o politiche paternalistiche come quelle tese ad aumentare il periodo di scuola dell'obbligo.

Il secondo capitolo (*Does Patience matter for Marriage Stability? Some evidence from Italy*) considera il ruolo delle preferenze intertemporali nella stabilità della relazione matrimoniale, evidenziando una relazione positiva tra l'impazienza e la decisione di divorziare, e mostra anche l'esistenza di una relazione negativa tra l'avversione al rischio e la probabilità di terminare il matrimonio. Dal momento che la disgregazione della famiglia ha importanti implicazioni per una serie di risultati socio-economici, come le disuguaglianze, le decisioni di offerta di lavoro e il benessere infantile, anche in questo caso il benessere sociale può essere incrementato con politiche volte a migliorare le abilità non cognitive. Soprattutto nel corso di una crisi economica, quando la coppia viene colpita da uno shock negativo a causa della riduzione delle sue risorse economiche, una migliore capacità di ritardare la gratificazione può aiutare la coppia a sostenere i costi dello shock senza terminare il rapporto matrimoniale. Inoltre, le politiche volte ad aumentare il benessere delle donne divorziate, fornendo sostegno economico alle ragazze madri che hanno un reddito basso o migliorando l'attuazione degli accordi di mantenimento dei

bambini possono indurre anche le donne relativamente più pazienti e avverse al rischio a decidere di porre fine al loro matrimonio divorziando.

Gli ultimi due capitoli studiano l'esistenza di differenze di genere nell'abilità di lavorare sotto pressione temporale e nel livello di overconfidence. Differenze di genere nelle attitudini psicologiche sono spesso considerate la causa della bassa percentuale di donne con posizioni di leadership o in posizioni lavorative altamente remunerate (Niederle and Vesterlund, 2008; Ertac and Gurdal, 2012).

I risultati nel terzo capitolo (*Who performs better under time pressure? Results from a field experiment*) suggeriscono che un ambiente caratterizzato dalla pressione derivante dal tempo limitato influisce negativamente sulle prestazioni degli studenti e che le studentesse non sembrano differire significativamente dai maschi nella loro capacità di gestire la pressione del tempo (semmai, sembrano gestire meglio la pressione del tempo, anche in compiti più maschili). Secondo tali risultati, la minore percentuale di donne in posti di lavoro altamente qualificati, che spesso richiedono l'esposizione a limiti di tempo vincolanti, non dipende dalla difficoltà delle donne nella gestione della pressione del tempo. Pertanto, sulla base dei risultati ottenuti, una politica che cerca di alleviare le disparità di genere sul posto di lavoro sovvenzionando una cultura del lavoro che promuove un'atmosfera più rilassata e un basso livello di pressione temporale non è una soluzione efficace.

Al contrario, il quarto capitolo (*Overconfidence, Omens and Gender Heterogeneity: Results from a Field Experiment*), che mostra la tendenza delle donne non solo ad essere meno sicure di sé rispetto agli uomini, ma a concentrarsi principalmente sugli aspetti negativi, offre una nuova spiegazione al più elevato grado di avversione al rischio delle donne e suggerisce che, al fine di migliorare i risultati scolastici e lavorativi delle donne potrebbe essere utile cambiare il tipo di stimolo che esse ricevono. Per esempio, se le donne sono più propense a concentrarsi sugli aspetti negativi, potrebbe risultare utile, nel presentare i costi e i benefici delle diverse alternative, cercare di attirare la loro attenzione soprattutto sui benefici. Ciò le aiuterebbe a dare il giusto peso ad aspetti negativi e positivi, migliorando il loro processo decisionale. Una strategia simile è suggerita anche da Hügelschäfer e Achtziger (2013), i quali dimostrano che indurre una mentalità attuativa può aiutare le donne ad essere più sicure delle proprie capacità. Inoltre, la constatazione che

l’overconfidence, assoluta e relativa, è influenzata da fattori non razionali (come stimoli positivi e negativi derivanti da credenze superstiziose) dimostra che le abilità non cognitive possono effettivamente essere modellate con interventi diretti.

INTRODUCTION[2]

Along with the cognitive dimension, motivation, trustworthiness, patience, tenacity, risk attitudes and perseverance are important determinants of socio-economic outcomes. The lack of attention to such multidimensional nature of skills may misguide economic research and the design of policy interventions.

In recent years, economic research has devoted particular attention to the contribution that other disciplines, especially psychology, offer to the explanation of individual behaviour.

In macroeconomics, researchers deepen typical concepts of psychology studies, such as expectations, motivation and attitudes, which are used to explain reactions to economic policy measures, to clarify certain aspects of economic growth or to study the effects of changes in the economic cycle. In addition, behavioural attributes are used to characterize Nations, which are considered more prone to saving or consumption, warlike or peaceful, reliable or irresponsible.

In microeconomics, where the individual is the analysis unit, economists show a growing interest in the role that human personality traits, originally studied in psychology, play in the achievement of certain economic and social outcomes, such as, for example, the choice of a certain level of investment in human capital or of a certain type of employment contract.

Although many aspects of human personality are influenced by the cognitive process (Schulkin, 2007) and, at the same time, cognitive abilities suffer the effect of personality characteristics (Phelps, 2006), the notion typically used in the economic literature contrasts *cognitive abilities*, defined by the American Psychological Association as "the ability to understand complex ideas, to adapt effectively to the environment, to learn from

[2] The thesis is co-funded with support from the European Commission, the European Social Fund, and the Regione Calabria. The views expressed in the thesis are those of the author and do not necessarily reflect those of the institutions she belongs to. The usual disclaimers apply.

experience, to engage in various forms of reasoning and overcome obstacles by taking thought" (Neisser et al., 1996; Borghans et al., 2008), to *non-cognitive abilities*, defined as "capabilities related to a person's personality; persisting attributes of human behavior, non-situational, such as self-control, self-discipline, agreeableness, self-esteem and conscientiousness" (Allport, 1937; Thiel and Thomsen, 2011).

The link between the two typologies of skills has been documented in several studies. In particular, Dohmen et al. (2010) study the relationship between cognitive ability, risk aversion and impatience, finding that individuals with higher cognitive abilities are more patient and less risk averse. Indeed, cognitive abilities may have a strong impact on the way in which individuals take their decisions, making it easier to understand the risk involved, facilitating the integration of considerations on present and future and helping individuals to resist impulses like fear of risk or urgency of immediate consumption.

The recent economic literature has seen a growing number of studies documenting the importance of non-cognitive abilities for different economic outcomes. Many of them investigate the impact of such skills on educational investments and performance (Rochat and Demeulemeester, 2001; Duckworth and Seligman, 2005; Deke and Heimson, 2006; Duncan, et al. 2007; Borghans et al., 2008a; Castillo et al., 2011; Cadena and Keys; 2012). Similar to human capital investment, individuals' personality may result in differences in job performance and contract choice (Feinberg; 1977; Kohn and Schooler, 1978; DellaVigna and Paserman, 2005; Drago, 2006; Van Huizen, 2010; Lee and Ohtake, 2012).

Some recent studies point out the importance of personality traits to better explain wage differentials (Heckman et al., 2006; Mueller and Plug, 2006; Heineck and Anger, 2010; Grove et al., 2011; Nyhus and Pons, 2012). Finally, non-cognitive skills are strongly correlated to many social outcomes such as the decision to smoke, the chance of running into trouble with the law, drug use, immigration, family breakdown and general health status (Fuchs, 1982; Komlos et al., 2003; Compton, 2009; Jaeger et al., 2010; Light and Ahn, 2010; Golsteyn et al., 2012).

Thesis outline – The thesis contributes to the existing literature on non-cognitive skills both by providing new evidence on some effects already investigated in behavioural

economics and by exploring new relationships which suggest directions for future research. It is composed by two parts.

In the first part (chapters 1-2), the relationship between non-cognitive skills and socio-economic outcomes is empirically scrutinized. In this part, we focus on two economic preference parameters: impatience and risk aversion, which have been shown to play a key role in economic outcomes (DellaVigna and Paserman, 2005; Saks and Shore, 2005; Drago, 2006; Caner and Okten, 2010; De Paola and Gioia, 2012; Golsteyn et al., 2012) and to be correlated to each other (Castillo et al., 2011). Both impatience and risk preferences are measured using hypothetical questions. The discount rate of each individual is computed using the percentage of a monetary win available in a year's time s/he would like to give up in order to have the residual sum immediately. The level of risk aversion is derived from individual willingness to invest in a hypothetical monetary lottery in which they could either double the amount invested or lose half of it with the same probability.

Time preferences are important in all decisions involving a trade-off between costs and benefits occurring in different periods of time, because impatient individuals weigh immediate costs more and delayed benefits less, therefore reaching social and economic outcomes which differ from those reached by more patient individuals. However, discount rates might reflect differences in risk preferences, therefore, when analysing the effect of time preferences, we also control for individual risk preferences.

The first two chapters of the thesis contribute to the literature investigating the role of non-cognitive skills in shaping individual outcomes both by providing new evidence and by improving on three crucial aspects. First of all, our analyses are based on a direct measure of both time preferences and risk attitudes, while other datasets used by researchers often compute those measures on the basis of the interviewer's assessment of the behaviour of the individual who answers the survey. Secondly, neither of the two analyses suffer from problems of reverse causality because the measures of impatience have been computed before the realization of the outcome of interest. Finally, while the literature typically focuses on a single preference indicator, in both chapters, the effect of impatience is computed controlling also for risk attitudes. Unfortunately, despite the big set of controls available in both analyses, as well as in almost all the current literature on non-cognitive

abilities, we cannot exclude that our findings are driven by unobserved factors correlated with both the preference indicator and the outcome variable of interest.

The second part of the thesis (chapters 3-4) does not suffer from this problem. In fact, in this part, we investigate the determinants of non-cognitive abilities trying to find out exogenous factors who could affect them. In particular, we try to contribute to the literature explaining observed gender inequality. Men and women differ in many socio-economic outcomes: field of study choice, job profile, occupation, earnings, participation in elections and in political activities (Turner and Bowen, 1999; Bertrand and Hallock, 2001; Blau and Kahn, 2006; Goldin et al., 2006; Fox and Lawless, 2008; Kanthak and Woon, 2013). The study of gender inequality has a long history in the field of economics. Different are the explanations put forth in the literature. The first relies on gender differences in abilities that lead to occupational self-selection (Polachek, 1981; Macpherson and Hirsch, 1995). The second explanation points to discrimination in the workplace which results in differential treatment of men and women of identical abilities (Black and Strahan, 2001).

A more recent strand of the literature, ascribes gender inequality to gender differences in attitudes and preferences. In particular, many papers provide experimental evidence of gender difference in attitudes toward competition, showing that women stay away from competitive environments and tend to perform worse than men under competitive pressure, even if they are able to perform similarly to men in non-competitive situations (Gneezy, Niederle, and Rustichini, 2003; Niederle and Vesterlund, 2007). In the last two chapters of the thesis, we try to contribute to this more recent class of explanations looking at the existence of gender differences in the ability to work under time pressure and in the level of overconfidence. At this aim, we exploit two randomized experiments, one for each chapter, conducted at the University of Calabria with students enrolled at the Faculty of Economics.

The **first chapter** (*Impatience and Academic Performance. Less effort and less ambitious goals*) examines the relationship existing between students' level of impatience and the performance they achieve during their studies. Given the inter-temporal trade-off arising from human capital investments, which require an immediate cost of effort to yield benefits only in the future, time preferences are a key determinant of education choices.

Impatient individuals are expected both to invest less in education and to acquire lower quality human capital.

In this chapter, we look at undergraduate students, suggesting that, in a university context, impatience affects academic performance through two different channels: impatient students spend less effort in studying activities and set less ambitious objectives in terms of minimum grade they would like to achieve at exams. As a consequence, the relationship between impatience and academic success may vary according to how performance is measured. Impatience negatively affects academic performance measured with indicators which mainly refer to the quality of the human capital accumulated, whilst it has an unclear effect on measures of academic performance which refer to the quantity of human capital accumulated, because of the contrasting effect with which the two channels described above operate.

Using data from a sample of 3,355 Italian undergraduate students, we find a strong negative relationship between impatience and both the average grade at exams and the probability of graduating with honours. Conversely, a negative but not statistically significant correlation emerges between time preferences and both the number of credits earned in the three years following enrolment and the probability of timely graduation. These findings are robust to the inclusion among controls of family background characteristics and both cognitive abilities and risk preferences. We find similar results also when controlling for indicators of the student economic condition. Moreover, the main findings do not change when impatience is expressed with different functional forms to take into account only extreme values or the prevailing interest rate for loans to households at the time the survey was asked.

We also investigate whether impatient students behave rationally by analysing the relationship between time preferences and drop out decisions. We find that more impatient students are more likely to drop out from university. This result holds true also when we focus on students who stated, at the moment of their enrolment, to have no doubts about their educational choice, which had been made on the basis of very good information, and who were pretty sure of being able to accomplish their degree program within the regular time. Dropouts in this sample are students who have changed their minds and decided not

to complete an educational program that initially appeared strongly attractive. Therefore, this evidence is suggestive of time inconsistent behaviour.

The **second chapter** (*Does Patience matter for Marriage Stability? Some evidence from Italy*) examines the effect of individual level of impatience on family breakdown decision. Three are the main economic trade-offs which can lead to the end of a marriage relationship. The first happens before the start of the relationship, when individuals choose the level of effort to profuse in mate search activity: impatient individuals would prefer to invest less in the research of a partner - and to lower their reserve "standard"-, in order to avoid the immediate costs arising from this activity; this leads to a lower initial quality of the match, which, in turn, increases their probability of divorce. Then, impatience plays a role in the daily life of the couple, full of small daily compromises which typically involve immediate costs for the delayed benefits of a long and stable relationship. Finally, when a married couple is hit by a shock which affects the equilibrium of the marriage, the decision on how to address such a shock is based on inter-temporal considerations, thus involving individual time preferences. Patient individuals may prefer to stay in a troubled marriage, sustaining the immediate costs of the shock in order to obtain the future benefits deriving from an improvement in the relationship. On the contrary, impatient individuals, who heavily discount the future, would be less likely to engage in costly activities with delayed benefits.

The relationship between impatience and divorce decision is empirically analysed using data from the Italian Survey on Household Income and Wealth. To avoid reverse causality problems that may emerge when using measures of impatience computed in the same moment in which marital status is observed, we have restricted our sample to the panel component of individuals for which we have observations both in 2004 and in 2010. We investigate whether the level of impatience of individuals who were married in 2004, measured in 2004, affects their probability of divorcing in the time interval 2004-2010. Controlling for a number of individual and family characteristics aimed at capturing the gains to marriage and divorce, it emerges that an increase in impatience of one standard deviation increases the probability of experiencing divorce by almost one percentage point.

Results are robust to different specifications of the model and to the inclusion of different controls.

To check whether results are driven by the fact that more patient individuals are also more risk averse, we measure risk aversion using a question of the 2010 wave of the survey, and analyse the relationship between time preferences and marriage stability controlling for risk attitudes. Results show that, taking the level of risk aversion constant, time preferences continue to play a role and more impatient individuals are more likely to experience a marriage breakdown. Furthermore, more risk averse individuals are less likely to experience divorce.

The **third chapter** (*Who performs better under time pressure? Results from a field experiment*) looks at gender differences in the ability to work under time pressure. When the time to perform a task is limited, individuals have to choose how to manage it in order to obtain the best possible outcome. The ability to work under time pressure is very important in particular, high-qualified, typologies of job such as emergency doctor, financial trader, manager. In this chapter, we try to understand whether being exposed to binding time constraints in a real life environment affects performance and whether there is heterogeneity between males and females in the way they handle time pressure. At this aim, we run a field experiment involving 113 students enrolled at the class of Personnel Economics at the University of Calabria in the academic year 2012-2013. We gave students the opportunity to choose whether to take the exam in the traditional way or in an experimental way. The "experimental exam" consisted in two intermediate tests, regarding respectively the first and the second half of the course program, and composed by both verbal and numerical questions. For each intermediate test, there was a treatment group, who had to take the exam under "binding time constraint", that is in 35 minutes, and a control group who had a "no binding time constraint" of 55 minutes. Students deciding to take the experimental exam were randomly assigned to one of the two groups and informed about that; the groups were switched for the second test.

We find that having to perform the test under binding time constraint reduces the grade students achieve at the test, with an effect stronger and more significant for the verbal component of it. Moreover, females seem to better handle time pressure even in the

numerical task, which is typically seen as a masculine task. Being exposed to time pressure reduces men's performance by about 6.64 points, 3.60 of which refer to the numerical part of the exam. We also find that students with a higher high school grade are more likely to decide to take the experimental exam than the traditional exam, and that, once decided to join the experiment and known the assigned group, females are less likely to be absent the day of the first intermediate test.

The **fourth chapter** (*Overconfidence, Omens and Gender Heterogeneity: Results from a Field Experiment*) focuses on students' overconfidence, that is the tendency to overestimate their own ability, knowledge and the precision of their own information. Overconfidence occurs with varying intensity depending on gender, with males being more overconfident than females, is negatively correlated with age and abilities and depends on the type of task carried out. In this chapter, we try to investigate whether students' overconfidence is affected by superstitious beliefs and emotions. At this aim, we have run a field experiment involving about 700 Italian students, who were randomly assigned to numbered seats in their written final exam. We used particular numbers, considered lucky or unlucky according to widespread superstitions, in order to cause positive and negative stimuli to students. At the end of the examination, we asked students the grade they expected to get. We find evidence of overconfidence among students and identify an exogenous factor influencing their level of overconfidence: students' overconfidence is positively affected by being assigned to a lucky number. Then, we turn our attention to the existence of gender heterogeneity in the effect of superstition on students' overconfidence. Interestingly, we find that males and females react differently to the positive and negative treatment: on the one hand, females tend to expect lower grades when assigned to unlucky numbers, while they are not affected by being assigned to lucky numbers. On the other hand, males are not affected by being assigned to unlucky numbers but expect higher grades when assigned to lucky numbers. No effect emerges for the effective performance of students. The robustness of the results is checked running placebo regressions.

As economics is moving further into analysing behaviours that were previously within the domain of psychology and sociology, there is the need to expand economic

models to account for more qualitative and imperfectly observable characteristics of individuals. Without including such psychological features we run the risk of overestimating the direct effect of the "traditional" determinants of socio-economic outcomes and this can lead to serious consequences for policy makers.

My thesis investigates how individual preferences and attitudes contribute to the explanation of two socio-economic outcomes, namely human capital investments and marriage stability, and of gender inequality. The findings in each chapter may provide a contribution to the optimal design of policy interventions. In particular, the first chapter (*Impatience and Academic Performance. Less effort and less ambitious goals*) shows that impatience is negatively correlated to students' academic performance and positively correlated to dropout decision. According to these findings, individuals might be induced to undertake welfare enhancing decisions through policies aimed at improving non cognitive skills (Heckman et al. 2010). More in detail, our findings point to the relevance of programs aimed at teaching individuals the art of patience and intelligent waiting. An improvement in individuals' human capital investment decisions might also be reached using schemes, such as monetary incentives, that increase the immediate benefits of these investments, or by paternalistic policies such as those increasing compulsory schooling periods.

The second chapter (*Does Patience matter for Marriage Stability? Some evidence from Italy*) considers the role played by individual time preferences in marriage stability pointing out a positive relationship between impatience and the decision of divorcing and finds also a negative relationship between risk aversion and the probability of experiencing divorce. Since family breakdown has important implications for a number of socio-economic outcomes, such as inequality, labour supply decisions and child wellbeing, also in this case, social welfare may be enhanced by policy aimed at improving non cognitive skills. Above all over an economic crisis, when the couple is hit by a negative shock due to the reduction of its economic resources, an improved ability to delay gratification may help the couple to sustain the costs of the shock without ending the marriage relationship. Furthermore, policies designed to increase the welfare of divorced women by providing income assistance to low-income, unmarried mothers or by improving the enforcement of child support agreements may induce even relatively more patient and risk averse women to end their marriages.

The last two chapters investigate the existence of gender differences in the ability to work under time pressure and in the level of overconfidence. Gender differences in psychological attitudes are often considered responsible for females under-representation in leadership positions and in highly paid jobs (Niederle and Vesterlund, 2008; Ertac and Gurdal, 2012).

The findings in the third chapter (*Who performs better under time pressure? Results from a field experiment*) suggest that an environment characterized by time pressure negatively affects students' performance and that female students do not seem to differ significantly from males in their ability to handle time pressure (if anything, they seem to better handle time pressure even in more masculine tasks). According to our evidence, the lower share of women in high-qualified jobs, often requiring exposure to binding time constraints, is not likely to depend on females' difficulty to manage time pressure. Therefore, based on our results, a policy seeking to alleviate gender inequality in the workplace by subsidizing a work culture that promotes a more relaxed atmosphere and a lower level of time pressure is not an effective solution.

On the contrary, the fourth chapter (*Overconfidence, Omens and Gender Heterogeneity: Results from a Field Experiment*), showing women's tendency not only to be less confident than men, but to focus mainly on negative aspects, offers a new explanation to women's higher degree of risk aversion and suggests that, in order to improve females' educational and career outcomes, it could be useful to change the type of stimulus they receive. For example, if women are more likely to focus on negative aspects, it might result beneficial, when presenting the costs and the benefits of different alternatives, to try to attract their attention on benefits. This would help them to give the right weight to both negative and positive aspects and improve their decision making process. A similar strategy is suggested also by Hügelschäfer and Achtziger (2013) who show that inducing implemental mindset may help women be more confident on their own abilities. Moreover, the finding that both absolute and relative overconfidence are affected by un-rational factors (such as positive and negative stimuli arising from superstitious beliefs) shows that non-cognitive attitudes may actually be shaped by direct intervention.

PART I

CHAPTER 1

Impatience and Academic Performance. Less effort and less ambitious goals.

Abstract

Impatience affects academic performance through two different channels: impatient students spend less effort in studying activities and set less ambitious objectives in terms of grades at exams. As a consequence, the relationship between impatience and academic success may vary according to how performance is measured. Using data from a sample of Italian undergraduate students, we find a strong negative relationship between impatience and both the average grade at exams and the probability of graduating with honours. Conversely, a negative but not statistically significant correlation emerges between time preferences and both the number of credits earned in the three years following enrolment and the probability of timely graduation. We also find that impatient students, even those who were pretty sure, at the moment of enrolment, of being able to accomplish their degree within the regular time, are more likely to drop out or to be late in their educational career. This evidence is suggestive of time inconsistent behaviour. Our results do not suffer from reverse causality problems and are robust to alternative functional forms of the measure of impatience and controlling for family background characteristics, for cognitive abilities and for risk preferences.

Keywords: Time preferences, impatience, human capital, academic success

JEL Classification: I20, D03, D91, J01

1.1 INTRODUCTION

Individuals are often confronted with decisions involving trade-offs between costs and benefits occurring at different points in time. Healthy eating habits, physical exercise, job search activities and saving are examples of such type of choices.

In this type of decisional processes a crucial role is played by inter-temporal preferences: impatient individuals weigh immediate costs more and delayed benefits less and then end up with economic and social outcomes that differ from those reached by more patient subjects. The relevance of inter-temporal preferences for individual decisions has long been recognized by the economic literature and an increasing number of empirical and experimental works confirms the influence of time preferences on individual choices in a very large number of domains. Among the most recent works, Della Vigna and Paserman (2005) show that impatience is negatively correlated to the exit rate from unemployment. Drago (2006) finds that impatience predicts workers' mobility into better paid jobs. Suen (2013) considers time preferences to explain wealth inequality. Meier and Sprenger (2010) study the relevance of time preferences for credit card borrowing, while Chabris et al. (2008), Scharff and Viscusi (2011), Sutter et al. (2011) and Golsteyn et al. (2012) focus their attention on substance use, smoking habits and nutrition.

Inter-temporal preferences are also crucial for investments in human capital (Mincer, 1958; Becker, 1964). Individuals with high discount rates are expected both to invest less in education and training and to accumulate human capital of a lower quality: the cost of effort is immediate while the benefits deriving from human capital and from high quality human capital may be years away.

The relationship between human capital accumulation and inter-temporal preferences has been empirically scrutinized only by few very recent papers. Golsteyn et al. (2012), using a Swedish longitudinal dataset, highlight a substantial averse relationship between impatience and educational performance. Castillo et al. (2011) show that children with higher discount rates are more likely to receive disciplinary referrals in school. Cadena and Keys (2012), using the National Longitudinal Survey of Youths (NLSY), find that impatient people do worse in terms of educational attainment and show dynamically

inconsistent behaviours, for example, by starting an educational program but failing to accomplish it.

In this paper, we offer new evidence on the relationship between time preferences and educational outcomes using a sample of Italian undergraduate students observed over a period of three years from their enrolment. This dataset allows us to measure time preferences, at the moment of students' enrolment at university, by referring to a survey question asking students about their willingness to give up part of a prize available in one year in order to have the win immediately. We have also detailed information on different measures of educational performance, such as the number of credits acquired in the three years following enrolment, the average grade at exams, the probability of timely acquiring the degree and the overall grade obtained on graduation.

Once enrolled at university, students have to decide the amount of effort to provide in studying activities and their objectives in terms of grades at exams. In educational systems, such as the Italian one, in which students are not forced to pass all the scheduled exams during an academic year in order to proceed to the subsequent year of study (allowing potentially uncapped completion period), these choices will affect both the time needed for degree completion and the final degree classification. The choice of a high level of effort will reduce the time to obtain the degree and increase the overall grade achieved. However, given a certain amount of effort, there exists a trade-off between grades obtained at exams and completion time: students aiming at obtaining high grades are more likely to focus their effort on few exams thus obtaining higher grades but increasing the time to degree completion; on the contrary, students setting less ambitious objectives in terms of grades are more likely to take a large number of exams thus reducing the time to obtain the degree albeit scoring lower grades.

We suggest that impatience affects students' academic performance by influencing both the level of effort they decide to exert in studying activities and the objectives they set in terms of grades at exams. Individual degree of impatience is negatively correlated with both decisions: more impatient students choose to exert lower effort, because it involves immediate costs and only delayed benefits, and to acquire a low-quality human capital because the benefits of high grades and deep knowledge will be obtained only when entering the labour market.

As students' academic performance is affected by time preferences through these two channels, the direction of the relationship between academic success and impatience may vary according to the measure of human capital considered. If we consider as a measure of success the average grade obtained at exams (or the probability of graduating with honours) the effect of impatience is clear-cut: more impatient individuals assign a lower value to the future benefits deriving from the accumulation of human capital and from its quality; therefore, they care less about good grades and exert less effort in studying activities ending up with a lower average grade at exams and a lower probability of graduating with honours. Instead, when we consider the effect of impatience on the number of credits earned in a certain period of time (or on the probability of timely graduation), the two channels described above operate with contrasting effects. On the one hand, since more impatient individuals assign a lower value to the future benefits of human capital and exert less effort, they acquire a small number of credits in a given period of time and delay the time of graduation. On the other hand, since more impatient students are less concerned about the quality of their human capital, they set less ambitious objectives in terms of grades and are more likely to acquire a larger number of credits and to timely obtain the degree. The global effect of impatience on these measures of academic success depends on the relative strength of these two factors.

Consistently with these predictions, in our empirical analysis we find that impatient individuals are less likely to be successful at university. The negative correlation between high discount rates and academic success is particularly strong when we consider as measures of academic performance the average grade at passed exams and the probability of obtaining a first class honours degree. On the other hand, we find a negative, but weakly statistically significant, relationship between impatience and the number of credits acquired in the three years after enrolment and between impatience and the probability of timely obtaining the degree.

To investigate whether impatient students behave rationally we have analysed the relationship between time preferences and drop out decisions. We find that more impatient students are more likely to drop out from university. This result holds true also when we focus on students who stated, at the moment of their enrolment, to have no doubts about their educational choice, which had been made on the basis of very good information, and

who were pretty sure of being able to accomplish their degree program within the regular time. Dropouts in this sample are students who have changed their minds and decided not to complete an educational program that initially appeared strongly attractive. The fact that also in this sample the dropout rate is higher among impatient students is consistent with short-run impatience: students with higher exponential discount rates should plan to drop out and behave consistently.

Three are the main contributions of our study to the field literature. Firstly, we are able to investigate the role of time preferences in shaping both the quantity and the quality of educational investments and to analyse whether choices made by students who discount future more heavily are suggestive of irrational behaviour. Secondly, our empirical analysis does not suffer from reverse causality problems (which are quite common in the literature analysing the relationship between psychological attitudes and individual outcomes) and is robust when controlling both for quite good measures of predetermined cognitive abilities and for risk aversion. Controlling for these variables is particularly important because previous research suggests that ability and time preferences are correlated (Shamosh and Gray, 2007; Dohmen et al 2010; De Paola, 2012) and that discount rates might reflect differences in risk preferences (Andersen et al., 2008; Andreoni and Sprenger, 2010). Last, but not least, we use a direct measure of time preferences, based on a survey question asking students about their willingness to give up part of a prize available in one year in order to have the win immediately, whilst other studies rely on indirect measures of time preferences, such as individual behaviours, like saving or smoking, and the assessment of the interviewer on whether or not the respondent was impatient or restless.

The remainder of the chapter is organized as follows. Section 1.2 describes the data used in our analysis. In Section 1.3 we present our main findings. In Section 1.4 we investigate the relationship between impatience and both the probability of timely graduation and the probability of obtaining an honours degree. Section 1.5 presents some robustness checks. In Section 1.6 we investigate the relationship between impatience and the probability of drop out and offer some evidence suggestive of irrational behaviours. Section 1.7 concludes.

1.2 DATA AND DESCRIPTIVE STATISTICS

Our empirical analysis relies upon individual-level data using a sample of undergraduate students enrolled in the academic year 2008-2009 at the University of Calabria, a middle-sized public university located in the South of Italy.[3] The students in our sample are enrolled in First Level Degree (FLD) courses offered within different fields (Economics, Pharmacy, Engineering, Humanities, Mathematics and the Natural Sciences, and Political Sciences).[4]

At the moment of their enrolment, the about 6000 students who decided to enrol at the University of Calabria were asked to participate at an on-line survey asking a number of questions on individual characteristics, family background, previous studies, motivation, expectations etc. Participation in the survey was on a voluntary basis (only questionnaires that were totally completed were accepted) and about 80% of the freshmen answered the questionnaire. More precisely, 4,281 students have answered to the survey. However, 926 of these students have dropped out from university during their first year of academic studies, so we end up with a sample of 3,355 individuals.

Among the survey's questions, there was one aimed at obtaining information on students' time preferences. The question presented students with the following hypothetical situation: 'Imagine that you have won 1000 Euros in a lottery. The full amount of money you have won will be available to you in one year, but you can have your winnings immediately if you give up a part. What would be the largest amount of money you would be prepared to give up in order to have your money immediately?' Respondents could select an amount of 0, 20, 40, 60, 80, 100, 120, 140, 160 or 180 Euros.

Table 1 shows the distribution of individuals by reported levels of discount rate. About 29% of students refused to give up any amount of money. About 19% of students decided to give up €20, while 7.42%, 5.37% and 4.71% of them chose respectively to give up €40, €60 and €80. A quite large fraction of students, 24.32% decided to give up €100.

[3] The University of Calabria currently has about 33,000 students, who are enrolled in different Degree Courses and are at different levels of the Italian University system.

[4] Since reform in 2001, the Italian university system has been organized around three main levels: First Level Degrees (3 years legal duration), Second Level Degrees (further 2 years), and PhD Degrees. When starting their university career, students choose a field and within that field they enrol in a certain FLD course. In order to gain a FLD course, students have to obtain a total of 180 credits (each successfully accomplished exam gives a number of credits ranging from 1-10; dissertation carries also some credits).

Instead, only 1.97%, 1.46% and 0.77% of students decided to give up €120, €140 and €160 respectively. Finally, 5.96% of students have favoured the last option of giving up €180.

[Table 1 Here]

We use the answers to this question in order to build the indicator of time preferences *Discount Rate* with values from 0 (for students who would not give up any amount of money) to 0.18 (for students who would give up €180). Students in the sample have an average discount rate of about 0.054.

Moreover, to check the robustness of our results, we also express students' impatience with different functional forms. We create three dummy variables. The first is *Impatient*, with a value of 1 for students who selected a positive amount of money they are willing to give up and 0 for those who would not give up anything. On average 71% of our sample students can be considered impatient according to this definition. Then, looking at the prevailing interest rate for loans to households at the time the survey was asked (which was 6.6[5]), we build the dummy variable *Impatient Relatively to Interest Rate i*, which takes the value of one for all students with a discount rate greater than the interest rate and zero otherwise. About 45% of students in the sample have a discount rate higher than the prevailing interest rate. Finally, we create the variable *Impatient >0.02*, coding students that are willing to give up €20 as patient rather than as impatient. Students considered impatient based on this definition represent about 52% of the sample.

Unfortunately, in our survey we do not have information on individual behaviours, such as smoking or saving, that can be proxy for individual time preferences. However, the measure of time preferences we have obtained using the survey question seems quite reliable, since it behaves in the same way as those emerging from a number of recent papers on the subject (Dohmen et al. 2010; Castillo et al., 2011). A gender analysis shows that females are less impatient than males (the correlation between *Discount Rate* and the dummy *Female* is equal to -0.0434, statistically significant at the 1 percent level); while,

[5] For details see www.istat.it.

looking at cognitive abilities, it emerges that more skilled individuals tend to be less impatient compared to students with a lower level of cognitive abilities (the correlation between *Discount Rate* and *High School final grade* is equal to -0.0279, statistically significant at the 10 percent level).

Still, our measure of time preferences presents some advantages with respect to those used in the literature. First of all, we are able to obtain a direct measure of student's impatience while other authors (Della Vigna and Paserman, 2005; Drago, 2006; Cadena and Keys, 2012) use proxies relying on the assessment of the interviewer of whether or not the respondent was impatient or restless, which may also be related to impulsivity. Secondly, as time preferences in our study are measured at the moment in which students enrol at university, while educational outcomes are taken later in the student life, our analysis does not suffer of reverse causality. In fact, the ability to delay gratifications may be not entirely an inborn personality trait (see Perez-Arce, 2011) and educational investments may play a role in shaping individual time preferences.

Thanks to the administrative data provided by the University of Calabria we have detailed information on all the students enrolled at this university in the academic year 2008-2009. In Table 2 the descriptive statistics of the variables we use in our analysis are reported. We observe a number of individual characteristics such as gender, age, province of residence, type of high school attended, parents' education and type of occupation. About 62% of sample students are females. They are on average 20 years old and about 8% of them were employed at the moment of their enrolment at University. About 7% of students enrolled at University not in the same year in which they graduated from High School (*Late Enrolment*). Most of the students are enrolled in Economics and Humanities (about 26 and 23% respectively); about 17% are studying Engineering, 12.4% Pharmacy and only 12.1% are enrolled in Mathematics.

The richness of data, allows us to gather some information on students' family background. The average number of years of education for fathers ranges from 0 to 18, with a mean of 11.30. About 45% of students have a father employed in the public sector and about 6% of students have a father who is an entrepreneur. Unfortunately, we do not have information on student's family income. However, to have some indication of student's economic conditions, we compute the dummy variable *Parents Employed*, which

takes the value of 1 for students whose parents are both employed and the value of 0 otherwise, and the dummy variable *University Choice Financial Reasons*, which considers a question proposed in the online survey, asking whether one of the reasons why students had chosen to enrol at the University of Calabria was the lower costs involved in this choice.[6] About 49% of students in our sample have both parents employed and about 47% have chosen the University of Calabria to avoid higher costs.

As regards information on students' cognitive abilities, we refer to two different indicators. First, we observe the type of high school attended: about 54% of students have attended a Lyceum, while about 46% come from Technical and Vocational Schools.[7] In addition, we observe the final grade obtained at high school, *High School Grade*, which ranges from 60 to 100, with a mean of about 86.47. Since time preferences are correlated to abilities, it is important to control for measures of predetermined cognitive skills (Shamosh and Gray, 2007; Dohmen et al., 2010). In the session checking the robustness of our results, we introduce another indicator of students' cognitive ability, *Score Entry Test*, represented by the percentage of correct answers (out of the total number of questions) at a cognitive test taken by students at the same time as the survey. Since the entry test was not mandatory for all students enrolled at university, we observe this variable only for 2,819 students. The percentage of correct answers at the entry test is on average 47%. Besides, we consider also 399 dummies for the high school attended by the student.

[Table 2 Here]

As shown in Castillo et al. (2011), when analysing the effect of time preferences, it might be important to control for individual risk preferences since discount rates might

[6] Most of the students enrolled at the University of Calabria (98.49%) live in the area where the university is located. Choosing another university would imply higher costs since students would have to move beyond their area of residence.

[7] In Italy, after compulsory education (8 years of schooling), students can choose between a "generalist track" (Lyceum), or a more labour market oriented track (Vocational or Professional Track). There are no entry regulations and students can choose between the two tracks without restrictions. Students typically select between the two tracks according to family background (see Brunello and Checchi, 2006). Students from more educated families typically choose a Lyceum, while those with poorer socio-economic backgrounds enrol at vocational schools. Moreover, Lyceums are more academically oriented, while technical and professional schools educate for white collar and blue collar occupations.

reflect differences in risk preferences. At this aim we use information on the risk attitudes of students that has been gathered from a question of the on-line survey asking them to choose the amount of money they would like to invest in a hypothetical lottery. More in detail, students were required to answer a question on the following hypothetical situation: 'Imagine that you have won 100,000 Euros in a lottery. Almost immediately after you collect the winnings, a reputable bank offers you an investment opportunity with the following conditions: You can invest money. There is the chance to double the invested money. However, it is equally possible that you could lose half of the amount invested. You have the opportunity to invest the full amount, part of the amount, or reject the offer. What share of your winnings would you be prepared to invest in this financially risky, yet potentially lucrative investment?' Respondents could select an investment amount of 0, 20,000, 40,000, 80,000, or 100,000 Euros. Using answers to this question, we built the variable *Risk Aversion* with values from 1 (for students who would invest the whole amount of the win) to 5 (for students who would refuse to invest any money). The average value of this measure in our sample is 3.88[8].

Student's performance can be measured considering different indicators, such as grades obtained at exams or the number of credits earned in a certain period of time. By the end of the three years following their enrolment (the regular duration of their degree course) students have acquired on average about 93.61 credits (out of 180 that they were expected to earn) while the average grade at passed exams is 24.35 (exams are evaluated on a scale ranging from 18 - the minimum passing line - to 30).

We also consider as measures of student's performance whether the student in the period of time we consider has accomplished the degree program[9] and the degree class s/he obtained. As shown in Table 2, only about 13% of students have acquired the degree in the three years following their enrolment and only 9.27% has obtained the highest degree class.

Our survey data provide a number of additional information on students' beliefs and expectations at the moment of their enrolment at university. About 77% of sample students stated that their educational choice was *Well Informed*. More than 73% of students, at the

[8] The correlation between *Discount Rate* and the variable *Risk Aversion* is equal to -0.0752, statistically significant at the 1 percent level.
[9] We measure the probability that the student has accomplished the degree program by considering whether the student has reached the number of credit necessary to gain a FLD (180).

moment of enrolment, evaluate their probability of accomplishing their degree program within the regular time to be higher than 50% (*Expected Timely Graduation*). 55% of students had no doubts at all about the opportunity to enrol at university (*No Doubts*).[10]

1.3 TIME PREFERENCES AND ACADEMIC SUCCESS

In order to obtain the degree, students have to accumulate an established number of credits by taking the corresponding exams. Exams are graded by instructors and students can earn credits with lower or higher grades.

Even if students are supposed to accomplish their degree program within its normal duration, extending university studies beyond the typical duration is becoming a common phenomenon in many countries. According to the US Department of Education, fewer than 40% of students, who enter college each year, graduate within four years, while almost 60% of students graduate in six years. As far as Europe is concerned, Brunello and Winter-Ebmer (2003) report that the percentage of students expecting to complete their degree at least one year later than the required time is quite high in many countries (31.2% in Sweden, 30.8% in Italy, 17.1% in France and 10% in Germany) with the exception of Anglo-Saxon countries where this percentage is close to zero.

In Italy, such tendency of late graduation might be, at least partially, due to the fact that in the Italian university system students are not forced to pass all the scheduled exams during an academic year in order to proceed to the subsequent year of study (they can retake an exam as many times as they want in case they are not satisfied with their performance).

[10] We build these variables using respectively the following questions proposed in the survey: 1) "Do you think the information you had available about the Degree Program you have chosen was: a) Adequate, b) Very Adequate, c) Fairly Adequate, d) Inadequate, e) Very Inadequate?". The dummy variable *Well Informed* takes the value of 1 for students answering "Very Adequate" or "Fairly Adequate" and 0 otherwise. 2) "What probability would you give to your obtaining your degree within the regular time?". Students could choose: 0.1; 0.2; 0.3; 0.4; 0.5; 0.6; 0.7; 0.8; 0.9; 1. The variable *Expected Timely Graduation* takes the value of 1 for students stating a probability higher than 0.5. 3) "Have you had any doubt about the decision to acquire a University degree?". Four answers were possible: a) No doubts, b) Few doubts, c) Some doubts, d) Many doubts. The dummy variable *No Doubts* takes the value of 1 for students answering "No doubts" and 0 otherwise.

Then, when planning their studies, students take important decisions that affect both the time they will take to accomplish the educational program (through the number of credits earned in a certain period of time) and the grades they will obtain at exams (and then the overall grade obtained on graduation). At one extreme, in a given academic year, students may decide to pass as many examinations as possible, albeit with low grades, or, at the other extreme, they might seek to obtain high grades by only concentrating their effort on few courses thus delaying the time of their degree. As we show in a simple theoretical model presented in the Appendix, students' impatience is negatively correlated with both the level of effort exerted in studying activities and the educational standards in terms of grades obtained at exams. When the degree of impatience varies, the change in these two factors affects academic performance. Impatient individuals exert less effort because they assign lower value to the future benefits of human capital and are more likely to set less ambitious objectives in terms of grades since they are also less concerned about the quality of their human capital.

In order to study the relationship between time preferences and academic success, we consider both the average grade at passed exams and the number of credits earned by each student in the three years following enrolment (that is the legal duration of their degree program). The first measure of academic performance is more focused on the quality of the human capital accumulated and we expect a negative correlation between this measure of success and impatience: impatient students spend lower effort in studying activities and set lower standards compared to patient individuals and, as a consequence, obtain lower grades. The second indicator of academic performance allows us to measure the impact of impatience on the time to obtain the degree. Such a relationship is less clear cut. On the one hand, impatient students are less likely to spend effort in studying activities with negative consequences on their probability of reaching the minimum passing grade. This would imply that they are less likely than patient students to earn a high number of credits in the three years following enrollment. Yet, impatient students set a lower grade standard, implying that, in a certain period of time, they are more likely than patient students to earn a high number of credits. Recall that in Italy students can refuse the grade obtained at an exam and retake the exam as many times as they wish. Students who are

satisfied with low grades are less likely to retake an exam, thus earning a higher number of credits in a given period of time.

Table 3 reports the estimation results of an OLS model in which we consider as dependent variable alternatively our two measures of academic performance (the average grade at exams and the number of credits earned in the three years following enrolment). In the first specification (columns 1 and 3) we only control for student's predetermined characteristics (gender, *Age*, *Employed* and *Late Enrolment*) and family background (father education and father type of employment). In the second specification (columns 2 and 4) we add among controls two indicators of student's cognitive ability (*Lyceum* and *High School Final Grade*) and our measure of student's risk aversion. In both specifications we also control for field of study dummies and for province of residence dummies (not reported).

In columns (1) and (2) we study the relationship between impatience and the average grade obtained at the exams taken during the three years following enrolment.[11] We find that more impatient students obtain lower grades (the relationship is statistically significant at the 1 percent level): an increase in the level of impatience from 0 (patient student) to 0.18 (highest level of impatience) reduces by almost 0.45 points (-2.519*0.18) the average grade obtained at exams; while an increase of one standard deviation reduces the average grade obtained at exams by almost 0.13 points (-2.519*0.0534). Column (2) shows that patience is an important trait for achieving high grades also when we control for individual ability: the negative relationship between the discount rate and the average grade obtained at the exams remains statistically significant at the 1% level although the magnitude of the effect becomes smaller.

As expected, when we analyse the relationship between impatience and time to degree completion by considering the number of credits earned within the normal degree completion time, results are less clear cut. Without controlling for individual cognitive ability (column 3), it emerges a negative relationship, with a coefficient statistically significant at the 5 percent level. That is, more impatient students earn a lower number of

[11] The variable *Average Grade* is a censored indicator of students' academic performance because it is possible to observe only the grade the students scored at passed exams (from 18 to 31 where 31 is 30 cum laude). For this reason we also study the relationship between impatience and the average grade obtained at exams using a Tobit model. Results do not change qualitatively.

credits: when impatience increases of one standard deviation the number of credits acquired by the student decreases on average by 1.87. However, once we control for individual ability (column 4), the negative correlation between the discount rate and the number of credits acquired becomes smaller and the coefficient is no longer statistically significant.

[Table 3 Here]

As far as control variables are concerned, cognitive ability is an important determinant of academic performance. Both when we consider as dependent variable *Average Grade* and *Number of Credits* it emerges a positive and statistically significant correlation. Students with a higher High School final grade and whose high school was a lyceum have on average a higher grade at the exams they take during the three years after enrolment and are more likely to graduate on time because they accumulate a higher number of credits during the legal duration of the degree program. Females have better performance than males; age and family background have only a marginal effect on student's achievements, whilst risk aversion does not produce statistically significant effects.[12] Enrolling at university late exerts a statistically significant negative impact on academic success, especially on the number of credits earned in the considered period, whilst working when studying has no statistically significant effect on performance.

All in all, our estimation results are consistent with the idea that impatience negatively affects grades obtained by students at examinations but has an unclear impact on the number of credits acquired. The two contrasting effects that impatience may produce on the number of credits in our estimates lead to a weakly statistically significant relationship.[13]

Our results are in line with those emerging from the few papers focusing on the effect of time preferences on human capital accumulation. Kirby er al. (2002) find reliable

[12] The coefficient of *Risk Aversion* is not statistically significant also in specifications that do not include the measure of time preferences among controls. Risk aversion is, instead, relevant to explain the field of study choice of our sample students (see De Paola and Gioia, 2012).

[13] We obtain very similar results also when considering the academic performance in the four years after enrolment both in terms of average grade at exams and number of credits earned (see Table A1).

negative correlations between discount rates and several education measures, including years of education, numeracy, literacy and the years of education of the participants' father; Kirby et al. (2005) find a negative relationship between the rate at which a person discounts future monetary rewards and college academic performance as measured by GPA. Other studies show that pre-schoolers' ability to delay gratification is positively associated with preschool achievement test scores (Flynn, 1985), and with scholastic performance (Michel et al, 1989) and academic competence (Shoda, Mischel and Peake, 1990).

We have also investigated whether the relationship between time preferences and educational outcomes differs between men and women, between students with high and low ability and between students with rich and poor parental background (see Table A2). When looking at students' gender we find that the relationship between impatience and performance does not significantly differ between men and women. Similarly, the effect of impatience does not seem to be heterogeneous neither according to student's ability (measured considering the average *High School Final Grade*) nor according to student's family background (we have considered as an indicator of family background whether student's father has at least completed college).

1.4 TIMELY GRADUATION AND FIRST CLASS HONOURS DEGREE

Measuring academic performance by considering the number of credits earned in the three years following enrolment (i.e. during the normal degree completion time) has allowed us to check whether time preferences affects the time students need to complete their studies.

As argued by Garibaldi et al. (2012), throughout the world obtaining a degree within the normal completion time is becoming the exception rather than the rule. Late graduation depends on different reasons. In some countries it is related to the high cost of education forcing not well-off students to do paid work to support their studies (i.e. US), in Nord-European countries it is related to the fact that students can leave educational programs relatively easily and re-enter at a later date (OECD, 2010). Finally, in other countries, such as Italy, the institutional system allows for an uncapped completion period.

In this section we look deeper at this aspect by analysing the relationship between student's time preferences and his/her probability of timely acquiring the degree. Besides, for the sub-sample of graduated students, we analyse the relationship between impatience and the probability of obtaining a first class honours degree.

In Italy the normal completion time for a FLD is three years, but students on average take 4.6 years (Almalaurea, 2011). Even a worst picture emerges for our sample students: only 13% of them has accomplished the degree program within the normal time; the fraction of students who have obtained their FLD degree within four years slightly increases at 17%.

On the basis of the same arguments discussed in relation to the number of credits earned by students, the relationship between time preferences and the probability of accomplishing the degree program within the normal completion time may be either negative or positive.

Table 4 presents estimation results of the specification including among regressors the full set of controls and considering as measure of impatience *Discount Rate*. Column (1) reports the average marginal effects of probit estimates for the probability of timely acquiring the degree. Similarly to results obtained for the number of credits, we find a negative but not statistically significant correlation between the probability of timely acquiring the degree and our measure of time preferences.

In columns (2) we only consider the sample of graduated students who obtained the degree within three years and present probit estimates for the probability of obtaining a first class honours degree. We find a negative and statistically significant (at the 5 percent level) correlation between impatience and the probability of graduating with the highest grade. [14]

[Table 4 Here]

In columns (3) and (4) we replicate the same estimates by extending the analysis to four years. Results do not change: impatience does not significantly affect the probability of graduating within four years, while it exerts a negative and statistically significant effect on

[14] Results do not change when we estimate a bivariate probit model. See Table A3.

the probability of obtaining a first class honours degree for the students graduated within four years after enrolment.

1.5 ROBUSTNESS CHECKS

In this section we check the robustness of our results both using more complete specifications which include further control variables and expressing individual time preferences with alternative functional forms.

The most pressing cause of concern is that time preferences, as well as other non-cognitive skills, are correlated with cognitive abilities (Shamosh and Gray, 2007; Borghans et al. 2008; Dohmen et al 2010). We have already included among regressors the typology of high school attended by the student and his/her high school grade. However, we try to better catch the impact of human capital considering a direct measure of cognitive abilities, represented by *Score Entry Test* (due to missing values, the number of observations reduces to 2,819).

As shown in columns (1) and (2) of Table 5, also after including such additional measure of cognitive ability, *Discount Rate* exerts a negative and statistically significant (at the 1 percent level) impact on student's average grade, and a negative but not statistically significant impact on the number of credits acquired by the student. As expected, the coefficient of the new measure of cognitive ability is positive and statistically significant.

Moreover, since we have information on the high school attended by each student, in the specifications reported in columns (3) and (4), we include also school fixed effects. Our main results remain qualitatively unchanged.

Another issue that may hamper the reliability of our results is that our measure of time preferences might actually be a proxy for credit constraints. In our analysis, we already control for family background variables, such as father's education and type of employment, which are correlated to family income and, therefore, catch part of the effects of the economic conditions of the family. Unfortunately, we do not have direct information on the level of income of student's family, then, as further indicators of students' economic

conditions, we use our variables *University Choice Financial Reasons* and *Parents Employed*.[15]

As shown in columns (5) and (6) of Table 5, respectively for *Average Grade* and *Number of Credits*, controlling for these proxies of student's economic conditions does not change our main results.

[Table 5 Here]

Results consistent with the previous analysis are found also when using as outcome variables the probability of graduating within the three years after enrolment and the probability of taking a first class honours degree (see Table A4). Students' impatience exerts a negative but not statistically significant impact on the probability of graduating in the normal completion time of three years. The effect on the probability of graduating with honours is negative and statistically significant although the significance becomes weaker (11.8, 12.2 and 13 percent level in the first, second and third specification, respectively). In the second and third specification the sample reduces considerably due to perfect collinearity caused by school fixed effects.

In Table 6, we check the robustness of our results to different functional forms of our measure of impatience. First, we use the dummy variable, *Impatient* (referring to students willing to give up any positive amount of money). Columns (1) and (2) show that our results remain stable when we use this new variable: an impatient student has an average grade at exams that is 0.2458 points lower with respect to a patient student, while no statistically significant effect emerges when considering the number of credits.

In the second specification (columns 3 and 4), we study the relationship between time preferences and academic performance using *Impatient Relatively to Interest Rate i*. We find that students that can be defined impatient because have a discount rate higher than

[15] The correlation between *University Choice Financial Reasons* and *Parents Employed* is -0.0991, statistically significant at the 1 percent level. The absence of statistically significance of the coefficients of such indicators might be due to their correlation to other family background variables (i.e. the correlation between *Parents Employed* and *Father Education* is 0.31, statistically significant at the 1 percent level).

the prevailing interest rate have an average grade 0.1796 points lower than patient students (statistically significant at the 5 percent level). The effect of impatience on the number of credits is negative but not statistically significant.

Finally, we check whether our results are robust to coding students that are willing to give up €20 as patient rather than as impatient by using the dummy variable *Impatient >0.02* (columns 5 and 6). Again, our main results remain qualitatively unchanged.

[Table 6 Here]

We estimate the same specifications also using as outcome variables the probability of timely acquiring the degree and the probability of graduating with honours (see Table A5). When expressed in such functional forms, students' impatience exerts a negative and weakly statistical significance on the probability to obtain a first class honours degree and no statistically significant effect on the probability of timely acquiring the degree.

1.6 DROP OUT AND TIME INCONSISTENCY

Our previous results showing that impatient students invest less in human capital and in its quality can be related both to exponential and hyperbolic discounting.

In this section, we try to understand whether the decisions of our sample students are time consistent. Are impatient students in our sample properly optimizing or are they making mistakes due to time-inconsistent forms of impatience? In order to investigate this issue, we study the relationship between drop out behaviour and impatience. Exponential discounters who decide to enrol in an educational program, in absence of additional information accruing over time, are expected to accomplish the program, while hyperbolic discounters may display time inconsistent drop out behaviour.

Although we do not have direct information on whether students have decided to drop out of their university studies, we consider as students who have dropped out (or who are at

strong risk of dropping out), *Drop-out,* those students who, during the four years following enrolment, have acquired less than 40% of the number of credits required to accomplish their degree program (about 36% of our initial sample of 3,355 students plus 926 students who scored zero credits).

We estimate by maximum likelihood a Probit model for *Drop-out.* In Table 7, the reported coefficients represent the average marginal effect of each regressor on the drop out probability. In column (1) we include all the control variables with the exclusion of *Score Entry Test*. We find a positive but weakly statistically significant relationship between *DiscountRate* and the probability of dropping out (*p*-value=0.16). However, in column (2), where we add among controls *Score Entry Test*, the relationship becomes statistically significant at the 5 percent level: an increase of one standard deviation in *DiscountRate* leads to an increase of about 1.5 percentage points of the drop out probability.[16]

This result suggests that students are undertaking time inconsistent choices and that the measure of impatience we are considering is a proxy of short-run impatience. In fact, by enrolling at university, these students are expressing a desire to attain the degree, considering this as a worthwhile investment; but, during their studies, they have changed their mind. In case of exponential discounting, we should find no relationship between impatience and the decision to drop out: once taken their optimal decision, exponential students should simply follow through their plans.

Nevertheless, a part from short-run impatience, there are also other factors that may explain our evidence of seemingly time inconsistent behaviour. In particular, individuals may have acquired additional information over time that has induced them to drop out. Then, to consider this potential source of confounding, we use the answers students gave to a question concerning their assessment as regards the quality and quantity of information supporting their educational choice (*Well Informed*). Farther, we look at their expectation about the probability of obtaining the degree within the regular time (*Expected Timely Graduation*) and at whether they had doubts about the decision to enrol at university (*No Doubts*).

In columns from (3) to (5) of Table 7, we study the relationship between impatience and dropout probability by gradually restricting the sample of students. We start from the

[16] Results do not change qualitatively even when we include school fixed effects.

least stringent restriction (about 76% of the whole sample of 4,281 students stated that their educational choice was *Well Informed*), to gradually reach the most binding one (about 71% of students *Expect Timely Graduation* with a probability higher than 0.5 and 52% of students had *No Doubts* at all about the opportunity to enrol at university).

This approach is similar to that followed by Cadena and Keys (2012), who restrict their sample either to individuals who desire to complete a college degree, who expect to complete it or who have actually enrolled at college. The main difference is that we start from students who have enrolled at university and gradually restrict our sample on the basis of detailed information that we have on their beliefs and expectations at the time of enrolment.

As shown in column (3) of Table 7, the relationship between impatience and drop out behaviour remains positive and statistically significant also when we restrict the sample in order to include only students who were *Well Informed* at the moment of their enrolment. Similar results are obtained also when we further restrict the sample focusing only on those students who were *Well Informed* and, at the moment of enrolment, estimated their probability of acquiring the degree within the regular time to be higher than 50% (column 4).

In column (5) we further restrict the sample used in specification (4) in order to include only students who had *No Doubts* at all at the moment of their enrolment. Again, we find a positive relationship between *DiscountRate* and *Drop-out*, statistically significant at the 10 percent level.[17]

[Table 7 Here]

These results are suggestive of irrational behaviour: students in these sub-samples are individuals who were pretty sure of their educational choice at the moment of enrolment and

[17] We do not find any statistically significant relationship between impatience and drop out probability neither for students who were not *Well Informed*, nor for those who had some or many doubts about the opportunity to enrol at University. On the contrary, the positive relationship between *Drop-Out* and *Discount Rate* emerges also for students who estimated their probability of accomplishing their degree program to be lower or equal to 50%.

it is unlikely that, among them, impatient individuals had planned to drop out from university. Besides, such hyperbolic discounters seem not to be aware of their own time inconsistency.

Evidence pointing to irrational behaviour emerges also when we consider as outcome variables the number of credits acquired and the probability of timely graduation (see Table 7 columns 6 and 7). Looking at the sub-sample of well-informed students with an expected probability of accomplishing the degree in the normal completion time higher than 50% and who had no doubts about the opportunity to enrol at university we find a negative relationship between *Discount Rate* and both the number of credits acquired and the probability of timely graduation, statistically significant at 10 or 5 percent level depending on the specification considered. These results hold true also when we define the dummy variable *Expected Timely Graduation* as equal to 1 for those students who evaluate their probability of accomplishing their degree program within the regular time to be higher than 80%. If impatient individuals had planned to be slow in their educational career, we would not expect them to state, at the moment of enrolment, that they are almost sure to graduate within the regular time. Then, we believe that the worse performance in terms of number of credits acquired among the impatient students is due to differences in short-run impatience, rather than in long-run impatience.

1.7 CONCLUDING REMARKS

When deciding their investment in education, students face a trade-off between costs and benefits occurring in different periods of time: the cost of effort in studying activity and the opportunity cost of earning no wage when studying are immediate while the benefits deriving from the human capital accumulated and from its quality may be years away. Students' degree of impatience strongly influences their response to this inter-temporal trade-off and negatively affects their academic performance: more impatient students choose to exert lower effort, because it involves immediate costs and only delayed benefits, and to acquire a low-quality human capital because the benefits of high grades and deep knowledge will be obtained only when entering the labour market.

In this paper we have investigated the relationship between impatience and academic performance using a rich dataset on a sample of 3,355 Italian undergraduate students observed over a period of three years after their enrolment. This dataset allows us to collect information on a number of students' predetermined characteristics, such as family background, cognitive abilities and personality traits, and to measure students' time preferences. We also have detailed information on students' academic performance such as their average grade at exams, the number of credits acquired each year, the probability of timely obtaining the degree and the degree class.

We suggest that impatience affects academic performance through two different channels: impatient students spend less effort in studying activities and set less ambitious objectives in terms of grades at exams. As a consequence, the relationship between academic success and impatience may vary according to how we measure student's performance.

In our empirical analysis, we find that, when we consider as measures of academic success the average grade obtained at exams or the probability of graduating with honours, it emerges a strong statistically significant negative relationship between impatience and academic performance. More impatient individuals assign a lower value to the future benefits of their investment and to its quality and choose to exert less effort in studying activities ending up with a lower average grade at exams and a lower probability of graduating with honours. Instead, when we measure performance with the number of credits earned during the three years after enrolment or with the probability of timely graduation, the relationship is negative but weakly statistically significant. In this case impatience operates with two contrasting effects. On the one hand, the choice to exert less effort leads more impatient students to acquire a small number of credits and delay the time of graduation. On the other hand, the lower concern about the quality of their human capital, makes them set less ambitious objectives in terms of grades thus becoming more likely to acquire a larger number of credits in the considered period of time and to timely obtain the degree.

In order to understand whether the worse performance of impatient students reflects a rational choice or is due to short-run impatience, we analyse students' drop out decision, focusing on those students who were well informed about their degree program at the

moment of their enrolment, were pretty sure of being able to accomplish their degree program within the regular time and had no doubts about their educational choice. We find that impatient individuals are more likely to drop out even when at the moment of their enrolment they expected to accomplish their degree program within the regular time. Moreover, we find that, for this subsample of students who considered university a strongly attractive investment at the moment of their enrolment, the negative relationship between discount rate and the number of credits acquired in the three (or four) years following enrolment becomes statistically significant also when considering all our control variables. This evidence supports the idea that our measure of time preferences catches short-run impatience and that students in our sample are undertaking time inconsistent behaviours.

Our results are in line with those emerging from the few papers focusing on the effect of time preferences on human capital accumulation and with those highlighted by the literature examining the role of non-cognitive skills in shaping individual outcomes. According to these findings, individuals might be induced to undertake welfare enhancing decisions through policies aimed at improving non cognitive skills (Heckman et al. 2010). More in particular, our findings point to the relevance of programs aimed at teaching individuals the art of patience and intelligent waiting. An improvement in individuals' human capital investment decisions might also be reached using schemes, such as monetary incentives, that increase the immediate benefits of these investments, or by paternalistic policies such as those increasing the minimum number of years in education.

APPENDIX

Theoretical Framework

In our paper we suggest that impatience affects academic performance through two different channels: impatient students spend less effort in studying activities and set less ambitious objectives in terms of grades at exams. In this section we set up a simple model in which we analyse student's choice regarding these two dimensions of his/her academic performance assuming that s/he has to decide the effort to exert in studying a given subject and the minimum grade s/he wants to score in that subject, with the possibility of freely determining the time s/he will take to accomplish the degree program. We have decided in favour of this theoretical framework because it reflects student's decisions in the Italian university system, but it is also sufficiently general to describe our idea in different contexts.

Unfortunately, we do not have information on students' decision to refuse or resit exams, therefore we cannot apply the model directly to the data.

More precisely we propose a two-period[18] model in which a student chooses both the effort (e) to exert in studying activity and the standard (s) to accept an exam: in period 0 the student bears a cost, $c(e)$, depending on the level of effort exerted; in period 1 with probability $p(e,s)$ s/he passes and accepts the exam obtaining a fixed level of utility ($\bar{u}$) plus an additional utility that depends on the standard chosen ($u(s)$) and represents the utility arising from higher chances on the labour market[19], whilst with probability $1-p(e,s)$ s/he fails the exam (or s/he passes but rejects it) thus getting nothing. Inter-temporal preferences are caught by the term δ which represents the discount factor of the student and returns the value in period 0 of the utility available in period 1.

[18] The two-period horizon can be interpreted either in terms of choices related to a single exam (assuming that the student makes the choices at every period) or in terms of degree award (in this case in period 0 the student decides the time to spend studying in order to get the degree in period 1, with a grade depending on the standard chosen for the exams).

[19] A number of works find a high rate of return to university grades (see Schweri, 2004; Bratti, Naylor and Smith, 2007; Chia and Miller, 2008).

Formally, the student maximizes the following utility function:

$$U = -c(e) + \delta * p(e,s) * \left(\bar{u} + u(s) \right)$$

When choosing the level of effort to exert in studying activities and the grade s/he wants to reach, the student faces two trade-offs: on one hand, the higher the effort the higher the probability of passing the exam, $p_e'(e,s) > 0$, but the higher also the cost to bear in period 0, as we assume $c'(e) > 0$ and $c''(e) > 0$; on the other hand, the higher the standard the lower the probability of accepting the mark obtained at the exam, $p_s'(e,s) < 0$, but the higher the utility deriving from adding this exam to the academic career ($u'(s) > 0$; $u''(s) < 0$).

The optimal choice of effort and standard satisfies the following first order conditions (FOCs):

$$F_e = \frac{\partial U}{\partial e} = -c'(e) + \delta * p_e'(e,s) * \left(\bar{u} + u(s) \right) = 0$$

$$F_s = \frac{\partial U}{\partial s} = \delta * p_s'(e,s) * \left(\bar{u} + u(s) \right) + \delta * p(e,s) * u'(s) = 0$$

Second-order conditions for a maximum (which are satisfied given our assumptions[20]) require that $F_{ee} < 0$ and $F_{ss} < 0$, and that the determinant of the Hessian (composed by the second derivatives) is positive. Since $F_{ee}F_{ss} - F_{es}F_{se} > 0$, the Jacobian *J* of this system with respect to the endogenous variables *e* and *s* does not vanish at the optimal values. Therefore, we can study the comparative static properties.

We are interested in showing how individual time preferences, represented by the discount factor δ, influence student's choice of effort and standard. Taking the total differentials of the FOCs and allowing the endogenous variables *e* and *s* to vary, together with the relevant exogenous variable δ, we obtain:

[20] We also assume $p_s''(e,s) < 0$; $p_e''(e,s) < 0$; $p_{se}''(e,s) = 0$; $\frac{u'(s)}{\bar{u} + u(s)} > \frac{p_s'(e,s)}{p}$

$$F_{ee}\partial e + F_{es}\partial s + F_{e\delta}\partial\delta = 0$$

$$F_{se}\partial e + F_{ss}\partial s + F_{s\delta}\partial\delta = 0$$

The above equation system can be written in matrix form as:

$$\begin{vmatrix} F_{ee} & F_{es} \\ F_{se} & F_{ss} \end{vmatrix} \begin{vmatrix} \partial e \\ \partial s \end{vmatrix} = \begin{vmatrix} -F_{e\delta}\partial\delta \\ -F_{s\delta}\partial\delta \end{vmatrix}$$

Then, using Cramer's rule we obtain $\partial e/\partial\delta$ and $\partial s/\partial\delta$:[21]

[1] $$\frac{\partial e}{\partial\delta} = \frac{-\overset{+}{F}_{e\delta}\overset{-}{F}_{ss} + \overset{+}{F}_{s\delta}\overset{+}{F}_{es}}{\overset{+}{|J|}} > 0$$

[2] $$\frac{\partial s}{\partial\delta} = \frac{-\overset{-}{F}_{ee}\overset{+}{F}_{s\delta} + \overset{+}{F}_{se}\overset{+}{F}_{e\delta}}{\overset{+}{|J|}} > 0$$

The model highlights a negative relationship between student's impatience and the level of *e* and *s* that s/he chooses: more impatient students both exert lower effort in studying and select a lower standard to be accepted as final grade. In fact, expression [1] shows that an increase in the discount factor δ (that is, a higher level of patience) produces an increase in the level of effort exerted by the student; likewise, expression [2] shows that as the discount factor increases the student chooses a higher standard.

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[21] $F_{ss} = \delta * p_s''(e,s) * \left(\bar{u} + u(s)\right) + 2\delta * p_s'(e,s) * u'(s) + \delta * p(e,s) * u''(s)$; $\quad F_{e\delta} = p_e'(e,s) * \left(\bar{u} + u(s)\right)$

$F_{se} = F_{es} = \delta * p_{se}''(e,s) * \left(\bar{u} + u(s)\right) + \delta * p_e'(e,s) * u'(s)$; $\quad F_{s\delta} = p_s'(e,s) * \left(\bar{u} + u(s)\right) + p(e,s) * u'(s)$

$F_{ee} = -c''(e) + \delta * p_e''(e,s) * \left(\bar{u} + u(s)\right)$

Table 1. Time preferences: amount given up to have money immediately

	Frequencies	*Percent*
0 (discount rate 0)	968	28.85
20 (discount rate 0.02)	643	19.17
40 (discount rate 0.04)	249	7.42
60 (discount rate 0.06)	180	5.37
80 (discount rate 0.08)	158	4.71
100 (discount rate 0.1)	816	24.32
120 (discount rate 0.12)	66	1.97
140 (discount rate 0.14)	49	1.46
160 (discount rate 0.16)	26	0.77
180 (discount rate 0.18)	200	5.96
	3,355	100.00

Table 2. Descriptive statistics for the sample of students

Variables	Mean	Std. Dev	Min.	Max.	Obs.
Discount Rate	0.054	0.053	0	0.18	3,355
Impatient	0.711	0.453	0	1	3,355
Impatient Relatively to Interest Rate i	0.446	0.497	0	1	3,355
Impatient>0.02	0.520	0.500	0	1	3,355
Average grade in exams taken	24.349	2.654	18	30	3,355
Number of credits earned	93.608	57.143	2	180	3,355
Timely Degree	0.133	0.340	0	1	3,355
First Class Honours Degree	0.093	0.290	0	1	3,355
Female	0.622	0.485	0	1	3,355
Age	20.019	3.444	17.717	62.327	3,355
Economics	0.261	0.439	0	1	3,355
Pharmacy	0.124	0.330	0	1	3,355
Engineering	0.171	0.376	0	1	3,355
Humanities	0.232	0.422	0	1	3,355
Mathematics	0.121	0.326	0	1	3,355
Father's Education	11.305	4.042	0	18	3,355
Father in Public Sector	0.455	0.498	0	1	3,355
Father Entrepreneur	0.063	0.243	0	1	3,355
High School Type: Lyceum	0.540	0.498	0	1	3,355
High school final grade	86.474	11.725	60	100	3,355
Risk Aversion	3.877	1.053	1	5	3,355
Employed	0.077	0.267	0	1	3,355
Late Enrolment	0.072	0.259	0	1	3,355
Score Entry Test	0.470	0.140	0.038	0.95	2,819
University Choice Financial Reasons	0.329	0.470	0	1	3,355
Parents Employed	0.396	0.489	0	1	3,355
Well Informed	0.766	0.423	0	1	3,355
Expected Timely Graduation	0.731	0.443	0	1	3,355
No Doubts	0.557	0.497	0	1	3,355

Table 3. Time Preferences and Academic Performance: OLS estimates

Variables	Average Grade (1)	Average Grade (2)	Number of Credits (3)	Number of Credits (4)
Discount Rate	-2.519***	-1.859***	-34.970**	-23.050
	(0.756)	(0.654)	(17.000)	(15.420)
Female	0.920***	0.306***	15.480***	3.695*
	(0.096)	(0.085)	(2.072)	(1.969)
Age	0.018	0.063***	-0.766**	0.066
	(0.016)	(0.016)	(0.350)	(0.355)
Father's Education	0.056***	0.008	0.938***	0.207
	(0.011)	(0.009)	(0.240)	(0.233)
Father in Public Sector	0.099	0.063	0.026	-0.561
	(0.084)	(0.073)	(1.935)	(1.769)
Father Entrepreneur	0.013	0.188	-4.070	-1.250
	(0.183)	(0.155)	(3.944)	(3.624)
Employed	-0.181	0.061	-6.317	-2.503
	(0.168)	(0.158)	(4.013)	(3.896)
Late Enrolment	-0.270*	-0.158	-16.730***	-15.020***
	(0.162)	(0.151)	(3.913)	(3.807)
Lyceum		1.046***		14.120***
		(0.076)		(1.811)
High School Final Grade		0.099***		1.960***
		(0.003)		(0.075)
Risk Aversion		-0.013		-0.055
		(0.033)		(0.793)
Constant	21.670***	13.990***	61.230***	-90.250***
	(0.552)	(0.579)	(10.990)	(12.240)
R-squared	0.223	0.414	0.141	0.289
Observations	3,355	3,355	3,355	3,355

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 4. Time Preferences and Graduation: Probit estimates

Variables	Graduation within 3 years (1)	Honours Degree within 3 years (2)	Graduation within 4 years (3)	Honours Degree within 4 years (4)
Discount Rate	-0.1692	-0.8031**	-0.1411	-0.7971**
	(0.1039)	(0.4063)	(0.1162)	(0.3842)
Female	0.0024	-0.0126	0.0170	-0.0124
	(0.0133)	(0.0481)	(0.0145)	(0.0442)
Age	0.0007	0.0241***	0.0004	0.0218***
	(0.0024)	(0.0083)	(0.0027)	(0.0080)
Father's Education	0.0027*	0.0054	0.0020	0.0032
	(0.0015)	(0.0059)	(0.0017)	(0.0052)
Father in Public Sector	-0.0127	0.0938**	-0.0131	0.0949**
	(0.0118)	(0.0414)	(0.0130)	(0.0371)
Father Entrepreneur	0.0260	0.0179	0.0229	0.0804
	(0.0237)	(0.0829)	(0.0262)	(0.0766)
Employed	0.0553**	-0.1086	0.0412	-0.1298
	(0.0233)	(0.0914)	(0.0261)	(0.0849)
Late Enrolment	-0.0784***	0.0117	-0.0847***	0.0176
	(0.0288)	(0.1270)	(0.0302)	(0.1070)
Lyceum	0.0524***	0.1485***	0.0643***	0.1555***
	(0.0120)	(0.0519)	(0.0133)	(0.0449)
High School Final Grade	0.0077***	0.0229***	0.0094***	0.0211***
	(0.0006)	(0.0029)	(0.0006)	(0.0025)
Risk Aversion	-0.0073	-0.0104	-0.0091	-0.0039
	(0.0053)	(0.0208)	(0.0059)	(0.0180)
Pseudo R-squared	0.128	0.208	0.128	0.194
Log pseudolikelihood	-1149.323	-245.014	-1347.879	-324.361
Observations	3355	448	3355	581

Notes: The Table reports average marginal effects of Probit estimates. In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 5. Time Preferences and Academic Performance: Further specifications

Variables	Average Grade (1)	Number of Credits (2)	Average Grade (3)	Number of Credits (4)	Average Grade (5)	Number of Credits (6)
DiscountRate	-2.1513***	-22.2133	-1.8522**	-17.0465	-1.8513**	-16.9857
	(0.6931)	(16.6501)	(0.7404)	(17.9063)	(0.7404)	(17.8952)
Female	0.3836***	6.6843***	0.3591***	6.2705***	0.3603***	6.2804***
	(0.0905)	(2.1584)	(0.0988)	(2.3700)	(0.0989)	(2.3716)
Age	0.0709***	0.3731	0.0866***	0.8045*	0.0850***	0.7681*
	(0.0205)	(0.4461)	(0.0177)	(0.4640)	(0.0177)	(0.4653)
Father's Education	0.0075	0.1170	0.0043	0.1815	0.0053	0.2220
	(0.0103)	(0.2529)	(0.0108)	(0.2704)	(0.0111)	(0.2780)
Father in Public Sector	0.0347	-1.8749	-0.0233	-2.1736	-0.0182	-2.0334
	(0.0763)	(1.8914)	(0.0799)	(1.9894)	(0.0799)	(1.9953)
Father Entrepreneur	0.0882	-1.0907	0.1169	0.1873	0.1122	0.1740
	(0.1615)	(3.9677)	(0.1726)	(4.1481)	(0.1727)	(4.1640)
Employed	0.0353	-0.7050	-0.0488	-1.8038	-0.0459	-1.7321
	(0.1847)	(4.5938)	(0.1854)	(4.7038)	(0.1854)	(4.7074)
Late Enrolment	-0.1183	-12.1155***	-0.1671	-12.9808***	-0.1587	-12.8194***
	(0.1706)	(4.4796)	(0.1771)	(4.6529)	(0.1775)	(4.6696)
Lyceum	0.7170***	9.7944***	0.5860***	7.8047*	0.5865***	7.8804*
	(0.0845)	(2.0604)	(0.1728)	(4.1063)	(0.1730)	(4.1065)
High School Final Grade	0.0857***	1.7573***	0.0871***	1.8479***	0.0871***	1.8470***
	(0.0039)	(0.0877)	(0.0041)	(0.0972)	(0.0041)	(0.0975)
Risk Aversion	0.0051	-0.4810	-0.0212	-0.4245	-0.0189	-0.3804
	(0.0352)	(0.8679)	(0.0369)	(0.9187)	(0.0369)	(0.9199)
Score Entry Test	4.0540***	47.9625***	3.9760***	45.1112***	4.0099***	45.7370***
	(0.3196)	(7.8274)	(0.3530)	(8.5769)	(0.3547)	(8.6362)
University Ch. Fin. R.					-0.0770	-1.2816
					(0.0838)	(2.0501)
Parents Employed					-0.0605	-1.7716
					(0.0842)	(2.0362)
School fixed effects	NO	NO	YES	YES	YES	YES
R-squared	0.450	0.308	0.515	0.375	0.515	0.375
Observations	2,819	2,819	2,819	2,819	2,819	2,819

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 6. Time Preferences and Academic Performance: different functional forms for student's impatience

Variables	Average Grade (1)	Number of Credits (2)	Average Grade (3)	Number of Credits (4)	Average Grade (5)	Number of Credits (6)
Impatient	-0.2458***	-0.9076				
	(0.0818)	(1.9964)				
Impatient Relatively to Interest Rate i			-0.1796**	-1.3469		
			(0.0756)	(1.8257)		
Impatient>0.02					-0.1880**	-2.5472
					(0.0751)	(1.8137)
Female	0.3901***	6.7339***	0.3835***	6.6797***	0.3851***	6.6548***
	(0.0906)	(2.1585)	(0.0907)	(2.1627)	(0.0908)	(2.1603)
Age	0.0716***	0.3513	0.0711***	0.3497	0.0713***	0.3530
	(0.0207)	(0.4479)	(0.0205)	(0.4477)	(0.0206)	(0.4476)
Father's Education	0.0088	0.1781	0.0085	0.1783	0.0087	0.1843
	(0.0106)	(0.2601)	(0.0106)	(0.2604)	(0.0106)	(0.2603)
Father in Public Sector	0.0375	-1.6904	0.0380	-1.6927	0.0378	-1.7028
	(0.0764)	(1.8966)	(0.0765)	(1.8970)	(0.0765)	(1.8958)
Father Entrepreneur	0.0901	-1.0677	0.0899	-1.0365	0.0839	-1.0668
	(0.1617)	(3.9802)	(0.1622)	(3.9813)	(0.1621)	(3.9835)
Employed	0.0261	-0.7027	0.0250	-0.7461	0.0303	-0.7366
	(0.1852)	(4.5990)	(0.1847)	(4.5922)	(0.1850)	(4.5963)
Late Enrolment	-0.1358	-12.1073***	-0.1130	-11.9875***	-0.1209	-12.0386***
	(0.1713)	(4.4883)	(0.1712)	(4.4873)	(0.1712)	(4.4972)
Lyceum	0.7174***	9.9072***	0.7183***	9.8862***	0.7195***	9.8631***
	(0.0846)	(2.0631)	(0.0848)	(2.0637)	(0.0847)	(2.0648)
High School Final Grade	0.0859***	1.7587***	0.0857***	1.7568***	0.0859***	1.7579***
	(0.0039)	(0.0879)	(0.0039)	(0.0880)	(0.0039)	(0.0879)
Risk Aversion	0.0089	-0.3675	0.0070	-0.4053	0.0069	-0.4570
	(0.0353)	(0.8705)	(0.0354)	(0.8713)	(0.0354)	(0.8706)
Score Entry test	4.0744***	48.4738***	4.0786***	48.5793***	4.0850***	48.8081***
	(0.3201)	(7.8755)	(0.3208)	(7.8813)	(0.3207)	(7.8852)
University Ch. F. R.	-0.0253	-1.0529	-0.0286	-1.0601	-0.0319	-1.0972
	(0.0800)	(1.9342)	(0.0799)	(1.9329)	(0.0799)	(1.9326)
Parents Employed	-0.0391	-2.2381	-0.0366	-2.2314	-0.0406	-2.2901
	(0.0801)	(1.9268)	(0.0802)	(1.9268)	(0.0803)	(1.9282)
R-squared	0.450	0.308	0.450	0.308	0.450	0.308
Observations	2,819	2,819	2,819	2,819	2,819	2,819

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 7. Time Preferences and Drop-out: Probit estimates

Variables	Drop-out					Number of Credits	Graduation within 3 years
	Whole Sample	Whole Sample	Well Informed	Well Informed & Exp. Timely Graduation	Well Informed & Exp. Timely Graduation & No Doubts	Well Informed & Exp. Timely Graduation & No Doubts	Well Informed & Exp. Timely Graduation & No Doubts
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DiscountRate	0.1701	0.2838**	0.3328**	0.3529*	0.3860*	-61.8999**	-0.4002*
	(0.1228)	(0.1359)	(0.1570)	(0.1804)	(0.2288)	(28.1840)	(0.2062)
Female	-0.0531***	-0.0712***	-0.0780***	-0.0689***	-0.0257	2.6707	0.0146
	(0.0152)	(0.0170)	(0.0196)	(0.0224)	(0.0280)	(3.6260)	(0.0263)
Age	0.0037	0.0033	0.0047	0.0116**	0.0303***	0.0493	0.0060
	(0.0026)	(0.0031)	(0.0039)	(0.0052)	(0.0115)	(1.2375)	(0.0091)
Father's Education	0.0016	0.0016	0.0002	-0.0003	0.0052	-0.6475	0.0025
	(0.0019)	(0.0021)	(0.0024)	(0.0028)	(0.0036)	(0.4489)	(0.0032)
Father in Public Sector	-0.0103	-0.0059	-0.0123	-0.0166	-0.0170	-0.2840	-0.0250
	(0.0140)	(0.0154)	(0.0176)	(0.0204)	(0.0249)	(3.0766)	(0.0226)
Father Entrepreneur	0.0262	0.0328	0.0164	0.0316	0.1132**	-10.2475	-0.0454
	(0.0277)	(0.0309)	(0.0364)	(0.0428)	(0.0532)	(6.6162)	(0.0559)
Employed	0.0998***	0.0816***	0.0586	0.0212	-0.0358	5.6986	0.1385**
	(0.0259)	(0.0308)	(0.0363)	(0.0456)	(0.0647)	(8.5300)	(0.0556)
Late Enrolment	0.0999***	0.0943***	0.0931**	0.0832*	0.0376	-9.1059	-0.1578*
	(0.0278)	(0.0323)	(0.0369)	(0.0461)	(0.0816)	(11.5244)	(0.0829)
Lyceum	-0.1185***	-0.0850***	-0.0825***	-0.0809***	-0.0901***	13.8899***	0.0744***
	(0.0141)	(0.0165)	(0.0191)	(0.0221)	(0.0283)	(3.6145)	(0.0278)
High School Final Grade	-0.0119***	-0.0108***	-0.0108***	-0.0108***	-0.0112***	1.8619***	0.0067***
	(0.0005)	(0.0007)	(0.0007)	(0.0009)	(0.0012)	(0.1600)	(0.0013)
Risk Aversion	-0.0064	0.0004	0.0038	0.0006	0.0088	-1.8239	-0.0096
	(0.0064)	(0.0071)	(0.0080)	(0.0092)	(0.0118)	(1.4406)	(0.0105)
University Ch. Fin. R.	-0.0228	-0.0222	-0.0284	-0.0349	0.0004	-4.8662	-0.0601**
	(0.0145)	(0.0162)	(0.0185)	(0.0218)	(0.0275)	(3.2634)	(0.0243)
Parents Employed	0.0089	0.0101	0.0200	0.0278	0.0597**	-5.2111*	-0.0155
	(0.0145)	(0.0160)	(0.0182)	(0.0209)	(0.0256)	(3.1570)	(0.0236)
Score Entry Test		-0.2707***	-0.2925***	-0.2635***	-0.2883***	63.3435***	0.4185***
		(0.0626)	(0.0719)	(0.0844)	(0.1048)	(13.4164)	(0.0947)
Pseudo R-squared	0.1929	0.1940	0.1927	0.1927	0.2162	0.3317	0.1718
Observations	4,281	3,477	2,633	1,959	1,196	1,029	1,029

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A1. Further specifications not commented in the text: Time Preferences and Academic Performance in the four years after enrolment. OLS estimates

Variables	Average Grade 4 years (1)	Average Grade 4 years (2)	Number of Credits 4 years (3)	Number of Credits 4 years (4)
DiscountRate	-2.6597***	-1.9835***	-31.0872*	-18.5653
	(0.7541)	(0.6497)	(18.0784)	(16.4202)
Female	0.9028***	0.2835***	17.4506***	5.1311**
	(0.0956)	(0.0847)	(2.1715)	(2.0703)
Age	0.0195	0.0649***	-0.8815**	-0.0110
	(0.0164)	(0.0163)	(0.3714)	(0.3785)
Father's Education	0.0553***	0.0068	0.9088***	0.1369
	(0.0104)	(0.0095)	(0.2531)	(0.2465)
Father in Public Sector	0.0934	0.0562	0.4829	-0.1378
	(0.0836)	(0.0726)	(2.0272)	(1.8535)
Father Entrepreneur	0.0167	0.1944	-6.1630	-3.1923
	(0.1826)	(0.1557)	(4.1367)	(3.8175)
Employed	-0.2116	0.0340	-7.9218*	-3.8999
	(0.1679)	(0.1583)	(4.1624)	(4.0329)
Late Enrolment	-0.3091*	-0.1957	-16.8257***	-15.0272***
	(0.1615)	(0.1507)	(4.0993)	(3.9803)
Lyceum		1.0619***		15.0134***
		(0.0756)		(1.9196)
High School Final Grade		0.0993***		2.0447***
		(0.0033)		(0.0799)
Risk Aversion		-0.0060		-0.0372
		(0.0326)		(0.8421)
R-squared	0.2158	0.4123	0.1474	0.2924
Observations	3,355	3,355	3,355	3,355

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A2. Further specifications not commented in the text: Heterogeneous Effects of Time Preferences on Academic Performance

Variables	Average Grade (1)	Number of Credits (2)	Average Grade (3)	Number of Credits (4)	Average Grade (5)	Number of Credits (6)
Discount Rate	-1.3077	-39.0381	-1.9100**	-17.0894	-1.7344*	-5.3141
	(1.1669)	(24.8124)	(0.9338)	(21.0931)	(0.9694)	(24.0498)
Female	0.3556***	2.2620	0.3050***	3.6833*	0.3049***	3.6641*
	(0.1176)	(2.6978)	(0.0853)	(1.9718)	(0.0852)	(1.9693)
Female Disc Rate*	-0.8829	25.5863				
	(1.4057)	(31.7490)				
High Ability			-0.1664	1.3987		
			(0.1547)	(3.7282)		
*High Ab*Disc Rate*			0.1179	-11.7598		
			(1.3103)	(30.8440)		
Family Background					-0.1033	-0.7147
					(0.1651)	(3.8797)
*Fam Back*Dis Rate*					-0.2329	-32.0137
					(1.3124)	(31.3906)
Age	0.0635***	0.0636	0.0643***	0.0641	0.0636***	0.0722
	(0.0161)	(0.3551)	(0.0163)	(0.3547)	(0.0160)	(0.3545)
Father's Education	0.0076	0.2091	0.0077	0.2051	0.0200	0.4728
	(0.0095)	(0.2328)	(0.0095)	(0.2329)	(0.0189)	(0.4433)
Father in Public Sector	0.0639	-0.5773	0.0629	-0.5628	0.0641	-0.5531
	(0.0729)	(1.7686)	(0.0729)	(1.7696)	(0.0729)	(1.7682)
Father Entrepreneur	0.1876	-1.2456	0.1896	-1.2722	0.1905	-1.1238
	(0.1547)	(3.6222)	(0.1547)	(3.6268)	(0.1548)	(3.6175)
Employed	0.0614	-2.5023	0.0612	-2.5019	0.0612	-2.5591
	(0.1578)	(3.8924)	(0.1582)	(3.8997)	(0.1579)	(3.8945)
Late Enrolment	-0.1569	-15.0569***	-0.1562	-15.0356***	-0.1565	-15.0401***
	(0.1513)	(3.8075)	(0.1517)	(3.8070)	(0.1514)	(3.8034)
Lyceum	1.0463***	14.1119***	1.0460***	14.1171***	1.0451***	14.0546***
	(0.0761)	(1.8111)	(0.0761)	(1.8115)	(0.0762)	(1.8123)
High School Final Grade	0.0986***	1.9611***	0.1046***	1.9320***	0.0986***	1.9570***
	(0.0034)	(0.0753)	(0.0062)	(0.1378)	(0.0034)	(0.0752)
Risk Aversion	-0.0126	-0.0735	-0.0126	-0.0539	-0.0136	-0.0720
	(0.0329)	(0.7937)	(0.0329)	(0.7930)	(0.0329)	(0.7936)
R-squared	0.4141	0.2893	0.4142	0.2892	0.4141	0.2895
Observations	3,355	3,355	3,355	3,355	3,355	3,355

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively. The same results hold if we do not control for High School Final Grade in columns (3) and (4) and if we do not control for Father's Education in columns (5) and (6).

Table A3. Further specifications not commented in the text: Time Preferences and Graduation. Bivariate Probit estimates

Variables	Graduation within 3 years (1)	Honours Degree within 3 years (2)
Discount Rate	-0.8904162	-1.707092**
	(0.5459674)	(0.7187753)
Female	0.0119781	0.002311
	(0.0704958)	(0.0814674)
Age	0.0024939	0.0259416**
	(0.0130265)	(0.0132037)
Father's Education	0.013925*	0.0168706*
	(0.0078742)	(0.0094578)
Father in Public Sector	-0.0688105	0.0556796
	(0.0622351)	(0.0741249)
Father Entrepreneur	0.1325582	0.1334298
	(0.1252408)	(0.1654613)
Employed	0.3016135**	0.0373051
	(0.1241067)	(0.1783847)
Late Enrolment	-0.405379***	-0.3980937**
	(0.1535369)	(0.1692572)
Lyceum	0.2883999***	0.3780155***
	(0.0641366)	(0.0832135)
High School Final Grade	0.0405239***	0.0597672***
	(0.0031893)	(0.0043795)
Risk Aversion	-0.0377317	-0.0479162
	(0.0277131)	(0.0349233)
Wald Test of rho=0		
chi2(3.42e-11)=1.42325	Prob > chi2=0.2329	

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A4. Further specifications not commented in the text: Time Preferences and Academic Performance - Robustness checks with Dependent Variable Graduation within 3 years and Honours Degree within 3 years, respectively

Variables	Graduation within 3 years	Honours Degree within 3 years	Graduation within 3 years	Honours Degree within 3 years	Graduation within 3 years	Honours Degree within 3 years
	(1)	(2)	(3)	(4)	(5)	(6)
DiscountRate	-0.1222	-0.6611	-0.0716	-0.8200	-0.0735	-0.7719
	(0.1148)	(0.4188)	(0.1260)	(0.5295)	(0.1255)	(0.5098)
Female	0.0194	-0.0069	0.0260	0.0361	0.0266	0.0313
	(0.0148)	(0.0490)	(0.0164)	(0.0548)	(0.0164)	(0.0551)
Age	0.0013	0.0296*	0.0016	0.0287	0.0011	0.0305
	(0.0023)	(0.0170)	(0.0028)	(0.0279)	(0.0028)	(0.0297)
Father's Education	0.0024	0.0039	0.0035*	-0.0034	0.0032*	-0.0012
	(0.0017)	(0.0063)	(0.0018)	(0.0071)	(0.0019)	(0.0075)
Father in Public Sector	-0.0173	0.0813*	-0.0227	0.0250	-0.0229	0.0271
	(0.0130)	(0.0430)	(0.0141)	(0.0485)	(0.0141)	(0.0490)
Father Entrepreneur	0.0304	-0.0151	0.0194	0.0893	0.0143	0.1035
	(0.0257)	(0.0800)	(0.0283)	(0.1203)	(0.0281)	(0.1203)
Employed	0.0749***	-0.0882	0.0657**	-0.0717	0.0668**	-0.0799
	(0.0264)	(0.0983)	(0.0298)	(0.1290)	(0.0298)	(0.1322)
Late Enrolment	-0.0648**	0.0539	-0.0657*	0.3853**	-0.0641*	0.3725**
	(0.0326)	(0.1351)	(0.0336)	(0.1567)	(0.0337)	(0.1552)
Lyceum	0.0376***	0.1327**	0.0744**	-0.0999	0.0738**	-0.1031
	(0.0141)	(0.0549)	(0.0336)	(0.1394)	(0.0338)	(0.1382)
High School Final Grade	0.0062***	0.0187***	0.0072***	0.0235***	0.0073***	0.0243***
	(0.0007)	(0.0030)	(0.0008)	(0.0042)	(0.0007)	(0.0042)
Risk Aversion	-0.0054	-0.0010	-0.0044	0.0284	-0.0042	0.0279
	(0.0059)	(0.0222)	(0.0065)	(0.0239)	(0.0065)	(0.0237)
Score Entry Test	0.2687***	0.6137***	0.2942***	0.9436***	0.3076***	0.8859***
	(0.0519)	(0.2011)	(0.0601)	(0.2266)	(0.0601)	(0.2343)
University Ch. Fin. R.					-0.0319**	0.0485
					(0.0144)	(0.0576)
Parents Employed					-0.0009	-0.0247
					(0.0140)	(0.0554)
School fixed effects	NO	NO	YES	YES	YES	YES
Pseudo R-squared	0.1443	0.2410	0.1897	0.3774	0.1918	0.3801
Log pseudolikelihood	-982.04945	-208.28151	-873.92876	-114.58957	-871.62925	-114.09913
Observations	2,819	398	2,487	273	2,487	273

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A5. Further specifications not commented in the text: Time Preferences and Academic Performance - Robustness checks with Dependent Variable Graduation within 3 years and Honours Degree within 3 years, respectively

Variables	Graduation within 3 years (1)	Honours Degree within 3 years (2)	Graduation within 3 years (3)	Honours Degree within 3 years (4)	Graduation within 3 years (5)	Honours Degree within 3 years (6)
Impatient	-0.0006	-0.0817*				
	(0.0135)	(0.0468)				
Impatient Relatively to Interest Rate i			0.0020	-0.0667		
			(0.0124)	(0.0423)		
Impatient>0.02					-0.0037	-0.0653
					(0.0122)	(0.0419)
Female	0.0207	-0.0071	0.0208	-0.0090	0.0204	-0.0089
	(0.0147)	(0.0490)	(0.0147)	(0.0488)	(0.0147)	(0.0488)
Age	0.0010	0.0303*	0.0010	0.0295*	0.0016	0.0292*
	(0.0023)	(0.0184)	(0.0023)	(0.0160)	(0.0025)	(0.0158)
Father's Education	0.0020	0.0058	0.0020	0.0046	0.0020	0.0055
	(0.0017)	(0.0064)	(0.0017)	(0.0065)	(0.0017)	(0.0064)
Father in Public Sector	-0.0172	0.0818*	-0.0171	0.0840*	-0.0173	0.0835*
	(0.0130)	(0.0441)	(0.0130)	(0.0439)	(0.0130)	(0.0439)
Father Entrepreneur	0.0249	-0.0108	0.0248	-0.0021	0.0256	-0.0068
	(0.0255)	(0.0804)	(0.0255)	(0.0810)	(0.0255)	(0.0809)
Employed	0.0762***	-0.0814	0.0763***	-0.1010	0.0819***	-0.0975
	(0.0264)	(0.1001)	(0.0264)	(0.0990)	(0.0278)	(0.0979)
Late Enrolment	-0.0645**	0.0377	-0.0645**	0.0428	-0.0649**	0.0470
	(0.0328)	(0.1369)	(0.0329)	(0.1346)	(0.0327)	(0.1363)
Lyceum	0.0368***	0.1273**	0.0369***	0.1338**	0.0367***	0.1322**
	(0.0141)	(0.0559)	(0.0141)	(0.0553)	(0.0141)	(0.0552)
High School Final Grade	0.0062***	0.0186***	0.0062***	0.0188***	0.0062***	0.0186***
	(0.0007)	(0.0030)	(0.0007)	(0.0030)	(0.0007)	(0.0030)
Risk Aversion	-0.0046	-0.0023	-0.0045	-0.0020	-0.0047	-0.0012
	(0.0060)	(0.0221)	(0.0060)	(0.0219)	(0.0060)	(0.0219)
Score Entry Test	0.2783***	0.5966***	0.2780***	0.6010***	0.2793***	0.6073***
	(0.0520)	(0.2034)	(0.0520)	(0.2046)	(0.0520)	(0.2033)
University Ch. F. R.	-0.0279**	0.0310	-0.0279**	0.0372	-0.0282**	0.0354
	(0.0132)	(0.0493)	(0.0132)	(0.0492)	(0.0132)	(0.0493)
Parents Employed	0.0020	-0.0068	0.0020	-0.0070	0.0021	-0.0090
	(0.0131)	(0.0464)	(0.0131)	(0.0465)	(0.0132)	(0.0465)
Pseudo R-squared	0.1458	0.2433	0.1458	0.2423	0.1460	0.2423
Log pseudolikelihood	-980.33479	-207.64738	-980.32251	-207.91663	-980.07166	-207.9405
Observations	2,819	398	2,819	398	2,819	398

Notes: In all specifications we control for field of study dummies and for province of residence dummies. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

CHAPTER 2

Does patience matter for marriage stability? Some evidence from Italy

Abstract

Time preferences can affect divorce probability both affecting the quality of the match and affecting the spouses' reactions to negative shocks. We analyze the relationship between time preferences and divorce decisions using data from the Italian Survey on Household Income and Wealth, which provides a measure of time preferences based on a hypothetical financial situation in which individuals have to decide how much money to give up in order to receive a certain amount of money today instead of in one year's time. Controlling for a number of individual and family characteristics, we find that an increase in impatience of one standard deviation increases the probability of experiencing divorce by almost one percentage point. Our results are not affected by reverse causality problems and are robust when controlling for individual risk attitudes. We also find that more risk averse individuals are less likely to experience divorce.

Keywords: Divorce, time preferences, impatience, risk aversion

JEL Classification: I20, D03, D91, J01

The chief thing in married life is patience… not love but patience.
Anton Čechov, The duel, 1891

2.1 INTRODUCTION

In recent years, a growing body of the economic literature has tried to include, both in theoretical models and in empirical analyses, the psychological dimension of individual decisions. A wide range of psychological traits have been found to be strong predictors of lifetime outcomes and success in life. For many outcomes psychological traits seem to be just as predictive as cognitive skills (Almlund et al., 2011).

Among psychological traits, the ones that have mainly attracted economists' interest are those reflecting two important dimensions of the utility function: risk aversion and time preferences. A large number of empirical and experimental works confirms the relevance of inter-temporal and risk preferences for a very large number of domains such as education, (Belzil and Leonardi, 2007; Caner and Okten, 2010; Castillo et al. 2011; Cadena and Keys, 2012; De Paola and Gioia, 2012), labour market outcomes (Della Vigna and Paserman, 2005; Drago, 2006; Ahn, 2010; Dohmen et al., 2010a; Dohmen and Falk, 2011; Pollmann et al. 2012), health (Sutter et al., 2011; Golsteyn et al., 2012), immigration (Jaeger et al., 2010). Much less studied is the role of these variables on marriage, divorce and fertility.

Family breakdown has important implications for a number of societal outcomes, such as inequality and child wellbeing. Therefore, the understanding of its determinants is very important, though still limited. The existing literature has mainly focused on a number of socio-economic factors, such as age at marriage, education, unemployment (Lehrer, 2008), while little attention has been paid to the role played by psychological traits and preferences (Lundeberg, 2013).

As regards risk attitudes, Spivey (2010) and Smidth (2008) consider their role in shaping marriage decision and show that risk-tolerant women are more likely to delay marriage. In addition, Smidth (2008) finds that higher tolerance for risk is positively

correlated to earlier births at young age. Light and Ahn (2010) focus, instead, on the relationship between risk preferences and divorce, finding that, conditional on the expected gains to marriage and divorce, the probability of divorce increases with relative risk tolerance.

In this paper, we contribute to this literature by focusing on the relationship between time preferences and marriage stability. Even if the economic theory typically models divorce decision as a choice involving a trade-off between costs and benefits occurring in different periods of time, individual time preferences are usually ignored. Compton (2009) is the only attempt to consider the role of time preferences on divorce. She presents a game theoretical model showing that, following a negative shock whose temporary or permanent nature is uncertain for the spouses at the time it occurs, patient individuals are more likely to remain in a marriage relationship, hoping that the shock is temporary.

Despite the lack of academic work on the relationship between time preferences and marriage stability, common wisdom considers patience as a key ingredient for marital success. Marriage stability is often the result of the spouses' willingness to make short term "sacrifices" for the long term viability of their marriage. Patience is likely to improve everyday interactions and communication within the couple with positive effects on the duration of the relationship. Time preferences can also affect the way in which individuals react to unanticipated shocks that deteriorate their relationship. More patient individuals may be more inclined to sustain the immediate costs deriving from staying in a troubled marriage and wait for an improvement in the relationship. They might also be more prone to invest in order to re-establish harmony within the couple.

Time preferences can affect marriage stability also through the initial quality of the match. As suggested in the seminal work by Becker, Landes and Michael (1977), the choice of search effort is principally an investment decision involving immediate costs and future gains in terms of better marriage opportunities. Then, impatient individuals are more likely to invest less and end up with a worse match. Furthermore, as in job search models (Della Vigna and Paserman, 2005), impatience can affect the quality of the match also by driving the reservation policy chosen by each individual (Burdett and Cole, 1999). The quality of the match, in turn, will affect the probability of divorce as unanticipated shocks are less destabilizing if partners are well matched.

Investigating the relationship between time preferences and marriage/divorce decisions is often hampered by the lack of appropriate data. In this paper we use data from Italy, a country that, notwithstanding its long tradition of a stable family system, is now experiencing a progressive rise in divorces. More precisely, we use data from the 2004 and 2010 waves of the Survey on Household Income and Wealth (SHIW). The use of these data has the advantage of providing a direct measure of time preferences. This measure is based on a hypothetical financial situation in which individuals have to decide how much money to give up in order to receive a certain amount of money today instead of in one year's time. To avoid reverse causality problems that may emerge when using measures of impatience computed in the same moment in which marital status is observed, we have restricted our sample to the panel component of individuals for which we have observations both in 2004 and in 2010. We focus on individuals who were married in 2004 and look at their probability of divorcing in the time interval 2004-2010. Our measure of impatience and all our controls are computed using answers to the 2004 survey.

We estimate a probit model for the probability of divorcing. Controlling for an array of variables aimed at capturing the gains to marriage and divorce (such as education gap, age cohort dummies, age gap, family composition, individual and family income, area of residence, occupation industry dummies, family background, etc.), we find that time preferences play an important role in the decision to divorce. More impatient individuals are more likely to experience divorce: an increase in impatience of one standard deviation increases the probability of divorcing by almost one percentage point. These results are robust to different specifications of our model and to the inclusion of different controls.

As time preferences might be correlated to risk aversion, our results may be driven by the fact that more patient individuals are more risk averse (De Paola, 2012) and, as shown by Light and Ahn (2010), more risk averse individuals are less likely to experience separation or divorce. Unfortunately, the 2004 wave of the SHIW does not provide any information on individuals' risk attitudes. This information is instead available in the 2010 wave of the survey, which poses individuals with a question asking them to choose the amount of money they would like to invest in a risky hypothetical lottery. Then, we use data from this wave to analyse the relationship between time preferences and marriage stability controlling for risk attitudes. Taking the level of risk aversion constant, time

preferences continue to play a role and more impatient individuals are more likely to experience a marriage breakdown. Although in such analysis the measures of time preferences and risk attitudes are computed at the same moment in which the marital status is observed, results from previous estimates (which do not suffer from reverse causality problems) reassure us that the relationship between time and risk preferences and divorce is unlikely to derive exclusively from the effect that marital condition produces on preferences.

Our analysis contributes to the emerging literature on the effect of time and risk preferences on marriage stability by proving additional evidence on this issue and by improving on some aspects. Our results are in line with those emerging from Compton (2009) who, considering the U.S. National Longitudinal Survey of Youth, finds that patient individuals are less likely to divorce especially in the earlier years of marriage. One advantage of our study is that we use a direct measure of time preferences, whilst Compton relies on indirect measures of time preferences, such as smoking, contraceptive use and the assessment of the interviewer on whether or not the respondent was impatient or restless. In addition, we control for a direct measure of risk aversion. To the best of our knowledge, this is the first study that jointly considers the role of time and risk preferences on divorce.

By controlling for risk aversion we both check that our results are not driven by the fact that higher discount rates are correlated to a lower degree of risk aversion and analyse the effect that risk aversion produces on divorce probability. Our results confirm those found by Light and Ahn (2010) for US, showing that less risk averse individuals are more likely to experience separation or divorce.

We also contribute to the small literature investigating divorce determinants in Italy. We find that couples with children and living in the southern part of the country are less exposed to divorce. On the other hand, individuals with higher individual income and living in large towns show a higher divorce probability. Women who were head of household in 2004 are more likely to divorce compared to men in the same position, confirming that female economic independence is a crucial determinant of divorce decisions.

The chapter is organized as follows. Section 2.2 describes the data used in the empirical analysis. Section 2.3 presents the probit estimates of the probability of experiencing separation or divorce. In Section 2.4 we check the robustness of our results

using a larger sample which also allows us to control for risk aversion. Section 2.5 concludes.

2.2 DATA AND DESCRIPTIVE STATISTICS

In Italy divorce was introduced by law in 1970. Since then, marital separation and divorce rates have been gradually rising in Italy[22], especially among couples between 35 and 40 years old. In 1995, the percentage of marriages ending with a separation or a divorce was of 2.38, while in 2010 this percentage has risen to 4.89.[23] In spite of this rising trend, Italy still displays one of the lowest levels of marriage dissolution in Europe: the Eurostat divorce statistics report a crude divorce rate of 0.9 for Italy (which translates in about 4.5% of couples that experience divorce/separation) in 2010, which is followed only by Former Yugoslav Republic of Macedonia and Montenegro (0.8) and Ireland (0.7); the highest divorce rate for the same year belongs to Lithuania (3.0).

Aside from cultural and religious factors, there are other potential explanations for such a low divorce rate in Italy. First of all, it may be due to the fact that in Italy it is not easy to divorce: couples are required to be legally separated for three continuous years before their divorce is finalized. The Italian law defines two kinds of legal separation: separation by mutual consent or judicial separation. In the first case, the decision to separate is consensual, whilst, if there is no agreement between the spouses, each spouse can file recourse for judicial separation. A separation decree may be granted when there are facts which make intolerable the continued cohabitation of the couple or things which are averse to the mental health or physical wellbeing of children in the household. The legal separation has the effect of suspending the legal consequences of marriage until reconciliation or divorce is reached. Therefore, the low divorce rate characterizing Italy can be also due to the fact that a number of separations do not end up in a divorce. This is typically not due to the couple reconciliation, but instead to the fact that the couple decides

[22] In recent years, Italy has been interested also by a growing rate of not married couples that live together, named “coppie di fatto” with the consequent loss of information on an important component of society.
[23] For a more detailed analysis see the 2012 report “Separations and divorces in Italy” of the Italian National Institute of Statistics (ISTAT), www.istat.it

to remain separated in order to spare the costs deriving from the legal proceeding (divorce is strictly necessary only if one of the partners wants to remarry).[24] For this reason, when studying marriage stability in Italy, it is useful to focus not only on divorces but also on separations.

To investigate the relationship between marriage stability and time preferences we use data from the *Survey on Household Income and Wealth* (SHIW)[25], which is a nationally representative survey that has been conducted every two years by the Bank of Italy since 1977. The SHIW provides detailed information on the personal and demographic characteristics of the individuals of each household (status in household, gender, age, educational qualifications, marital status, region of residence) and on their working activity (employment status, type of occupation, industry, number of work experiences, type of contract, average weekly hours of work, earnings, wealth). Most importantly, worldwide this is one of the few surveys providing information on time and risk preferences.

The other main sources of data on individual time and risk preferences include the German Socio-Economic Panel (GSEP) and the National Longitudinal Survey of Youth (NLSY) for US.

However, in all the available surveys, questions aimed at eliciting time and risk preferences have been comprised only recently. For example, the NLSY includes questions on risk aversion starting from 1993, while both the GSEP and the SHIW pose questions on time and risk preferences starting from 2004 and 2000 respectively. When using the data at the purpose of investigating divorce decisions, this leads to some important problems. In fact, we would need measures of time and risk that are predetermined with respect to the outcome variable. Instead, these data allow to observe marriage histories starting from many decades ago, but individual time and risk preferences only refer to more recent years. For example, Light and Ahn (2010) analyse divorce decisions using NLSY data from 1979 to 2004, but they have information on risk preferences only starting from 1993. This poses a serious problem of reverse causality as the ability to delay gratifications may be not

[24] As reported by Salvini and Vignoli, 2011, of the total number of legal separations obtained in 1995, only 60% ended in a divorce during the following decade.
[25] The detailed questionnaire, the data and further details regarding the *Survey on Household Income and Wealth* are available on the website of the Bank of Italy, http://www.bancaditalia.it/statistiche/indcamp/bilfait.

entirely an inborn personality trait (see Perez-Arce, 2011) and the marital status may play a role in shaping individual risk (and time) preferences.

To handle this problem in our analysis we compute our measure of impatience and our control variables using the 2004 wave of the SHIW[26] and then we restrict our sample to the panel component of heads of household for which we have observations both in 2004 and in 2010. We only consider heads of household, defined as the subject who is responsible of the household's economic decisions, since the survey question we use to compute the measure of time preferences was posed only to these subjects. From this sample we drop individuals who were not married in 2004, ending up with 1,723 observations. In this way we are able to use time preferences revealed in 2004 to estimate the probability that the individual experiences separation or divorce after 2004. Since all individuals in our sample were married in 2004 and our variable of interest is predetermined with respect to the outcome variable, our results should not be biased by reverse causality problems.

Our dependent variable is *DivorceAfter2004*, a dummy variable taking the value of 1 if the marital status of the individual results "separated or divorced" in 2010 but s/he was married in 2004 and the value of 0 for people who result married both in 2004 and 2010; 2.7% of the sample has divorced after 2004.

The structure of the SHIW question on civil status, which places both "separated" and "divorced" within the same alternative[27], reflects the fact that in Italy, as explained above, an important indicator of family dissolution is represented by separations. We do not know whether these separations and divorces were decided by mutual consent. However, from the 2012 report of the Italian National Institute of Statistics (Istat) it emerges that the type of proceeding mainly chosen by couples is consensual separation: in 2010, 85.5% of separations and 72.4% of divorces were decided by mutual consent (ISTAT, 2009).[28] The information on which of the partners requested the proceedings (in case of judicial

[26] In the 2000 survey the question on time preferences was posed to only a half of the panel sample. This jointly to a number of missing values considerably reduces the sample and makes it unsuitable for our research project.

[27] Respondents are asked to choose their marital status among four alternatives: a) married; b) single; c) separated/divorced; d) widow/er.

[28] Until 2005, sole custody of minors was mainly awarded to the mother. In 2006, Law 54/2006 introduced the provision of joint custody of minor children as an ordinary procedure. In 2009, 86.2% of separations with children were with joint custody, as opposed to 12.2% in which custody of the children was awarded exclusively to the mother.

separation) is not crucial for our analysis since the divorce decision is likely to be influenced by both the individual time preferences and those of his/her partner.

The SHIW data allow to compute indicators of time preferences in a direct way by using the answers to a question of the 2004 wave posed only to the heads of household inquiring their behaviour in a hypothetical financial situation in which they had to decide how much money to give up in order to receive a certain amount of money today instead of in one year's time. To be more precise, respondents are asked the following question: "You have won the lottery and will receive a sum equal to your household's net yearly revenue. You will receive the money in a year's time. However, if you give up part of the sum you can collect the rest of your win immediately". After the description of the hypothetical situation, the respondent is routed in a series of questions about the percentage s/he would be willing to give up. Among the available alternatives for the percentage of the sum that respondents would be willing to give up to have immediately the money won there are 0, 2, 3, 5, 10 or 20 percent.

Table 1 shows the distribution of heads of household by reported percentage of the win that they would like to give up to get the money immediately. About 26% of respondents refuse to give up any amount of money, waiting to have the whole amount the following year. 5.92% of respondents decide to give up 2 percent and about 9.63% decide to give up 3 percent, while 31.11% of them choose to give up 5 percent. Finally, 19.21% and 8.30% of heads of household give up 10 and 20 percent, respectively. In terms of the Discounted Utility Model[29], the percentage given up in order to have money immediately represents the discount rate of the respondent.

[Table 1 Here]

We use the answers to this question of the 2004 survey to build an indicator of time preferences: *DiscountRate2004* taking values from 0 (for patient respondents who decided to give up nothing, waiting to have the whole amount of the win in one year) to 0.2 (for really impatient respondents who would give up 20 percent). Since we compute our

[29] For a detailed description of the Discounted Utility Model see Samuelson (1937).

indicator of time preferences before the realization of the outcome of interest, we avoid the problem of reverse causality: having divorced after 2004 has no role in shaping the level of impatience in 2004. Individuals in the sample have an average discount rate of about 0.06.

As underlined by Ventura (2003, p. 308), the measures of inter-temporal attitudes (as well as other personal traits) collected through surveys have some advantages with respect to experimental data. Firstly, the number of observations is typically greater because a survey allows the collection of information on more individuals compared to the participants in experimental studies. Secondly, problems related to the reliability of the indicators are less relevant for analyses based on broad surveys (such as SHIW): individuals are asked to answer many questions about their economic situation, financial assets, properties, loans, consumption and investment decisions, which allows them to better link the hypothetical situation with their real life.

The measure of time preferences we have obtained seems quite reliable: it behaves in the same way as those emerging from a number of recent papers on the subject. In particular, looking at cognitive abilities, it emerges that individuals with a higher level of education tend to be less impatient compared to respondents who invest less in education (the correlation between *DiscountRate2004* and *Education* is equal to -0.0874, statistically significant at the 1 percent level). Results that are consistent with the literature (Golsteyn et al., 2012) emerge also when looking at family background: individuals whose parents are more educated tend to be less impatient than respondents whose parents have a lower level of education (the correlation between *DiscountRate2004* and *Parents_Education* is equal to -0.0445, statistically significant at the 10 percent level). As in Ventura (2003), people residing in the North of Italy seem to be more patient than people living in regions of the Centre (the correlation between *DiscountRate* and *North* is equal to -0.0676, statistically significant at the 1 percent level); on the contrary, individuals living in the South have a higher level of impatience (the correlation between *DiscountRate2004* and *South* is equal to 0.1570, statistically significant at the 1 percent level). The gender analysis is not very relevant in our study due to the particular features of the women present in our sample. Indeed, they are heads of household, therefore they do not represent the whole female population (the correlation between *DiscountRate2004* and the dummy *Female* is equal to 0.0471, statistically significant at the 5 percent level). In addition, *DiscountRate2004* is

negatively correlated with savings (-0.0964, statistically significant at the 1 per cent level), which is a variable that has been proven to strongly react to time preferences.

Table 2 reports the summary statistics for the variables used in the analysis. About 23% of individuals in the sample are woman. Respondents are 53.65 years old on average. To consider the effect produced by changes in cultural attitudes and customs occurring overtime we have built 5 dummy variables for birth cohorts (born before 1940, born in the period 1941-1950, 1951-1960, 1961-1970 and born after 1970); the majority of the sample is born before 1960 while only about 19 and 5 percent of respondents are born in the sixties or after 1970, respectively. The majority of the sample resides in the North of Italy (about 44% against 37% and 19% who are resident in the South and in the Centre, respectively). About 31% of the sample resides in a municipality with less than 20,000 inhabitants. As far as occupation industries are concerned, about 3% of the sample work in agriculture, 17% in industry and 16% in the public administration sector; about 17% work in other sectors while the remaining are retired or not employed.

With the aim of capturing heterogeneity in match quality, we use a large number of variables to control for the expected gains to marriage and divorce. The variable *Age Gap*, computed using the years of birth of the partners of each couple indicates the absolute value of the difference in the husband's and wife's age, which has a mean value of 5.41. Respondents have studied on average for 9.56 years. We use the information on the couple's education level to build the variable *Education Gap,* which is the absolute value of the difference in the number of years of education acquired by the spouses. This variable has a mean value of 2.14.

[Table 2 Here]

The data at hand also provide information on the family composition of the individual prior to separation/divorce. To describe the family composition we consider: the dummy variable *Kids Under 11* indicating whether the couple has any child with an age lower or equal to 10 years and the dummy variable *Male-Kids* which takes the value of 1 if at least one of the kids younger than 11 years is male. Controlling for the presence of kids is

important to capture marriage-specific capital (Becker, 1974; Becker et al., 1977; Weiss and Willis, 1997). In addition, the presence of a male child has been found to reduce the probability of divorce (Morgan and Pollard, 2002; Lundberg and Rose, 2003). About 18% of the interviewed heads of household has at least one kid aged ten or below in 2004 and for 14% of respondents at least one of these children is male. The number of kids in the household ranges from 0 to 5, with an average number of 0.86. Unfortunately, we are not able to control whether the couple has any child born outside the marriage and living in the household because the 2004 wave does not contain such information.

Our data set also provides information on the individual and family economic conditions prior to divorce. Economic variables are important when looking at couple dynamics: on the one hand, family income captures part of the benefits of marriage because the higher the income that the family earns, the higher its level of consumption; on the other hand, individual income defines the share of total income contributed by the respondents and therefore his\her economic independence (Oppenheimer, 1997; Moffitt, 2000; Light and Ahn, 2010). As far as income is concerned, we have information on the income earned by the head of household in the year preceding the survey (i.e. 2003), which includes both labour income and income from financial and real assets, and on the total income of the family. We restrict our attention on individual and family net labour income,[30] computed as the sum of payroll income, pensions and net transfers, and net self-employment income, and build three economic indicators: *Individual Net Labour Income*, which is on average €15,284.13; *Family Net Labour Income*, with a mean value of €26,015.81, and *Individual Share Family Labour Income*, which represents the share of the family net labour income contributed by the head of the household. On average, heads of household contribute for 63% of the family net labour income.

In models looking at the determinants of the decision of ending a marriage relationship, however, the net labour income of the individual can be endogenous: individuals' beliefs about a future divorce can alter their labour supply decisions (Greene and Quester, 1982; Johnson and Skinner, 1986; Stevenson, 2007). In order to solve this potential endogeneity problem, we follow the procedure by Light and Ahn (2010) and compute individual's predicted labour income using gender, age, age-squared, age-cubed,

[30] Since in our analysis we consider net income figures, the income variables can assume negative values.

education attainments, dummies for area of residence, a dummy for the presence of children aged 10 years or below, a dummy for the presence of male children aged 10 or below and industry dummies. *Individual Predicted Labour Income* is on average €11,711.19, and *Family Predicted Labour Income*, given by the sum of the spouses' predicted income, is on average €23,248.18. Furthermore, we compute also the square values of individual and family net labour income and measures of individual and family net total income (i.e. labour income plus property income from real-estate and financial assets) and of the share of the net total income contributed by the head of household. On average, heads of household contribute for 70% of the net total family income, which is on average €33,421.10.

As regards family background, the parents of the individuals included in our sample have on average 4.5 years of education and they mainly work/ed in the agriculture sector (29%, against 24% in industry, 15% in public administration and the remaining in other sectors).

2.3 IMPATIENCE AND DIVORCE: PROBIT ESTIMATES

Individual level of impatience is a key determinant of decisions involving a trade-off between costs and benefits occurring in different periods of time. In divorce decisions there are different channels through which these trade-offs may operate: 1) mate search activity – impatient individuals, in order to avoid the immediate costs arising from search activity, prefer to invest less in the research of a partner and to lower their reserve "standard", ending up with a lower initial quality of the match; 2) daily life of the couple – living together as a couple means spending time with a partner that has habits and tastes, which in some cases diverge from personal ones; this entails small daily compromises, which typically involve immediate costs for the delayed benefits of a long and stable relationship; 3) negative shocks which affect the equilibrium of the marriage – staying in a troubled marriage implies sustaining the immediate costs of the shock in order to obtain the future benefits deriving from an improvement in the relationship.

In this section, we examine the relationship between individual time preferences and the probability of divorcing. In all estimates our dependent variable is the dummy variable *DivorceAfter2004*, which takes the value 1 if the interviewed head of household has experienced separation or divorce[31] after 2004 (his/her civil status is separated or divorced in 2010 but married in 2004) and 0 otherwise.

Given the binary nature of the outcome of interest, we use the following probit regression model:

$$P(DivorceAfter2004 = 1 \mid X) = \Phi(Z) \tag{1}$$

where P denotes the probability of experiencing divorce, X is a vector of all the regressors of the model, Φ is the Cumulative Density Function of the standard normal distribution that makes it possible to obtain a realistic value for the probability (>0 and <1) and a non-linear relationship between the probability and the explanatory variables, and the '*z-scores*' vector Z is defined as follows:

$$Z = \Phi^{-1}(P) = \alpha + \beta DiscountRa\ te2004 + \gamma D \tag{2}$$

with D representing a vector of all the other explanatory variables except *DiscountRate2004*, and β and the vector γ the unknown parameters.

All the regressors are measured in 2004. Table 3 shows the probit model estimates of the probability of divorce for five different specifications. The reported coefficients represent the average marginal effect of each regressor on the probability to divorce after 2004. The explanatory variables we control for in our analysis are those typically used in the literature studying marriage stability and divorce decisions (Light and Ahn, 2010) with the exception of some variables, such as race, ethnicity, which are not relevant in our sample (in Italy the population is quite homogeneous both in race and ethnicity), and others, such as date of marriage, presence of children born before the marriage or born from another partner, which are not available in the 2004 wave of the SHIW.

The first column of Table 3 examines the effect of time preferences on the probability of being separated or divorced without other controls. We find a positive relationship between impatience and the probability of divorce: an increase in the level of impatience of

[31] The label divorce is therefore used in a broad sense to indicate both couples which are separated and couples which are divorced.

one standard deviation increases by almost 1 percentage point (0.1734*0.0553=0.00959) the probability of being divorced, with an effect that is statistically significant at the 1 percent level.

In the second column we add among controls some individual characteristics such as gender, *AgeGap*, *EducationGap*, birth cohort dummies, area of residence dummies and a dummy variable for individuals residing in villages with less than 20,000 inhabitants. Also controlling for these variables, we find that the individual discount rate in 2004 is positively correlated with the probability of divorcing after 2004 with an effect that is statistically significant at the 1 percent level; the higher the level of impatience of the individual, the higher the probability of being divorced. As far as control variables are concerned, contrary to the findings of Light and Ahn (2010), we find that the absolute value of the difference of age between spouses has a negative and statistically significant effect on the probability of divorce, while the difference in the number of years of education does not affect the probability of divorce in a statistically significant way. The area of residence and the size of the municipality do not exert any statistically significant effect, but their sign is as expected. In fact, due to more traditional cultural values, divorce rate is lower in the southern part of the country.[32]

The third specification enriches our analysis including among controls some characteristics of the family of the respondent in order to capture marriage-specific capital (Becker, 1974; Becker et al., 1977; Weiss and Willis, 1997). We include the dummy variables *KidsUnder11* and *Male-Kids*. Estimates show that having kids reduces the probability of being divorced in a statistically significant way, while a negative but not significant effect emerges when one of the kids is male. Also in this specification the relationship between impatience and divorce probability is positive and highly statistically significant. The same results are obtained if, instead of controlling for *KidsUnder11* and *Male-Kids*, we include among regressors the total number of kids in the household and a dummy variable for male kids (see Table A1 column 1).

In column (4) we consider also variables describing the economic conditions of the household. While family income should capture gains to marriage deriving from joint

[32] We find results that are very similar to those reported in the Table also when, instead of controlling for *EducationGap* and *AgeGap*, we control for the age and education of the spouses.

consumption (Moffitt, 2000), the share of it contributed by the individual is an indicator of the individual economic independence (which affects the expected gains from divorce) and also captures the individual comparative advantage in market and home production (Becker, 1974). Consistently with theoretical predictions, the decision of ending the relationship is positively affected by the share of the family net labour income contributed by the head of household with an effect that is statistically significant at the 1 percent level. *Family Net Labour Income* produces a negative but weakly statistically significant effect on the probability of ending the marriage relationship. More important for our research question, even after controlling for these variables, the coefficient on *DiscountRate2004* is positive and statistically significant at the 1 percent level. In this specification including the whole set of controls, an increase of the discount rate of one standard deviation increases the probability to divorce of 0.8 percentage points.

[Table 3 Here]

In column (5) we estimate the same specification of column (4) without including our impatience indicator to check whether its inclusion influences the estimated effects of other determinants of divorce. We find that the estimated coefficients for all variables - including age and education gap between spouses, family composition, family net labour income, the individual's net labour income share and other factors that we expect to be correlated with time preferences - are virtually invariant to the inclusion or exclusion of discount rate. Time preferences has a nontrivial effect on the probability of divorce, yet omitting *DiscountRate2004* from the model causes only slightly changes in the magnitude of the effects of the other control variables.

In Table 4 we push our analysis of the effect of time preferences on the decision to divorce further by considering five alternative specifications of our model. In all specifications we replicate the specification in column (4) of Table 3, including the whole set of control (to save space, in Table 4, we do not report coefficients on these controls which remain almost unchanged).

In the first two columns we enrich our model by including among controls industry dummies and information on family background, respectively. We find that the average marginal effect of impatience is still positive and statistically significant with a magnitude that remains close to 1 percentage point for an increase of the discount rate of one standard deviation. As far as the new control variables are concerned, individuals working in the agriculture or industry sector are significantly more likely to divorce with respect to not employed people (retired workers and housewives), while family background (column 2), represented by the level of education of respondent' parents and his/her father's occupation industry dummies, does not contribute in a significant way to the explanation of divorce decision. [33]

[Table 4 Here]

The last three columns report some more flexible specifications in which we look at different measures or functional forms for our economic variables.

In column (3) we redefine our measure of individual and family net income by considering the total income, that is the sum of labour income plus property income from real-estate and financial assets. We find that also when considering the total income, instead of the labour income, the share contributed by the head of household exerts a positive and statistically significant effect while the family net total income produces a negative but not statistically significant effect. Again, the effect of time preferences remains positive and statistically significant.

In column (4) we propose a different functional form including the square of both individual and family net labour income.[34] Individual discount rate exerts a positive and statistically significant effect with an almost unchanged magnitude. We find that family level of net labour income decreases the probability of divorcing at an increasing rate,

[33] In the specification in column (2), including control variables for individual family background, the sample reduces to 1,394 observations because of some missing values in such controls.
[34] Since we want to check for a non-linear effect of individual and family income, in this specification we control for the level of individual net labour income instead of for the share contributed by him/her.

while the individual level of net family income is linked to the probability to divorce by a linear relationship.

In the last specification, following Light and Ahn (2010), we replace our economic variables with their predicted values, given that these variables are likely to be endogenous to the expected probability of divorce. Our results are consistent with those emerging from the literature: data shows that individual predicted income exerts a positive and statistically significant effect on the probability of divorce while the effect of family predicted income is negative and significant. When considering individual predicted share of income (computed as the ratio between individual and family predicted income) the coefficient of individual predicted share is still positive and significant at the 1 percent level, while the effect of family predicted income becomes not statistically significant. Also in this specification the relationship between individual discount rate in 2004 and the probability to divorce after 2004 is positive and statistically significant.

2.4 DIVORCE AND TIME AND RISK PREFERENCES

As shown in Castillo et al. (2011) and De Paola (2012), when analysing the effect of time preferences, it might be important to control for individual risk preferences since discount rates might reflect differences in risk preferences. Andreoni and Sprenger (2012) argue that, since present is known while future is risky, it might be difficult to disentangle the effects of time and risk preferences. Then, uncontrolled risk may drive our results: less patient individuals might also be more risk oriented and, as shown by Light and Ahn (2010), less risk averse subjects are more likely to experience separation or divorce.

Unfortunately, there is no information regarding individual risk attitudes in the 2004 wave of the SHIW. This information is instead available in the 2010 wave. In this section, we use these data with the aim of both investigating whether our results are robust once we control for risk preferences and of providing some new evidence on the effect that risk preferences produce on marriage stability. The relationship between risk aversion and divorce has been highlighted by Ligh and Ahn (2010) presenting a model in which they show how a married person's relative risk tolerance affects his/her choice between the less

risky option of remaining married and the riskier option of divorcing. From their empirical analysis, based on US data, it emerges that individuals with a higher degree of risk tolerance are more likely to experience divorce. To the best of our knowledge, there are no other works analysing this relationship and we think it is valuable to shed some more light on this issue providing evidence for another country.

In the 2010 wave of the SHIW, as well as in the 2004 one, information on time preferences is available only for the heads of household. We use both the panel and the non-panel component of the sample and focus our attention on subjects that in 2010 were either married or divorced, ending up with a sample of 3,661 observations.[35]

Our dependent variable is *Divorce*, a dummy variable taking the value of 1 if in 2010 the marital status of the individual is "separated or divorced" and the value of 0 if the marital status is married. About 11.20% of the heads of household in our sample are separated or divorced.

We compute our measure of impatience, *DiscountRate*, using the answers to a question of the 2010 survey, similar to the one asked in 2004, with the only difference that among the available alternatives for the percentage of the sum that respondents would be willing to give up to have immediately the money won there are 0, 2, 5, 10 or 20 percent.[36] The mean value of this variable is 0.0618 with a standard deviation of 0.0682.

To investigate the role played by risk attitudes in divorce decisions we use a question asking individuals to choose the amount of money they would like to invest in a hypothetical lottery where there is the chance to double the invested money but it is equally possible to lose half of the amount invested, depending on a coin toss (tails mean win, heads mean loss). More precisely, individuals are posed with the following question: "Imagine you can take part in a lottery in which for every euro invested, you can either double your money (win 1 euro) or lose half of it (lose 50 cents), depending on a coin toss (tails you win, heads you lose). How much money would you invest?".

[35] This wave covers 7,951 households composed of 19,836 individuals and the information on time preferences and risk aversion is available for 5,128 heads of household. 801 and 666 individuals were widows and singles, respectively, in 2010, and have been excluded from our sample.

[36] 28.38% of respondents refuse to give up any amount of money, waiting to have the whole amount the following year. 19.94% of respondents decide to give up 2 percent and 18.38% decide to give up 5 percent. Finally, 17.97% and 15.32% of heads of household give up 10 and 20 percent, respectively.

Using answers to this question, we built two measures of individual risk aversion. The first, *AbsoluteRiskAversion,* is an Arrow–Pratt index of absolute risk aversion.[37] This index takes values in the range 0.000012 (for individuals willing to invest 100.000 euros, the maximum value in our sample) and 1.5[38] (for those who are unwilling to invest any amount of money), and takes an average value of 0.6398466 (standard deviation 0.6865863). The second measure of individual risk aversion is the dummy variable *Averse*, with the value of 1 for respondents who refuse to invest any money and 0 otherwise. Based on this indicator, about 35% of the individuals in our sample are considered risk averse.

It is worthwhile to notice that the larger sample and the information on risk attitudes come at the price of having measures of impatience and risk attitudes that are revealed in the same moment in which the marital status of respondents is observed. This could give rise to reverse causality problems. Nevertheless, results discussed in the previous section reassure us that the relationship between time preferences is unlikely to originate exclusively from the effect that marital status produces on this type of individual attitudes.

Table 5 presents average marginal effects of probit model estimates. The first column replicates specification (1) of Table (3) in which we only consider time preferences among regressors. We find a positive correlation, statistically significant at the 5 percent level that is very similar in magnitude to that found using the panel sample.[39] An increase of one

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[37] We obtain a measure of the Arrow–Pratt index of absolute risk aversion for each individual. Let w_i denote household i's endowment, and $u_i(.)$ be the (lifetime) utility function and let $\tilde{P}_i$ be the security random return for individual i, taking values $2Z_i$ and $Z_i/2$ with equal probability. The maximum purchase price is thus given by $u_i(w_i) = \frac{1}{2}u_i(w_i + 2Z_i) + \frac{1}{2}u_i(w_i + \frac{Z_i}{2}) = Eu_i(w_i + \tilde{P}_i)$. We take the second-order Taylor expansion of the second equality of this equation around w_i and obtain: $R_i(w_i) \cong \frac{-u_i''(w_i)}{u_i'(w_i)} = 2(2Z_i + \frac{Z_i}{2})/(4Z^2 + \frac{Z^2}{4})$.

[38] Since the Arrow-Pratt index of risk aversion is not defined for individuals refusing to invest any amount of money, for them we have imputed a value of 1.5. We have also experimented imputing alternative values (always higher than the value obtained for individuals wanting to invest 1 euro). Independently of the imputed values our results remain qualitatively unchanged.

[39] However, in comparing these effects to those found previously, we have to consider that while in the previous section we were estimating the probability that a person who was married in 2004 had experienced divorce in the six following years, here we are looking at the probability of being divorced in a certain point of time (in 2010). In fact, in section 3, conditional on all the covariates, the increase of 1 percentage point in the probability of divorcing due to an increase of one standard deviation in the discount rate, compared to a divorce rate of 2.25 percentage points among individuals with discount rate equal to zero, represents a 44 percent larger likelihood of divorcing. Instead, in the 2010 analysis, the increase of 1 percentage point in the

standard deviation in *DiscountRate* is correlated to an increase in the probability of being divorced of about 1 percentage point. We have also replicated specification (4) of Table 3, including the full set of controls, and again we find an effect of time preferences that is similar to that found considering the panel sample (see Table A1 column 2).

Starting from column (2), we turn our attention to the role played by risk aversion. Firstly, we only consider among regressors our measure *AbsoluteRiskAversion*. We find that individuals who display a higher degree of absolute risk aversion are less likely to divorce (the effect is statistically significant at the 1 percent level). An increase of one standard deviation in our measure of *AbsoluteRiskAversion* decreases the probability of being divorced by about 1.5 percentage points. This effect persists also when we add among regressors the full set of our controls (see Table A1 column 3).

In column (3) we present a specification in which we consider both risk and time preferences. Both these variables show statistically significant coefficients: again impatience is positively correlated with the dependent variable (at the 10 per cent level), while risk aversion shows a negative sign, statistically significant at the 1 per cent level. Remarkably, the magnitude of the effects of time and risk preferences is very similar to that obtained when considering separately each variable.

In column (4) we add a number of individual predetermined characteristics (gender, year of birth cohort dummies -not reported-, age, residential area, a dummy variable indicating whether individuals live in a small town, education). Adding these controls increases the magnitude of the effect produced by time preferences, while the coefficient of our measure of risk aversion remains almost the same.

[Table 5 Here]

As education might not be sufficient to control for differences in cognitive abilities, which are typically correlated with both time and risk preferences (Dohmen et al. 2010), we

probability of divorcing due to an increase of one standard deviation in the discount rate, compared to a divorce rate of 9.62 percentage points among individuals with discount rate equal to zero, represents a 10 percent larger likelihood of divorcing.

have also considered answers to a question of the 2010 wave of the SHIW aimed at understanding individual logical and computational skills.[40] This variable does not affect divorce probability and leaves our main results qualitatively unchanged (see Table A1 column 4).

In column (5) we also consider among controls two variables aimed at describing family composition (*KidsUnder11* and *Male-Kids* observed in 2010). Our main findings remain qualitatively unchanged. Finally, in column (6) we add controls for individual and family economic conditions. Also in this case, we find that more impatient and more risk prone individuals are more likely to experience divorce. After including the full set of our controls, an increase of one standard deviation in *DiscountRate* increases the probability of being divorced by 0.8 percentage points.

Control variables also behave as discussed in the previous section. Some coefficients that were not statistically significant, now gain statistical power. For example, the dummy variable *South*, is again negative but now it becomes statistically significant at the 10 percent level, implying that people living in the southern part of the country, probably due to cultural factors, show lower divorce rates. In addition, having male children also produces a negative and statistically significant impact. However, it is worthwhile to notice that measures of family composition and individual and family economic conditions are less reliable and more subject to endogeneity problems in the 2010 sample as they refer to the same year in which we observe whether respondents are married or divorced.

In Table 6 we replicate specifications (2)-(5) of Table 5 using as a measure of risk aversion the dummy variable *Averse*. Again, more impatient individuals are more likely to be divorced. The statistical significance and the magnitude of the coefficient of *DiscountRate* remains almost the same as that obtained when controlling for *AbsoluteRiskAversion*. We also find that people who refused to invest any money in the risky lottery are less likely to experience divorce, with an effect that is statistically

[40] Individuals are asked the following question: "Imagine leaving 1,000 euros in a current account that pays 1% interest and has no charges. Imagine that inflation is running at 2%. Do you think that if you withdraw the money in a year's time you will be able to buy the same amount of goods as if you spent the 1,000 euros today? Possible answers are: "Yes"; "No, I will be able to buy less"; "No, I will be able to buy more"; "I do not know". Using answers to this question, we have built a dummy variable, *Logical and Computational Skills*, for individuals providing the correct answer.

significant at the 1 or at the 5 percent level depending on specifications. When adding all our controls (column 5), a very risk averse individual is about 2.16 percentage points less likely to have ended his/her marriage compared to persons who have decided to invest an amount of money in the risky lottery.

[Table 6 Here]

All in all, our results show that the positive effect of impatience on divorce probability, found in the previous section, is not due to correlation between time and risk preferences. Also controlling for risk aversion, we find that more impatient individuals are more likely to experience divorce. In addition, we confirm the results found by Light and Ahn (2010) for US: individuals with a higher level of absolute risk aversion are less likely to divorce given the riskier nature of this decision with respect to the alternative of remaining married.

2.5 CONCLUDING REMARKS

An increasing psychological and economic literature investigates the role of a number of non-cognitive traits on individual outcomes. However, while the effect of these variables on certain outcomes, such as academic results, labour market performance and health, has been considered by a large number of works, other domains are almost ignored.

In this paper, we have contributed to close this gap by focusing on the relationship between time preferences and separation/divorce decisions. Time preferences can affect marriage stability through a number of different channels. Time preferences can affect marriage stability through the initial quality of the match: impatient individuals may invest less in searching activity and end up with a worse match, which would affect marriage duration since unanticipated shocks are less destabilizing if partners are well matched. In addition, patience might improve daily interactions between the spouses with positive effects on the duration of their marriage. Finally, time preferences can influence the way

individuals manage unanticipated shocks that deteriorate their relationship: more patient individuals may be more inclined to sustain the immediate costs deriving from the shock and wait for an improvement in the relationship or invest more (for example in terms of time and energies) to re-establish harmony.

We have empirically assessed the relationship between time preferences and divorce decision using an Italian data-set that allows us to build a measure of time preferences based on a hypothetical financial situation in which individuals have to decide how much money to give up in order to receive a certain amount of money today instead of in one year's time. For couples that were married in 2004, we estimate the probability of divorcing in the next 6 years. Controlling for a number of individual characteristics, we find a positive correlation between the probability of being separated/divorced and impatience. More precisely an increase of one standard deviation in individual discount rate increases the probability of experiencing divorce by almost one percentage point.

This result is consistent with findings highlighted by Compton (2009), showing for US that more impatient individuals are more likely to divorce. Compared to Compton's analysis, which relies on indirect measures of time preferences, such as smoking or contraceptive use, our study has the advantage of using direct measures of time preferences that are less likely to be correlated to other confounding variables.

We have also checked whether our estimates are robust when we include among controls a measure of individual risk aversion. We find that taking constant individual risk aversion, time preferences still produce a statistically significant effect on the probability of divorce. In line with results found by Light and Ahn (2010) for US, we find a positive relationship between risk tolerance and divorce decision.

Unfortunately, as much of the literature investigating the effect of non-cognitive traits, we cannot exclude that our findings are driven by unobserved components of the gains to marriage and divorce that are correlated with individual levels of time preferences and risk tolerance. However, we control for a large number of demographic predictors of marital breakdown and for variables that are typically correlated to time and risk preferences, such as individual family background and cognitive ability.

Table 1. Time preferences: percentage given up to have money immediately

Percentage	*Frequencies*	*%*
0	445	25.83
2	102	5.92
3	166	9.63
5	536	31.11
10	331	19.21
20	143	8.30
	1,723	100.00

Table 2. Descriptive statistics for the sample of heads of household

Variables	**Mean**	**Std. Dev**	**Min.**	**Max.**
DiscountRate2004	0.0554	0.0553	0	0.2
DivorceAfter2004	0.0273	0.1629	0	1
Female	0.2263	0.4186	0	1
Age	53.6489	12.9862	18	92
Born before or in 1940	0.2455	0.4305	0	1
Born in 1941-1950	0.2577	0.4375	0	1
Born in 1951-1960	0.2589	0.4381	0	1
Born in 1961-1970	0.1880	0.3909	0	1
Born after 1970	0.0499	0.2178	0	1
North	0.4382	0.4963	0	1
South	0.3680	0.4824	0	1
Centre	0.1938	0,3954	0	1
Small Municipality	0.3064	0.4611	0	1
Education	9.5572	4.2926	0	20
Age Gap	5.4115	4.3760	0	28
Education Gap	2.1416	2.5587	0	13
Kids under 11	0.1822	0.3861	0	1
Male-kids	0.1404	0.3476	0	1
Individual Net Labour Income	15,284.13	11,788.29	-6,566	125,000
Family Net Labour Income	26,015.81	17,531.98	-5,705.95	255,000
Individual Share Family Labour Income	0.6266	0.3238	-0.4227	1
Agriculture	0.0273	0.1629	0	1
Industry	0.1706	0.3763	0	1
Public Administration	0.1608	0.3674	0	1
Other Sector	0.1683	0.3743	0	1
Individual Net Total Income	22,689.41	17,377.28	-5,693.50	245,671
Family Net Total Income	33,421.1	22,533.9	-5,693.504	262,007.1
Individual Share Family Total Income	0.7015	0.2677	-0.2160	1
Individual Net Labour Income Square	372,487.7	875,156	0	15.625,000
Family Net Labour Income Square	984,014.6	2.378,609	0	65.025,000
Individual Predicted Labour Income	11,711.19	5,205.12	-4,121.33	27,545.63
Family Predicted Labour Income	23,248.18	10,366.72	-2,776.28	62,143.93
Parents' Education	4.505284	3.453444	0	18
Father in Agriculture	0.2899787	0.4539135	0	1
Father in Industry	0.2395167	0.4269403	0	1
Father in Public Administration	0.1492537	0.3564651	0	1

Table 3. The Determinants of divorce. Time Preferences. Probit model estimates (average marginal effects). Time preference indicator: DiscountRate2004

Variables	Divorce After 2004 (1)	Divorce After 2004 (2)	Divorce After 2004 (3)	Divorce After 2004 (4)	Divorce After 2004 (5)
DiscountRate2004	0.1734***	0.1586**	0.1680***	0.1380**	
	(0.0640)	(0.0644)	(0.0631)	(0.0603)	
Female		0.0437***	0.0438***	0.0668***	0.0694***
		(0.0102)	(0.0100)	(0.0119)	(0.0122)
North		0.0031	0.0023	-0.0009	0.0011
		(0.0109)	(0.0107)	(0.0104)	(0.0105)
South		-0.0041	-0.0026	-0.0079	-0.0036
		(0.0115)	(0.0112)	(0.0109)	(0.0109)
Small Municipality		-0.0089	-0.0071	-0.0044	-0.0034
		(0.0088)	(0.0085)	(0.0083)	(0.0083)
Education Gap		0.0008	0.0008	0.0010	0.0010
		(0.0016)	(0.0016)	(0.0015)	(0.0016)
Age Gap		-0.0029**	-0.0031***	-0.0023**	-0.0024**
		(0.0012)	(0.0012)	(0.0011)	(0.0011)
Kids Under 11			-0.0552**	-0.0413*	-0.0423*
			(0.0251)	(0.0229)	(0.0229)
Male-Kids			-0.0153	-0.0171	-0.0134
			(0.0308)	(0.0283)	(0.0279)
Individual Share Family Labour Income				0.0737***	0.0754***
				(0.0159)	(0.0162)
Family Net Labour Income				-0.0005	-0.0005
				(0.0003)	(0.0003)
Pseudo R-Squared	0.0176	0.0846	0.1361	0.2267	0.2146
Log likelihood	-211.8343	-197.3862	-186.2749	-166.7530	-169.3617
Observations	1,723	1,723	1,723	1,723	1,723

Notes: The Table reports average marginal effects of Probit estimates (the average of each marginal effect). The dependent variable is the dummy *DivorceAfter2004*. Standard errors, corrected for heteroskedasticity, are reported in parentheses. *Family Net Labour Income* is expressed in thousands of Euros. In all specifications but the first we include among controls birth cohort dummies. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 4. The Determinants of divorce: probit model estimates (average marginal effects). Further specifications. Time preference indicator: DiscountRate2004

Variables	Divorce After 2004 (1)	Divorce After 2004 (2)	Divorce After 2004 (3)	Divorce After 2004 (4)	Divorce After 2004 (5)
DiscountRate2004	0.1452**	0.1289*	0.1409**	0.1501**	0.1379**
	(0.0595)	(0.0670)	(0.0601)	(0.0601)	(0.0573)
Agriculture	0.0520***				
	(0.0191)				
Manufacture	0.0313**				
	(0.0140)				
Public Administration	0.0157				
	(0.0147)				
Other Sector	0.0093				
	(0.0147)				
Parents Education		0.0013			
		(0.0013)			
Father in Agriculture		-0.0148			
		(0.0115)			
Father in Industry		-0.0093			
		(0.0107)			
Father in Public Administration		-0.0007			
		(0.0108)			
Individual Share Family Total Income			0.0921***		
			(0.0198)		
Family Net Total Income			-0.0004		
			(0.0003)		
Individual Net Labour Income				0.0042***	
				(0.0011)	
Individual Net Labour Income ^2				-0.0000	
				(0.0000)	
Family Net Labour Income				-0.0036***	
				(0.0007)	
Family Net Labour Income ^2				0.0000***	
				(0.0000)	
Individual Predicted Labour Income					0.0078***
					(0.0014)
Family Predicted Labour Income					-0.0047***
					(0.0008)
Pseudo R-Square	0.2512	0.2424	0.2288	0.2326	0.3024
Log likelihood	-161.4692	-121.0991	-166.2878	-165.4745	-150.4249
Observations	1,723	1,394	1,723	1,723	1,723

Notes: The Table reports average marginal effects of Probit estimates (the average of each marginal effect). The dependent variable is the dummy *DivorceAfter2004*. In all specifications we include controls for individual characteristics and family composition as in Table 3 specification 3. In columns (1) and (2) we also include *Individual Share Family Labour Income* and *Family Net Labour Income* (the coefficients are not reported). Standard errors, corrected for heteroskedasticity, are reported in parentheses. In all specifications we also control for birth cohort dummies. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 5. The Determinants of divorce. Time and Risk preferences. Probit model estimates (average marginal effects). Risk aversion indicator: AbsoluteRiskAversion

Variables	Divorce	Divorce	Divorce	Divorce	Divorce	Divorce
	(1)	(2)	(3)	(4)	(5)	(6)
Discount Rate	0.1528**		0.1454*	0.1935***	0.1649**	0.1218**
	(0.0741)		(0.0742)	(0.0746)	(0.0678)	(0.0622)
AbsoluteRiskAversion		-0.0225***	-0.0220***	-0.0190**	-0.0128*	-0.0119**
		(0.0077)	(0.0077)	(0.0075)	(0.0066)	(0.0060)
Female				0.1220***	0.0876***	0.1314***
				(0.0104)	(0.0088)	(0.0088)
North				0.0235*	0.0066	-0.0062
				(0.0127)	(0.0115)	(0.0104)
South				-0.0363**	-0.0119	-0.0241*
				(0.0154)	(0.0140)	(0.0127)
Small				-0.0335***	-0.0317***	-0.0253***
				(0.0119)	(0.0104)	(0.0093)
Education				0.0011	0.0016	0.0008
				(0.0013)	(0.0011)	(0.0014)
Age				0.0012	0.0004	-0.0002
				(0.0015)	(0.0013)	(0.0012)
Kids Under 11					-0.1779***	-0.1234***
					(0.0126)	(0.0125)
Male-Kids					-0.1142***	-0.0739***
					(0.0200)	(0.0179)
Individual Share Family Labour Income						0.2316***
						(0.0180)
Family Net Labour Income						-0.0009**
						(0.0004)
Pseudo R-squared	0.0016	0.0033	0.0048	0.0848	0.3070	0.4437
Log likelihood	-1281.6854	-1279.4741	-1277.5912	-1174.9094	-889.5972	-705.6065
Observations	3661	3661	3661	3661	3661	3618

Notes: The Table reports average marginal effects of Probit estimates (the average of each marginal effect). The dependent variable is the dummy *Divorce*. Standard errors, corrected for heteroskedasticity, are reported in parentheses. Year of birth dummies included in specifications (4), (5) and (6). The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 6. The Determinants of divorce. Time and Risk preferences: probit model estimates (average marginal effects). Risk aversion indicator: Averse

Variables	Divorce	Divorce	Divorce	Divorce	Divorce
	(1)	(2)	(3)	(4)	(5)
Discount Rate		0.1456**	0.1955***	0.1666**	0.1235**
		(0.0741)	(0.0745)	(0.0677)	(0.0622)
Averse	-0.0331***	-0.0324***	-0.0282***	-0.0228**	-0.0216**
	(0.0112)	(0.0112)	(0.0109)	(0.0097)	(0.0089)
Female			0.1215***	0.0872***	0.1311***
			(0.0104)	(0.0088)	(0.0088)
North			0.0232*	0.0059	-0.0070
			(0.0128)	(0.0115)	(0.0103)
South			-0.0373**	-0.0140	-0.0261**
			(0.0154)	(0.0141)	(0.0127)
Small			-0.0346***	-0.0324***	-0.0261***
			(0.0119)	(0.0104)	(0.0093)
Education			0.0012	0.0017	0.0009
			(0.0013)	(0.0011)	(0.0014)
Age			0.0012	0.0005	-0.0002
			(0.0015)	(0.0013)	(0.0012)
Kids Under 11				-0.1779***	-0.1234***
				(0.0126)	(0.0125)
Male-Kids				-0.1146***	-0.0740***
				(0.0200)	(0.0179)
Individual Share Family Labour Income					0.2316***
					(0.0179)
Family Net Labour Income					-0.0009**
					(0.0004)
Pseudo R-squared	0.0035	0.0049	0.0849	0.3078	0.4445
Log likelihood	-1279.3172	-1277.4251	-1174.7675	-888.66475	-704.5572
Observations	3661	3661	3661	3661	3618

Notes: The Table reports average marginal effects of Probit estimates (the average of each marginal effect). The dependent variable is the dummy *Divorce*. Standard errors, corrected for heteroskedasticity, are reported in parentheses. Year of birth dummies included in specifications (3), (4) and (5). The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A1. Further specifications not commented in the text

Variables	Divorce After 2004	Divorce	Divorce	Divorce
	(1)	(2)	(3)	(4)
Discount Rate2004	0.1824***			
	(0.0609)			
Discount Rate		0.1247**		0.1937***
		(0.0621)		(0.0746)
AbsoluteRiskAversion			-0.0122**	-0.0191**
			(0.0061)	(0.0075)
Female	0.0379***	0.1307***	0.1317***	0.1222***
	(0.0091)	(0.0088)	(0.0088)	(0.0105)
North	-0.0022	-0.0044	-0.0086	0.0238*
	(0.0102)	(0.0104)	(0.0104)	(0.0128)
South	0.0063	-0.0203	-0.0226*	-0.0360**
	(0.0106)	(0.0127)	(0.0126)	(0.0155)
Small	-0.0073	-0.0261***	-0.0246***	-0.0336***
	(0.0082)	(0.0093)	(0.0093)	(0.0119)
Education Gap	0.0005			
	(0.0015)			
Age Gap	-0.0025**			
	(0.011)			
Education		0.0009	0.0007	0.0011
		(0.0014)	(0.0014)	(0.0013)
Age		-0.0003	-0.0002	0.0012
		(0.0012)	(0.0012)	(0.0015)
Number of Kids	-0.0753***			
	(0.0164)			
Any Male-Kids	0.0184			
	(0.0160)			
Kids Under 11		-0.1233***	-0.1233***	
		(0.0125)	(0.0125)	
Male-Kids (Under 11)		-0.0748***	-0.0735***	
		(0.0179)	(0.0178)	
Individual Share Family Labour Income		0.2311***	0.2317***	
		(0.0179)	(0.0181)	
Family Net Labour Income		-0.0009**	-0.0009**	
		(0.0004)	(0.0004)	
Logical and Computational Skills				0.0024
				(0.0134)
Pseudo R-squared	0.2664	0.4422	0.4420	0.0848
Log likelihood	-158.18257	-707.504	-707.71067	-1174.8932
Observations	1723	3618	3618	3661

Notes: The Table reports average marginal effects of Probit estimates (the average of each marginal effect). The dependent variable is the dummy *Divorce*. Standard errors, corrected for heteroskedasticity, are reported in parentheses. Year of birth dummies included in specifications (4), (5) and (6). The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively. In column 1 we replicate specification (3) of Table 3 including among regressors the total number of kids in the household and a dummy variable for male kids instead of controlling for *KidsUnder11* and *Male-Kids (Under 11)*. In column 2 we replicate specification (4) of Table 3 using the 2010 wave of the SHIW. In column 3 we replicate specification (2) of Table 5 adding among regressors the full set of our controls. In column 4 we replicate specification (4) of Table 5 including among regressors our indicator for Logical and Computational Skills.

PART II

CHAPTER 3

Who performs better under time pressure?

Results from a field experiment.

Abstract

We investigate whether and how time pressure affects performance. We conduct a field experiment in which students from an Italian University were proposed to sustain an experimental exam consisting of two written intermediate tests, one of which to be taken under binding time constraints. Students deciding to sustain the experimental exam were randomly assigned to the binding and no binding time constraint groups according to their gender, high school grade and typology of high school attended. We find that being exposed to time pressure negatively affects students' performance with an effect that is statistically significant for the verbal component of the test, and weakly statistically significant for the numerical part. Interestingly, we find that in the more masculine task, represented by answering to numerical questions, females handle time pressure better than males. Instead, when focusing on the verbal task, which is typically thought as a more feminine one, gender differences are smaller in magnitude and weakly statistically significant.

Keywords: time pressure, time constraints, gender differences, student performance

JEL classifications: I20, C93, D03, J01

3.1 INTRODUCTION

"*Remember that time is money*" was one of Benjamin Franklin's hints in a pamphlet published in 1748.[41] Nowadays many individuals value time even more than money: Robinson and Godbey (1999), in a research focusing on US, found an increase in subjective levels of time pressure over the past 30 years. A similar trend is likely to characterize also other countries. Therefore, understanding the role of time pressure on individual outcomes and the differences in individuals' response to environments characterized by time constraints becomes important to explain many recent social and technological changes.

The role of time has been studied in psychology and other disciplines with research pointing out individual differences in the ability to handle time pressure and the relevance of time constraints for individual decision-making, motivation and group behavior (Bluedorn and Denhardt, 1988).

In a study on voting behavior, Hansson et al. (1974) find that time pressure induces to a more conservative voting of both liberals and conservatives. Instead, studying moral reasoning, Björklund (2003) finds that, in moral judgments, time pressure leads to a greater incidence of justice and fairness compared to care and kindness and it increases individuals' orientation towards duty, obligations and rights compared to consequences and effects on others.

Several researchers claim that time pressure may lead to different possible effects on the cognitive processing of a task, suggesting that, when the time to perform a task is limited, decision makers tend to speed up the execution of their decision strategies or switch to simpler strategies (Miller, 1960; Smith, Mitchell and Beach, 1982; Edland and Svenson, 1993; Svenson and Benson, 1993). According to Johnson, Payne and Bettman (1993), under time pressure, when deciding which strategies to employ, decision makers appear to tradeoff effort against accuracy. Furthermore, Ordónez and Benson (1997) suggest that individuals experiencing time pressure also tradeoff the immediate effort of switching strategies against using strategies that are easier or more familiar.

Wright (1974) finds that subjects experiencing time pressure tend to place greater

[41] Franklin, B. (1748) Advice to a Young Tradesman, Written by an Old One, pamphlet written and published by Franklin, Philadelphia

weight on the negative aspects of each alternative. Wright and Weitz (1977) study the effects of time horizon and time for a decision and find that subjects who made quicker decisions were more loss-averse and used more one-dimensional type strategies compared to those working without any time pressure. In 1981, Zur and Breznitz, asking subjects to choose between two gambles characterized by both positive attributes (amount and probability of winning) and negative attributes (amount and probability of losing), find that, subjects focus more on negative factors under time pressure. Finally, Svenson and Edland (1987) run three experiments on students' choice of apartments with different characteristics. They demonstrate that decisions and choices can be affected by time pressure with an effect strong enough to affect the majority of subjects so that one type of alternative is preferred under time pressure and another type when decision time is unlimited. This change of preference seems to be the result of subjects giving increasing importance to the apartment characteristic already considered the most important and becoming more influenced by its negative aspects.

As well as in the cognitive process per se, time pressure exerts an important role also in shaping individual performance. To the best of our knowledge, there are only two papers focusing on this issue. Andrews and Farris (1972) examine several aspects of the performance of scientists and engineers and find that a sense of time pressure can enhance several qualities of scientific performance, including innovation. In addition to experiencing the strongest level of time pressure, the highest performing scientists also tended to want relatively large amounts of pressure. More recently, Shurchkovy (2012) shows that among factors that make women less effective than men in competitive environments (Gneezy, Niederle, and Rustichini, 2003; Niederle and Vesterlund, 2007) a crucial role might be played by the ability to handle time pressure. Using controlled experiments involving the execution of verbal tasks, she does not find gender differences in performance neither under non-competitive nor under competitive payment conditions. She also finds that competition per se is not the cause of the gender gap. According to the author, gender inequality is also due to men and women reacting differently to time pressure: women perform significantly better than men in competitive verbal tasks without time constraints. The better performance of women is due to their better use of the extra time: women use the extra time to increase the quality of their work; on the contrary, men

use the extra time to increase the quantity, thus producing a higher volume of work but also increasing the share of mistakes.

Our paper tries to contribute to this small literature analyzing the effects of time pressure on performance. We are particularly interested in understanding whether there are gender differences in time pressure response. While Shurchkovy (2012) investigates this issue relying on a laboratory experiment, we run a field experiment. We observe individuals in a real life environment, in which they perform a task that they would have performed anyway. In addition, while Shurchkovy (2012) analyses this issue considering individual performance in a competitive environment, we introduce time pressure in a non-competitive setting.

Our field experiment has involved 113 students enrolled at the class of Personnel Economics at the University of Calabria in the academic year 2012-2013. At the beginning of the course, students were given the opportunity to choose whether to take the exam in the traditional way or in an experimental way. The "experimental exam" consisted in two intermediate tests, regarding respectively the first and the second half of the course program, and composed by both verbal and numerical questions. The first test was held four weeks after the beginning of teaching classes and the second test was held two weeks after the end of teaching classes. For each intermediate test, there was a treatment group, who had to take the exam under "binding time constraint", that is in 35 minutes, and a control group who had a "no binding time constraint" of 55 minutes. Students deciding to take the experimental exam were randomly assigned to one of the two groups. Students having to complete the first test under "binding time constraint" were assigned to the "no binding time constraint" group for the second test and viceversa. The "traditional exam" was held two weeks after the end of teaching classes (as the second intermediate test) and consisted in verbal and numerical questions covering the whole course program. Students had two hours of time to answer to a number of questions that was equal to the sum of those proposed in the two intermediate tests.

After having chosen the type of exam, students opting for the "experimental exam" were informed about their treatment status at the first test. As required by the university administration, students were allowed to leave the experiment and take the traditional exam at each stage of the experiment.

We study the determinants of students' decisions at each stage of the experiment. We find that female students and students endowed with higher cognitive skills are more likely to choose the "experimental exam" than the "traditional exam". Female students are also less likely to change their mind and not attend the first test after having signed up for the "experimental exam". Then, we do not find evidence of gender differences in the willingness to work under time pressure; if anything, women are more prone than men in accepting this type of working conditions.

Then, we focus our attention on the role played by time pressure on performance for the subsample of students taking the first test. We find that time pressure negatively affects performance: treated students have an average grade at the first test about three points lower than the grade achieved by not treated students. Moreover, when splitting the grade at the first test in its two components, we find that time pressure exerts a statistically significant effect only on the verbal part of the test. This might point to a heterogeneous impact according to gender. Then, we look at gender heterogeneity both in the overall performance and in the performance in each of the two parts of the test. We find a weakly significant gender difference in the impact of time pressure on the overall grade at the first test. Time pressure does not affect females in a statistically significant way, whilst a male student having to complete the exam under time pressure obtains a grade at the test which is about 6.64 points lower than a male student with a non-binding completion time (the effect is statistically significant at the 5 percent level).

In a binding time constraint environment, a stereotype effect might emerge with women being more likely to dedicate the limited time to the verbal component of the task and men to the numerical task. However, this does not seem to be the case in our data. Indeed, when splitting the overall performance in its two components, we find that in numerical tasks, which are typically thought as masculine, there are significant gender differences in performance: females seem to be not affected by time pressure while males exposed to a binding time constraint obtain a grade which is 3.6025 points lower than males with non-binding completion time. On the other hand, differences between males and females are smaller in magnitude and less statistically significant when looking at the verbal component of the test.

According to our findings females are not worse than males in handling time pressure. This is in contrast to results highlighted by Shurchkovy (2012) showing that females use extra-time better than males and tend to under-perform in competitive settings when facing binding time constraints. The difference in results could be due to the fact that in our study individuals work under a piece rate type of scheme, while in the Shurchkovy' s experiment they were involved in a tournament.

The chapter is organized as follows. In Section 3.2 the design of the experiment is explained and some descriptive statistics are provided. Section 3.3 examines students' participation decisions for each step of the experiment. In Section 3.4 we analyze the relationship between time pressure and performance and the existence of heterogeneous effects according to gender. Section 3.5 concludes.

3.2 EXPERIMENT DESCRIPTION AND DATA

When sitting an exam students have to answer to the exam questions in a given amount of time which is fixed by the professor on the basis of the structure of the examination form. Typically, the time allowed to complete the exam and the structure of the exam are the same in different examination sessions of the same year and, in many cases, also in consecutives academic years. This allows students to know how the exam will be like and to train themselves with past examination forms before taking the exam.

The aim of our research is to understand whether being exposed to a binding time constraint during the exam affects students' performance and whether there is heterogeneity between males and females in the way they handle time pressure.

In order to investigate this issue, we conducted an experiment which has involved 113 students enrolled at the class of Personnel Economics[42] offered by the First Level Degree Course in Business and Administration at the University of Calabria in the academic year 2012-2013.[43] The class was taught to students during the first half of the

[42] The class of Personnel Economics is not mandatory for all students. It is one of the optional courses among which students have to choose to complete the number of credits necessary to obtain the First Level Degree.
[43] The University of Calabria is a middle-sized public university located in the South of Italy. It has currently about 35,000 students enrolled in different Degree Courses and at different levels of the Italian University

second semester (teaching period from March to April). All students attended the lectures in the same room, at the same time and with the same instructor and teaching material.

At the end of the first week of teaching, students were told that there were two ways to sit the exam: the "traditional exam" to be taken at the end of the teaching period or "the experimental exam" consisting in two intermediate tests to be taken right after the first half of the course and at the end of it, respectively.[44] Although for convenience here we name the two forms of the exam "traditional" and "experimental", our students were not informed of being part of an experiment. We only told them that they had the choice between two different exam schemes and explained them the advantages and the disadvantages of each scheme. This at the aim of avoiding Hawthorne[45] and similar effects. The introduction of time pressure in one of the schemes was motived to students on the basis of the importance that performing under time constraints has in many on-the-job situations.

The two intermediate tests were structured in the same way as the traditional exam with the only difference that each of the two tests was about only half of the program (the first test had questions regarding only the first half of the program, while the second test had questions regarding only the second part of the program)[46]. Tests were divided into two parts, the first part was aimed at assessing the knowledge of the exam program with questions requiring verbal answers (not based on computation or graphical analysis), while the second part was composed by questions requiring numerical and graphical solutions. Each part was worth 16 points. Tests undertaken under the "experimental exam" and under the "traditional exam" were evaluated with scores ranging from 0 to 32, but for students undertaking the two tests the grade at the exam is given by the average of the marks obtained at the two tests.

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system. Since the 2001 reform, the Italian University system is organized around three main levels: First Level Degrees (3 years of legal duration), Second Level Degrees (2 years more) and Ph.D. Degrees. In order to gain a First Level Degree students have to acquire a total of 180 credits. Students who have acquired a First Level Degree can undertake a Second Level Degree (acquiring 120 more credits). After having accomplished their Second Level Degree, students can enroll in a Ph.D. degree.

[44] The present experiment has never been carried out before neither at the class of Personnel Economics nor in the whole University of Calabria. Therefore, students in our sample could not use feedback by previous students.

[45] The Hawthorne effect refers to a phenomenon in which participants alter their behaviour, working harder and performing better, when they are participants in an experiment. Therefore, the change in behaviour may be due to the attention they are receiving from researchers rather than to any manipulation of independent variables.

[46] The traditional exam comprises questions regarding the entire program taught during the class.

Students deciding to sit the "traditional exam" had two hours to complete the exam form. The "difficulty" associated with the two intermediate tests was that only for one of them the student had the normal amount of time (one hour), i.e. half of the time available in the final exam, while for the other s/he had a binding time constraint (half an hour).[47] We explained that, before the first test, students choosing the "experimental exam" would have been assigned to two groups: a "binding time constraint group" that was required to accomplish the test in half an hour and a "no binding time constraint group" that had one hour to complete the test. Groups would have been disclosed five days before the first test. For the second test, the assigned group would have been exactly the opposite: students taking the first test in the "binding time constraint group" would have had one hour at the second test and *viceversa*.

When marking the exams, the professor had no information on whether the students were assigned to the treatment or control group.

It is important to notice that setting a time constraint is not enough to ensure that individuals feel time pressure (Svenson and Benson, 1993; Benson, 1993). *Time constraint* exists whenever there is a time deadline, even if the person is able to complete the task in less time. In each university exam's context, students have a time constraint because they are required to complete the exam in a given amount of time, which they may perceive as scarce, adequate or abundant. *Time pressure* indicates that the time constraint induces some feeling of stress and creates a need to cope with the limited time. Thus, it is possible to have time constraint but no time pressure. Since our aim was to study time pressure, based on the experience of previous sessions of the same exam, we set the time constraint for treated students in order to induce stress deriving from limited time. Therefore, all students were working under time constraints, but only for a subsample of them, the treated, the constraint was binding and therefore time pressure was relevant in shaping individual behavior.

Students were given one week of time to choose whether to sit the traditional exam or the two intermediate tests. They had to manifest their decision by signing up online for the respective lists. Students took this decision knowing that, as required by the university

[47] The exact amount of time to complete the test was 55 minutes for the control group while the exact time given to the treatment group was 35 minutes. At the moment of the choice the student did not know for which of the tests s/he would have had less time.

administration, they were allowed to exit the experiment even after having joined it.[48] Nevertheless, they did not have information on the group at which they would have been assigned at the first test.

113 students (about 71% of those enrolled at the class of Personnel Economics) subscribed to the list of the "experimental exam". On the basis of the available administrative information on students' characteristics, we proceeded to the stratification of students deciding to sit the experimental exam according to gender, high school grade (which has been divided into quartiles) and typology of high school attended. As a result of this procedure[49], we end up with a "binding time constraint group" of 59 students (52.21%) and a "no binding time constraint group" of 54 students (47.79%).[50]

Five days before the first test students were informed about their treatment status. 86 students attended the first test, about 76% of those signing to join the experimental exam. Tests were marked and students were informed about the mark obtained. 58 out of the 86 students undertaking the first test decided to show up at the second test. Students who were assigned to the "binding time constraint group" at the first test, at the second test were assigned to the control group (i.e. for the second test, they were given a completion time of one hour) and *viceversa*.

Table 1 provides descriptive statistics for each sample of students. About 65% of students enrolled at the course are females. Females represent about 63% of students who decided to take the "experimental exam" and about 68.6% and 68.9% of students attending the first and the second test, respectively. *High School Grade* ranges from 60 (the minimum passing grade) to 100 (the maximum grade), with a mean value of 88.755 and 89.566 for the whole sample of students attending the course and for students joining the

[48] This implies that some students who initially signed to join the experiment decided to not show up at the first test. Moreover, some students who decided to undertake the first test then chose to not show up at the second test. Finally, students undertaking both the tests who were unsatisfied with the grade obtained had the possibility to undertake the traditional exam at the end of the course.

[49] We proceeded to the stratification of students using a dummy for gender, a dummy with value of 1 if the typology of High School attended was Lyceum and four dummies indicating the first, second, third and fourth quartile of the distribution of high school grade. As a result, 16 groups were formed. Within each of such groups, students were randomly assigned to the treatment and the control group. The number of students assigned to each of the 16 groups was not always even. Therefore, the number of treated students slightly differs from the number of control students.

[50] Since before choosing whether to take the intermediate tests or not, students did not know to which group they would have been assigned, students who decided not to sit such tests were independent from the treatment status and no sample selection problem arises.

"experimental exam", respectively. Students showing up at the first test have an average high school grade of 90.86 which is slightly higher than the average high school grade of students undertaking both the two tests (90.345). 49% of students enrolled at the course and about 42% of students who joined the "experimental exam" have studied in a Lyceum. Most of the students deciding to attend the first intermediate test come from technical schools (65.12%), while about 59% of students who decided to take also the second intermediate exam have attended a Lyceum.

52% of the 113 students who signed the list for the "experimental exam" are assigned to the treatment group. The percentage remains almost the same for the sub-sample of students attending the first and the second intermediate tests (0.5 and 0.517%, respectively).

[Table 1 Here]

We observe grades both in passed examinations (18-32) and in failed examinations (grades below 18). At the first intermediate test, students obtain on average a grade of 18.39; therefore, on average, they are able to pass the exam with almost the minimum grade. At the second intermediate test the average grade scored by students is higher (23.276), mainly because, given the possibility to exit the experiment at each time, only students with a higher grade at the first test decided to attend the second test. When splitting the overall grade in its two components, we see that students on average have the same grade in both the numerical and the verbal part of the exam. Of course, in both parts, the average grade is higher for the sub-sample of students taking both the first and the second intermediate tests.

We focus our analysis only on the sub-sample of 86 students who decided to take the "experimental exam" and sustained the first test because those are the only data that allow us to catch the effect of time pressure. Indeed, two problems arise when considering data on the second intermediate test. First, students taking also the second test, received a feedback after the first test: they have learned from their previous experience how the exam looks like, how they have performed in the assigned time and how they could perform in the time

that will be assigned to them for the second test. It could be that only students who consider themselves more able to handle time pressure decide to sit the second test, while the others shift to the traditional exam. Second, given that students knew the grade at their first test before taking the second one and that they had possibility to take the traditional exam if not satisfied with the grade obtained, only students who scored a good mark at the first test came to take the second test, while those who scored lower grades in the first test preferred to shift to the traditional exam. For the above reasons, also a comparison within students taking the first and second test would result rich of confounders. (We will devote attention to this analysis in the appendix of the chapter).

Students who signed up the online list for the "experimental exam" could change their mind and, indeed, 27 did it. We do not know exactly why they decided to withdraw, but, as we will show in the next section, although male students are more likely to withdraw from the experimental exam, after having initially joined it, the withdrawal decision is not related to whether the student was assigned to the treatment or to the control group at the first test. Then, in Table 2, we show that the randomization was successful also in the sub-sample of students who effectively attended the first test. In the first two columns of the table, means for a number of individual characteristics are reported for treatment and control group. Differences in means between treated and control students are presented in column 3 (standard errors are reported in parentheses); while in column 4 we report the *F*-stat (and *p*-value) for a test of equality of variables' means across the two groups.

[Table 2 Here]

Results show that the randomization was successful in creating comparable treatment and control groups as regards the observable characteristics: there are no significant differences between the treatment status in terms of students' gender, *High School Grade* and type of High School attended. Even if students signing up the online list to take part in the experiment could further select themselves by deciding whether or not to show up the day of the exam, the pre-assigned allocation to treatment and control group resulted in a random assignment also for the sub-sample of students who did take the exam. This

because the decision to withdraw from the experimental exam was not based on the treatment status at the first test.

3.3 DETERMINANTS OF STUDENTS' PARTICIPATION DECISIONS

The experimental setup allowed students to express their willingness to undertake the "experimental exam" in different stages. We firstly analyze whether there are some differences among students at each decisional moment.

Table 3 shows the probit model estimates for students' participation decisions. The reported coefficients represent the average marginal effect of each regressor on the outcome variable.

Columns (1) and (2) investigate the determinants of the decision to accept to sustain the "experimental exam" instead of the traditional one. In the first specification, we control only for *Female* and we find no statistically significant gender differences between students deciding to enrol for the experimental exam or for the traditional one. In the second specification, we control also for student's cognitive ability measured by the typology of high school attended and the high school final grade. We find a positive and statistically significant effect for *High School Grade*: students with a higher level of cognitive ability, measured by a higher final grade at high school, are more likely to participate in the "experimental exam". *Lyceum* and gender do not affect the decision to join the experimental exam in a statistically significant way.

In columns (3) and (4) we turn our attention toward the decision of not attending the first test after having joined the experimental exam, therefore we run our regressions on the sub-sample of 113 students.

One of the questions that this paper is trying to answer regards the sources of heterogeneity according to gender. Therefore, in column (3), we control only for gender and we find that females are less likely to change their mind avoiding to take the first test after having registered for the experimental exam. In the second specification (column 4), we add among our controls personal characteristics and abilities that we have used to randomize students, the treatment variable *Time Pressure* and the interaction term between

each control variable and *Time pressure*. Since we have stratified students according to gender, lyceum and dummies for each quartile of the distribution of their high school grade, instead of using the main variable *High School Grade*, we control for quartile's dummies. Although we still find a negative and significant effect for females, the interaction terms are never statistically significant. These results show that having known to be assigned to the "binding time constraint group" at the first test does not affect students' decision to withdraw from the experimental exam by not showing up at the first test. This explains way the initial randomization is effective also for the subsample of 86 students attending the first test.

[Table 3 Here]

Finally, in column (5) we investigate the determinants of the decision to not attend the second test in the sub-sample of (86) students who took the first test and knew the grade they scored at it.[51] We find that the only determinant of the decision to come to the second test is the grade achieved in the first test: the increase in one point of the grade at the first intermediate test reduces the probability of not attending the second one by 3.7 percentage points with an effect that is statistically significant at the 1 percent level. Moreover, the decision of not showing up at the second test is not heterogeneous according to the grade achieved at the first test for students assigned to the treatment group at the second test.

All in all our estimates show that there are no gender differences in students' willingness to work under pressure. Females are as disposed as males to accept to sit their exam under time pressure. However, contrary to male students, females are less likely to exit the experiment once known that they have to work under time pressure at the first test.

[51] In this specification we have a better indicator of student's cognitive ability, that is the grade they achieved in the previous test. Therefore, we have controlled for cognitive ability by replacing *High School Final Grade* and *Lyceum* with *Grade at First Test* and interacting this measure of cognitive ability with *Time Pressure* to check heterogeneity.

3.4 TIME PRESSURE AND STUDENTS' PERFORMANCE: HETEROGENEOUS EFFECTS ACCORDING TO GENDER

When a task has to be performed under a binding time constraint, individuals have to choose how to manage time in order to obtain the best possible outcome. The ability to work under time pressure is very important in particular typologies of job such as emergency doctor, financial trader, manager.

In this section, we investigate whether being exposed to time pressure during an examination session affects the academic performance of students and whether the effect is heterogeneous according to gender. We focus on results obtained by students at the first test of the experimental exam, since only in this case the treatment and control groups are balanced in terms of observable characteristics and the effect is not influenced by feedback. We estimate the following linear regression model:

$$GradeAtFirstTest_i = \beta_0 + \beta_1 Time\_pressure_i + \beta_2 \mathrm{X}_i + \varepsilon_i$$

where *Grade at First Test* is the dependent variable of the model, that is the grade that the student scores at the first test of the experimental exam; *Time_Pressure* is the dummy for the treatment group; *X* denotes the vector of student's predetermined characteristics, cognitive ability, and the interaction term between *Female* and *Time_Pressure* in the specifications aimed at investigating gender differences in performance under time constraints; ε is an error term.

Table 4 reports OLS estimates for the impact of time pressure on students' academic performance. In the first two columns, students' academic performance is measured using the grade obtained at the first test. The first specification controls only for the impact of time pressure. It emerges a negative and statistically significant relationship between time pressure and grade: treated students who had to complete the exam in half an hour obtain an overall grade at the exam that is on average 3.10 points lower than the grade obtained by control students who had a completion time of one hour. [52]

[52] Our findings show that students' performance may worsen when they work under pressure. However, this

The second specification adds among controls students' personal characteristics and cognitive abilities. The impact of time pressure is negative, statistically significant at the 10 percent level and slightly smaller in size. As far as control variables are concerned, the impact of gender is not statistically significant while students' cognitive abilities, represented by a higher high school grade and having attended a lyceum, are positively and statistically significantly correlated with the grade obtained.

We run the same specification considering as measure of academic performance the probability of passing the exam.[53] The negative relationship between time pressure and performance persists with an effect statistically significant at the 5 percent level: having less time to complete the exam reduces the probability of passing it.

Unfortunately, we do not have information on family background (parents' education and occupation) for the whole sample of students. In the sub-sample of students taking the first intermediate exam, we have such information for 83 students. Although we prefer to keep the whole sample for the main analysis, we have run the same specification on the restricted sample of 83 students controlling also for family background. We find that the negative effect of time pressure remains negative and statistically significant (at the 10 percent level) also when controlling for students' family background.

[Table 4 Here]

In columns (3) and (4) we estimate the same specification of column (2) by splitting the overall grade in its two components. We find that being exposed to time pressure exerts a negative and statistically significant impact on performance when looking at the grade scored in the verbal part of the test. Students who had to complete their test with binding time constraints have a grade that is 1.63 points lower in the verbal task, compared to

result does not give rise to ethics concerns because students taking part to the experimental exam were facilitated both by the fact that each test was only on half of the taught program and by the opportunity to exit the experiment and take the traditional exam after both the first and the second test.

[53] We built a dummy variable taking the value of 1 if the grade obtained by the student is equal or higher than 18 (the minimum passing grade) and 0 otherwise. About 60% of the sample passed the exam.

students who had a completion time of one hour. Only weakly statistical significance (15%) emerges for the numerical task.

After having assessed the existence of a negative impact of time pressure on students' performance, both overall and in the two typologies of task considered individually, we inquire whether the reactions of students to time pressure differ according to gender and whether this heterogeneity depends on the typology of task considered.

At this aim, we include among regressors the interaction term between the treatment status *Time Pressure* and the dummy *Female*. Results are reported in Table 5. In column (1) we report OLS estimates obtained using as outcome variable the overall grade obtained by students. The interaction term is statistically significant at the 13.5 percent level. A male student having to complete the exam under time pressure obtains an overall grade at the exam which is about 6.64 points lower than a male student with a non-binding completion time (the effect is statistically significant at the 5 percent level); on the contrary no statistically significant effect of time pressure emerges for females (-1.2751= -6.6376+5.3626; *t*-stat=-0.66).

[Table 5 Here]

In columns (2) and (3), to investigate whether such heterogeneity depends on the typology of task students had to complete, we replicate the specification reported in column (1) considering as dependent variable the grade obtained in the *Numerical Task* and in the *Verbal Task*, respectively.

When looking at the numerical task, which is typically considered as a masculine task because males have been found to perform better and to prefer such typology of tasks (Gneezy, Niederle, and Rustichini, 2003; Niederle and Vesterlund, 2007; Shurchkovy, 2012), we find that males and females react differently to *Time Pressure*. The coefficient of *Time Pressure* shows that males exposed to a binding time constraint, in the numerical part of the test, obtain a grade which is 3.6025 points lower than males with non-binding completion time (the effect is statistically significant at the 5 percent level). On the other hand, the linear combination of the interaction term with the coefficient of the treatment

shows that time pressure does not exert a statistically significant effect on females (-0.2550=-3.6025+3.3475; *t*-stat=-0.25).

Gender differences are smaller in magnitude and weakly statistically significant when we look at the verbal component of the intermediate exam. In this case, we find a negative and significant effect for males (-3.0351) and a smaller negative but not statistically significant effect for females (-1.0201=-3.0351+2.0151; *t*-stat=-0.88). However, this difference is weakly statistically significant (the interaction term is not statistically significant).

3.5 CONCLUDING REMARKS

Time is a valuable commodity in our lives. In today's society, characterized by strong competition, rapid changes in technology and innovation, the faster things can be done, the better it is. Therefore, many decisions and activities are made under time constraints. This may generate feelings of stress, which in turn can affect the performance in the task.

Recently, Shurchkovy (2012), using controlled experiments involving the execution of verbal tasks, has studied individual performance with and without time pressure, finding that women perform significantly better than men in verbal tasks in a competitive environment without time constraints. The better performance of women is due to their better use of the extra time: women increase the quality of their work effectively reducing the number of mistakes; on the contrary, men use the extra time to increase the quantity, thus producing a higher volume of work but also increasing the share of mistakes.

In this paper, we investigate whether experiencing time pressure affects individual performance in tasks carried out under binding time constraints and whether the effect is heterogeneous according to gender. At this aim, we run a randomized field experiment involving undergraduate students enrolled at an Italian university. The experiment consisted in two written tests to be taken in the middle and at the end of the classes, respectively, asking both numerical and verbal questions. Students willing to sit the "experimental exam", rather than the "traditional exam", have been randomly assigned to two groups: one group had to perform the test under binding time constraint, the other

under no binding time constraint. Students assigned to the binding time constraint group in the first test were switched to the no binding time constraint group in the second test and *viceversa*.

We find that having to perform the test under binding time constraint reduces the grade students achieve at the test, with an effect stronger and more significant for the verbal component of it. Moreover, females seem to better handle time pressure even in the numerical task, which is typically seen as a masculine task. Being exposed to time pressure reduces men's performance by about 6.64 points, 3.60 of which refer to the numerical part of the exam.

We also find that students with a higher high school grade are more likely to decide to take the experimental exam than the traditional exam, and that, once decided to join the experiment and known the assigned group, females are less likely to be absent the day of the first intermediate test. On the other hand, the decision to take also the second intermediate test is mainly driven by the grade achieved at the first intermediate test: students scoring higher grades are more likely to sit the second test instead of switching to the traditional exam.

All in all, our findings suggest that an environment characterized by time pressure negatively affects students' performance and that female students do not seem to differ significantly from males in their ability to handle time pressure. According to our evidence, the lower share of women in high-qualified jobs, often requiring exposure to binding time constraints, is not likely to depend on females' difficulty to manage time pressure. Our results are in contrast to the main findings of Shurchkovy (2012), who ascribes gender inequality to a weaker performance of females under time pressure. These contrasting findings might be related to the fact that we study the effect of time pressure in a non-competitive environment, while Shurchkovy considers a competitive environment. It could be that in competitive environments women under perform under time pressure, while they are able to better handle time constraints in non-competitive settings.

However, the few works on this topic do not allow to reach conclusive results and further research is required to understand how men and women react to time pressure and how this reaction is related to other environment's characteristics. It would be also interesting to study whether the repeated exposition to time pressure helps at reducing its

negative effect on performance and to investigate whether there exists an "optimal" level of time pressure that can actually improve individuals' performance (as in Andrews and Farris, 1972).

APPENDIX

Time pressure and students' performance: second intermediate test

In this appendix we investigate the impact of time pressure in the subsample of 58 students who attended both the first and the second intermediate tests.

Table A1 shows OLS estimation results for six different specifications. In the first three columns we investigate whether having to complete the second intermediate test under time pressure affects students' performance, both overall and in the two different tasks; in the last three columns we run the same specifications including among controls the interaction term between *Female* and *Time Pressure* in order to catch gender heterogeneity in the ability to work under time pressure.

We find that being exposed to time pressure reduces students' grade in the verbal component of the test by 1.9 points with an effect statistically significant at the 5 percent level. The impact on the overall grade is negative while having less time seems to encourage students to better perform in the numerical component of the exam, although both coefficients have no statistical significance. Females perform better than males in verbal tasks although the coefficient is no longer statistically significant when considering also the interaction term. No statistically significant differences emerge between males and females assigned to the "binding time constraint group". The main determinant of students' performance in the second test is the grade they achieved in the first test: the higher such grade, the higher their mark in the second test.

Table A1. Effect of Time Pressure. Second intermediate test: OLS estimates

Variables	Grade at Second Test (1)	Numerical Task (2)	Verbal Task (3)	Grade at Second Test (4)	Numerical Task (5)	Verbal Task (6)
Time Pressure	-1.7288	0.1748	-1.9036**	-2.1229	0.4035	-2.5264**
	(1.1341)	(0.7444)	(0.7443)	(2.0988)	(1.5346)	(1.2422)
Female	1.1083	-0.5063	1.6146**	0.8120	-0.3343	1.1463
	(1.2547)	(0.8938)	(0.7885)	(2.0347)	(1.4498)	(1.2709)
*Time pressure*Female*				0.5708	-0.3313	0.9020
				(2.5746)	(1.7371)	(1.6897)
Grade First Intermediate Test	0.9432***	0.4892***	0.4540***	0.9506***	0.4849***	0.4657***
	(0.1006)	(0.0720)	(0.0717)	(0.1096)	(0.0739)	(0.0802)
Observations	58	58	58	58	58	58
R-squared	0.6381	0.5108	0.5347	0.6384	0.5112	0.5369
Effect for Females				-1.5521	0.0723	-1.6244
P_Value				0.2693	0.9309	0.1052

Notes: Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

As explained in section 3.2, we cannot rely too much on data on students taking the second intermediate test to examine how students behave under time pressure. Indeed, results can depend either on the small sample size (only 58 out of the 86 students taking the first test decided to take also the second one) or on the feedback received after the first test, both in terms of the grade scored and in terms of self-evaluation of the time needed with respect to the complexity of the exam. They could also have shifted their effort from the verbal to the numerical task, or *viceversa*, in relation to the feedback they received from the first test.

Table 1. Descriptive Statistics

	Enrolled at Course	Joining the experimental exam	Showing up at the first test	Showing up at the second test
Variables	Mean (Standard Deviation)			
Female	0.64780	0.62832	0.68605	0.68966
	(0.47917)	(0.48541)	(0.46682)	(0.46667)
High School Grade	88.755	89.566	90.8605	90.345
	(8.7140)	(8.6663)	(7.9160)	(8.3824)
Lyceum	0.49057	0.42478	0.34884	0.58621
	(0.50149)	(0.49651)	(0.47940)	(0.49681)
Time pressure		0.52212	0.5	0.51724
		(0.50173)	(0.50293)	(0.50407)
Grade at First Test			18.389	23.276
			(7.7355)	(7.3103)
Verbal Task			9.2558	11.629
			(4.4336)	(4.2474)
Numerical Task			9.1337	11.647
			(4.1773)	(4.0349)
Observations	159	113	86	58

Notes: Grade at First Test ranges from 2 to 32. The minimum passing line is 18. High School Grade ranges from 60 to 100 and both Numerical task and Verbal task range from 0 to 16.

Table 2. Students' characteristics across treatment and control groups

	Means		Differences (s.e.)	*F*-stat (*p*-value)
	Time Pressure	Control		
Female	0.65116	0.72093	-0.06977	0.47727
	(0.48224)	(0.45385)	(0.10099)	(0.62078)
High School Grade	90.069	91.651	-1.5814	0.85660
	(8.5367)	(7.2568)	(1.7086)	(0.42528)
Lyceum	0.41860	0.27907	0.13953	1.83942
	(0.49917)	(0.45385)	(0.10288)	(0.16008)
Observations	43	43		

Notes: Standard errors are reported in parentheses. In the last column, we report the *F*-stat and *p*-value for a test of equality of variables' means across all three groups.

Table 3. Determinants of students' participation decisions

Variables	Joining the Experimental Exam	Joining the Experimental Exam	Not showing up at the first Test	Not showing up at the first Test	Not showing up at the second Test
	(1)	(2)	(3)	(4)	(5)
Female	-0.0615	-0.1052	-0.1759**	-0.2316**	0.1964
	(0.0759)	(0.0784)	(0.0748)	(0.1105)	(0.1510)
High School Grade Quartile I				0.2397	
				(0.1507)	
High School Grade Quartile II				0.0572	
				(0.1757)	
High School Grade Quartile III				-0.1570	
				(0.1668)	
High School Grade		0.0072*			
		(0.0043)			
Lyceum		-0.1051		0.1502	
		(0.0739)		(0.1222)	
Time Pressure				0.0202	-0.1225
				(0.1901)	(0.2551)
*Time pressure*Female*				0.1982	-0.1984
				(0.1510)	(0.2062)
*Time Pressure*HSG Quartile I*				-0.1248	
				(0.2065)	
*Time Pressure*HSG Quartile II*				-0.0380	
				(0.2407)	
*Time Pressure*HSG Quartile III*				0.2260	
				(0.2123)	
*Time Pressure*Lyceum*				-0.1577	
				(0.1570)	
Grade at First Test					-0.0369***
					(0.0082)
*Time Pressure*Grade at First Test*					0.0122
					(0.0133)
Observations	159	159	113	113	86
R-squared	0.0034	0.0365	0.0403	0.1298	0.2313

Notes: Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 4. Time Pressure and Performance: OLS estimates

Variables	Grade at first test (1)	Grade at first test (2)	Numerical Task (3)	Verbal Task (4)
Time Pressure	-3.1047*	-2.9065*	-1.2734	-1.6331*
	(1.6436)	(1.6526)	(0.8755)	(0.9682)
Female		2.2851	1.2192	1.0659
		(1.6781)	(0.9254)	(0.9953)
High School Grade		0.2092**	0.1435***	0.0657
		(0.0948)	(0.0478)	(0.0594)
Lyceum		3.1405*	1.6691*	1.4714
		(1.7269)	(0.9178)	(0.9931)
Observations	86	86	86	86
R-squared	0.041	0.134	0.146	0.084

Notes: Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 5. Heterogeneous Effects of Time Pressure according to Gender: OLS estimates

Variables	Grade at first test (1)	Numerical Task (2)	Verbal Task (3)
Time Pressure	-6.6376**	-3.6025**	-3.0351*
	(3.0099)	(1.6417)	(1.7374)
Female	-0.5201	-0.5319	0.0118
	(2.6266)	(1.3700)	(1.5944)
*Time pressure*Female*	5.3626	3.3475*	2.0151
	(3.5555)	(1.9260)	(2.0705)
High School Grade	0.1962**	0.1354***	0.0608
	(0.0934)	(0.0465)	(0.0592)
Lyceum	3.3864*	1.8226**	1.5638
	(1.7138)	(0.9012)	(0.9929)
Observations	86	86	86
R-squared	0.159	0.180	0.095
Effect for Females	-1.2751	-0.2550	-1.0201
P_Value	0.5115	0.8007	0.3788

Notes: Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

CHAPTER 4

Overconfidence, Omens and Gender Heterogeneity:

Results from a Field Experiment

Abstract

We investigate whether overconfidence is affected by superstitious beliefs and whether the effect is heterogeneous according to gender. At this aim we run a field experiment involving about 700 Italian students. According to widespread superstitions, some numbers are considered lucky, while others are thought as unlucky. In our experiment, we exploit this by randomly assigning students to numbered seats in their written exam. At the end of the examination, we asked students the grade they expected to get. We find that students tend to be systematically overconfident about their performance at the exam and that their overconfidence is positively affected by being assigned to a lucky number. Interestingly, males and females react differently: females tend to expect lower grades when assigned to unlucky numbers, while they are not affected by being assigned to lucky numbers; males are not affected by being assigned to unlucky numbers but expect higher grades when assigned to lucky numbers.

Keywords: Expectations; Grade; Overconfidence; Gender Differences; Emotions; Superstition

JEL Classification: D01, D83, D03

4.1 INTRODUCTION

Psychological studies, surveys and laboratory experiments show that human beings are characterized by overconfidence: they tend to overestimate their ability, their knowledge and the precision of their information (Della Vigna, 2009).

Existing literature features two types of overconfidence: "absolute overconfidence" or "stand-alone overconfidence", a form of self-evaluation in absolute terms (Yates et al., 2002) and "relative" or "referential" overconfidence, when it requires comparison with others (Alicke et al., 1995; Glaser and Weber, 2007; Grieco and Hogarth, 2009). Examples of absolute overconfidence are the excessive expectation about self-control ability found in the choice of health club contracts (Della Vigna and Malmendier, 2006), the wrong prediction of the time needed to complete a task and the overestimation of the accuracy of own information (Buehler et al., 1994; Newby-Clark et al., 2000). As regards relative overconfidence, Svenson (1981) shows that subjects perceive their driving skills higher than the average driver, while Camerer and Lovallo (1999) provide evidence on the overestimation of one's own ability to start a business relative to others.

Overconfidence occurs with varying intensity depending on gender, with males being more overconfident than females, is negatively correlated with age and abilities and depends on the type of task carried out (Barber and Odean, 2001; Bengtsson et al., 2005; Niederle and Vesterlund, 2007). Overconfidence comes out in many professional fields: Cooper et al. (1988) study entrepreneurs and their excessive optimism; Bauman et al. (1991) investigate overconfidence among physicians and nurses; Malmendier and Tate (2005, 2008) show how CEOs overestimate their ability to manage a company; Kent et al. (1998) consider investors' overconfidence about the precision of their private information; Menkhoff et al. (2006), studying the effects of experience for fund managers, find that inexperienced fund managers yield higher return because they have a higher degree of overconfidence that makes them more willing to risk, confident that they can beat the odds; similar results are shown by Camerer and Lovallo (1999) that explain the high rate of business failure in relation to overconfidence, which leads to excess entry.

Some recent works (Niederle and Vesterlund, 2007; Datta Gupta et al., 2013; Örs et al., 2013) show that gender differences in overconfidence are greatly responsible for

women's tendency to shy away from competition; this, in turn, could explain female under representation in top positions. However, little is known about the factors that lead individuals to different levels of confidence. Since overconfidence represents a deviation from the traditional economic paradigm – which assumes that individuals are on average correct about the distribution of the states – it could happen that overconfidence itself, like human behaviour in general, is influenced by incidental emotional states or by irrational factors. For example, Ifcher and Zarghamee (2011a, 2011b) find that both positive and negative affects significantly increase overconfidence in a laboratory experiment.[54]

In our work, we analyse gender differences in overconfidence and whether males and females react differently to positive and negative factors that may induce positive or negative feelings. At this aim, we have conducted a field experiment involving about 700 students enrolled at a middle sized Italian public University and attending four different economics classes in the academic years 2010-2011 and 2011-2012. During the examination sessions, each student was randomly assigned to a numbered seat and was given a corresponding numbered examination form.

Our investigation strategy relies on the fact that, according to superstitious beliefs, still widespread in Italy, some numbers are considered lucky, while others are considered unlucky (see, among others, Schimmel, 1994; Warning, 2009; Hiller, 2012). Therefore, the randomly assigned number at the exam represents a positive or negative "element", which may induce feelings for superstition-prone individuals.

Superstitions seem to be relevant for individual behaviours and are then expected to affect individual feelings. For example, O'Reilly and Stevenson (2000) show that in Northern Ireland patients prefer delaying the day of discharge from maternity units to avoid the bad luck of Saturdays; Lewis and Gallagher (2001) study the unwillingness of college students of taking a test on "Friday the Thirteenth". Similarly, Kolb and Rodriguez (1987) investigate the effects of superstition on financial markets showing lower mean returns for "Friday the Thirteenth". The beliefs in "lucky" and "unlucky" numbers have been found to have effects on the prices of houses (Bourassa and Peng, 1999), on the prices of vehicle

[54] Good and bad mood seem to affect individual attitudes towards reciprocity (Kirchsteiger et al., 2006), time and risk preferences (Drichoutis and Nayga, 2010), bidding (Capra et al., 2010) and perceived probabilities (Fehr-Duda et al., 2011).

license plates in China (Woo and Kwok, 1994; Woo et al., 2008; Ng et al., 2010) and on the timing of babies' birth year (Wong and Yung, 2005).

In our experiment, students taking some economics exams were randomly assigned to seats and examination forms numbered from 1 to 30. In the Italian popular culture the number 17 is considered unlucky, while the number 13 is thought to be a lucky number (in contrast to the Anglo-Saxon tradition). In addition, in the context of college students, the number 30 (corresponding to the maximum grade that students may obtain at an exam) is considered a lucky number. As a consequence, we consider students assigned to the seats and examination forms numbered 17 as exposed to a negative stimulus (which we call *Bad Omen*), while students assigned to seats 13 and 30 are subject to a positive stimulus (*Good Omen*). These represent our two treatment groups. All the other students assigned to the remaining numbered seats constitute our control group. The assignment to lucky or unlucky numbers is aimed at introducing a positive or a negative shock in a real life situation in order to study individual response and whether this response varies according to gender. The attempt of introducing a positive or a negative stimulus is common to the literature studying individual reaction to emotions. Compared to this literature in which positive and negative feelings are induced via audio-video stimuli, we have decided to rely on the experimental design described above because the simple assignment of students to numbered seats with lucky and unlucky numbers in the context of a real life situation (a university examination) should be perceived as less artificial and then be less affected by biases arising from a laboratory setting and from the fact that individuals are aware of being involved in an experiment ("Hawthorne" and "John Henry" effects).

Once students had accomplished their exam, we asked them to answer a short survey including questions about their expected grade at the exam and about the average grade they expect their peers will get. We matched this information with the effective grades obtained by students at exams and with administrative data on student's gender, academic abilities and family background.

From our analysis it emerges that students are typically overconfident, in that they expect higher grades than those effectively obtained. Moreover, they expect to perform better than their peers. More importantly, we find that absolute and relative overconfidence

are positively affected by the *Good Omen* and negatively affected by the *Bad Omen* (the latter effect has weaker statistically significance).

In line with the existing literature on gender differences in attitudes, we find that females tend to be less overconfident than males, although the gender effect is imprecisely estimated. Then, we investigate the existence of gender heterogeneity in the effect of the treatments. Interestingly, we find that males and females react differently to the positive and negative treatment. On the one hand, females tend to expect lower grades when assigned to the unlucky numbers, while they do not seem to react to the lucky numbers. On the other hand, we find that males are not affected by the negative treatment but expect higher grades when assigned to the lucky numbers. Consistently with other findings on male-female differences (Croson and Gneezy, 2009; Bertrand, 2010), our results suggest that not only females tend to be less confident than males, but that they are more susceptible to negative stimuli, while males tend to ignore negative stimuli and are instead affected by positive stimuli.

Women's tendency to focus on negative aspects might also explain their higher degree of risk aversion. Gender differences in psychological attitudes are often considered responsible for females under-representation in leadership positions and in highly paid jobs (e.g. Niederle and Vesterlund, 2007; Ertac and Gurdal, 2012). Our finding suggests that in order to improve female's educational and career outcomes it could be useful to change the type of stimulus they receive. For example, if women are more likely to focus on negative aspects, it might result beneficial, when presenting the costs and the benefits of different alternatives, to try to attract their attention on the benefits. This would help them to give the right weight to both negative and positive aspects and improve their decision making process. A similar strategy is suggested also by Hügelschäfer and Achtziger (2013) who show that inducing implemental mindset may help women be more confident on their own abilities.

The chapter is organized as follows. In Section 4.2 the design of the experiment is explained and some descriptive statistics are provided. Section 4.3 investigates the effects of the positive and negative emotions related to superstition on overconfidence and relative overconfidence. In Section 4.4 we analyse heterogeneous effects according to gender.

Section 4.5 offers some robustness checks. Section 4.6 examines if the effective performance is also affected by superstitious beliefs. Section 4.7 concludes.

4.2 EXPERIMENT DESCRIPTION AND DATA

The experiment we conducted has involved 719 students enrolled at the classes of Microeconomics, Macroeconomics, Personnel Economics and Econometrics offered by the First Level Degree Course in Business and Administration at the University of Calabria in the academic years 2010-2011 and 2011-2012.[55]

The aim of the experiment is to understand whether negative and positive feelings evoked by superstitions affect students' expectations. Our investigation strategy relies on the fact that the Italian popular culture is still characterized by superstitious beliefs, that have been passed down for generations, especially in the South.

According to the Italian culture the number 17 is unlucky (Warning, 2009; Hiller, 2012). Since Italians consider 17 as a bad omen you do not find a 17th row in a theatre or in a cinema or a seat with the number 17. Some Alitalia planes have no row 17 and Renault sold its "R17" model in Italy as "R177".[56] On the other hand, while the number 13 is considered unlucky in many countries, in Italy it is considered to be a lucky number. A "13" in the popular football pool "Totocalcio" is the equivalent of the big prize. In the South of Italy, until recently, talismans with the number 13 were very diffuse. Finally, in the context of college students, the number 30 is also considered as a good omen since it is the maximum grade students can obtain at a university exam.

To assess students' attitudes toward the numbers 17, 13 and 30 we have conducted

[55] The University of Calabria is a middle-sized public university located in the South of Italy. It has currently about 35,000 students enrolled in different Degree Courses and at different levels of the Italian University system. Since the 2001 reform, the Italian University system is organized around three main levels: First Level Degrees (3 years of legal duration), Second Level Degrees (2 years more) and Ph.D. Degrees. In order to gain a First Level Degree students have to acquire a total of 180 credits. Students who have acquired a First Level Degree can undertake a Second Level Degree (acquiring 120 more credits). After having accomplished their Second Level Degree, students can enroll in a Ph.D. degree.

[56] The 17th curve at the Cesana bobsled run at 2006's Winter Olympics in Turin was "Senza Nome" (i.e. "Without a name").

preliminarily a survey among a sample of 141 students (81 females and 60 males) who were not involved in the experiment.[57] We asked these students whether they believe in lucky and unlucky numbers. Only 22.7% of students answered that they do not believe at all in lucky or unlucky numbers. This percentage is slightly higher among males: 27% against 20% of females. We also asked students to choose among 8 different numbers (2, 5, 10, 13, 17, 23, 29, 30) and to associate them to good and bad luck. It emerges that the number 17 is associated to bad luck by 55.2% of sample students (67% of males and 47% of females). This percentage is significantly higher compared to the percentage of students indicating any other number (the second and third ranked "bad" numbers are "2" and "13" with a percentage of 11% and 10% of students selecting them). On the other hand, the number "13" is considered lucky by about 38% of students (43% of males and 35% of females), while the number 30 is indicated as a lucky number by 26% of students (the same percentage for males and females). Both these percentages are significantly higher compared to those associated to any other number (the number "10" is the third ranked lucky number by 15% of students). All in all, the results from our survey confirm that students enrolled at the University in which we conduct our experiment share the same superstitious beliefs that are common in the area in which they live.

Given these superstitions, we expect that students who are exposed to the number 17 experiment negative feelings, while students exposed to the number 13 or to the number 30 experiment positive feelings.

Typically, in the Italian system, during an examination session students do not have a pre-assigned numbered seat: before the exam starts, they are called individually (usually in alphabetic order) and they take the first available seat.

In order to study whether superstitions related to lucky or unlucky numbers affect students' expectations, we prepared for the experiment – before students' arrival - the classroom in which the written exams took place. We numbered the seats in each row of such large classroom from 1 to 30. For logistic reasons and for leaving some distance among students we only used 15 numbered seats and left unfilled the other 15 in each row.

[57] The survey was conducted the semester preceding the experiment and has involved students of a different cohort attending a course of Accounting.

Then, we assigned students to these seats according to a randomization that we carried out in advance.

More precisely, on the basis of the available administrative information on students' characteristics, we proceeded to the stratification of students sitting each exam according to the High School Grade (three categories). For each group of 15 students, we randomly assigned one student to seat 17 (*Bad Omen*), one student to seat 13 and one student to seat 30 (*Good Omen*).[58] The remaining students were randomly assigned to the other numbered seats.

As a result of this procedure, we end up with a control group of 550 students (76.5%) that is much larger compared to the two treatment groups, respectively 61 (8.5%) for the *Bad Omen* and 108 students (15%) for the *Good Omen*.[59]

At the beginning of the examination session, we called students individually and made them aware of the number of the seat assigned to them. Moreover, to reinforce the negative and positive stimuli, students received an examination form with the same number printed on it (i.e. the student sitting at the seat 3 has the examination form numbered 3). To avoid to influence their reactions, they were not told to be involved in an experiment.

The classes involved in the experiment were taught to students during the second semester (teaching period from March to June) of two academic years (2010-2011and 2011-2012). As the treatment and the control status was assigned only at the moment in which students took their exam, treated and control students attended the classes in the same room, at the same time and with the same instructor and teaching material. At the end of the teaching period, in July, students were required to undertake the exam for the respective class (in two sessions). Examinations were based on multiple choice tests.

At the end of the exam, students were required to fill a short survey aimed at measuring their expectations regarding the outcome of the exam. More precisely, students were required to answer the following two questions: 1) "What grade do you expect to get at this exam?"; 2) "What grade do you expect that the other students will get on average at

[58] When the number of students included in each stratified group was not a multiple of 15, each of the remaining students were simply assigned with a probability of 1/15 to each of the treated groups and with a probability of 12/15 to the control group.

[59] On the whole, about 300 students who were supposed to take the exam were absent from the examinations. Since students did not know the seat assigned to them before the examination, absent students were independent from the treatment status and no sample selection problem arises.

this exam?". For both questions respondents could select a grade ranging from 0 to 30 *cum laude*, which we consider equal to 31.[60] We reassured students that we would have looked at their answers only after having graded their exams.[61] We use the answers of students to build two measures of students' expectations. The answers to the first question allow us to build the variable *Expected Grade*; while we build an indicator of the student's *Relative Expected Grade* as the difference between his/her expected grade and the average grade s/he expects to be obtained by his/her peers.

Furthermore, we create both a measure of absolute overconfidence, *Overconfidence*, computed as the difference between student's *Expected Grade* and the actual grade s/he gets at the exam (*Grade*) and a measure of *Relative Overconfidence*, computed as the difference between the student's relative expectation and his/her relative performance (that is, *Relative Overconfidence=Relative Expected Grade–*(*Grade–Average Grade*), where the *Average Grade* is the average grade obtained by all the students sitting the same exam in the same session).

Table 1 provides descriptive statistics for our sample of students. 42% of students have undertaken the *Microeconomics* exam, 15% *Macroeconomics*, 37% *Personnel Economics* and 6% *Econometrics*. About 59% of students are females. *High School Grade* ranges from 60 (the minimum passing grade) to 100 (the maximum grade), with a mean of 88.9. Students come from *Technical Schools* (54%) and *Lyceums* (about 46%). The variable *Regular* shows that about 77% of sample students are regularly enrolled, while the remaining 23% have not passed all the exams that they were supposed to pass, thus being late in their academic career. The exams were undertaken in two academic years and in two sessions per year. The average number of years of education for parents ranges from 3 to 18, with a mean of 11.32.[62]

We observe grades both in passed examinations (18-31) and in failed examinations (grades below 18); the effective *Grade* students obtain on average is 18.03. The mean

[60] *Expected Grade* was an integer, whereas the grade expected for others was with one decimal place.

[61] In order to make our announcement credible, we have put students' answers to the survey in a closed envelope (signed by two students) and we have opened the envelope at the presence of students after having corrected the exams and having published the results on courses' web pages.

[62] We do not have information about the age of students. However this is not a major concern for our analysis because the variable *Regular* catches the effect of student's age. In fact, students that are regularly enrolled have almost the same age while students that are late in their academic career are typically older. Moreover, people that decide to enroll at university some years after the end of High School studies (thus having an age different from that of regular students) represent only few cases in the university we consider.

Expected Grade is 20.72. Students have a strong positive level of *Overconfidence*: they expect to pass the exam with a grade that is on average 2.687 points higher than the effective one. The median value of *Overconfidence* is 2; about 60% of students (427/719) expect a grade higher than their effective grade.

[Table 1 Here]

Students feel overconfident also with respect to their peers. *Relative Expected Grade* shows that students on average expect to perform about 1.67 points better compared to what they expect for their peers. About 71% of students (519/719) expect to perform better than their peers. The level of *Relative Overconfidence* is 1.67.[63]

We firstly verify if the randomization has been successful. In the first three columns of Table 2, means for a number of individual characteristics are reported by treatment groups. Differences in means between *Good Omen* and *Control*, and *Bad Omen* and *Control* are reported in columns (4) and (5), respectively (standard errors are reported in parentheses). In column (6) we report the *F*-stat (and *p*-value) for a test of equality of variables' means across all three groups.

Results show that the randomization was successful in creating comparable treatment and control groups as regards the observable characteristics: there are no significant differences between the treatment status in terms of students' gender, *High School Grade*, type of high school attended, parents' education and class attended.

[Table 2 Here]

[63] Given how *Relative Overconfidence* is built, the mean of *Relative Overconfidence* coincides with the mean of *Relative Expected Grade*.

4.3 GRADE EXPECTATIONS, OVERCONFIDENCE AND GOOD AND BAD OMENS

4.3.1. Expected Grade and Absolute Overconfidence

A large psychological literature shows that people tend to bias their judgments by overestimating their skills, the precision of their information and their self-control abilities. Such a behaviour represents a deviation from the perfect rationality assumption and is likely to be affected by incidental emotional states or by non-informative elements.

In this section, we investigate whether students' superstitions and their exposition to emotional stimuli, in the form of seats' numbers associated with positive or negative omen, does affect their expectations and their level of overconfidence. We estimate the following linear regression model:

$$Expected\_Grade_i = \beta_0 + \beta_1 Good\_Omen_i + \beta_2 Bad\_Omen_i + \beta_3 Grade_i + \beta_4 X_i + \beta_5 Z_i + \varepsilon_i$$

where *Expected Grade* is the dependent variable of the model; *Grade* is the effective grade students obtain; *Good Omen* and *Bad Omen* are the two dummies for treatment status as described in section 4.2, *X* denotes the vector of student's predetermined characteristics, cognitive ability, and family background and *Z* denotes the vector of additional control variables (dummies for class attended, examination session and academic year in which the student took the exam); ε is an error term.

Furthermore, we estimate a similar model to analyse directly if overconfidence is affected by superstitions and emotions:

$$Overconfidence_i = \phi_0 + \phi_1 Good\_Omen_i + \phi_2 Bad\_Omen_i + \phi_4 X_i + \phi_5 Z_i + v_i$$

We start by focusing our attention on student's expectations and absolute overconfidence to investigate whether being assigned to the *Good Omen* or to the *Bad Omen*'s seat during the exam influences students' capacity to estimate their ability and their knowledge. In the next section, we turn our attention towards relative overconfidence and

question whether students' superstitious beliefs or the emotions induced by these beliefs affect also the relative judgment of their own ability.

Table 3 reports the estimation results of an OLS model in which we investigate whether being exposed to *Good Omen* and to *Bad Omen* influences expectations concerning the grade obtained at the exam. The dependent variable is the *Expected Grade*, but as we include among controls the effective grade obtained at the exams, our estimations indirectly describe the determinants of the gap between expected and effective performance. In columns (1), (2) and (3) we jointly consider the two lucky numbers (13 and 30) defining the *Good Omen*, while in columns (4), (5) and (6) the same specifications are reported by splitting the *Good Omen* in its two components, *Thirty* and *Thirteen*.

In the first specification (columns 1 and 4) we only control for the grade obtained at the exam, the class attended by the students, the academic year and the examination session in which they took the exam (not reported). We find a strong positive impact for the *Good Omen* (statistically significant at the 1 percent level): students receiving the good omen expect to have 1.09 points more than control students. On the other hand, the coefficient of *Bad Omen* is negative but far from being statistically significant. The effective *Grade* is a strong determinant of the expected grade: the higher the grade a student actually obtained at the exam, the higher the grade s/he was expecting to get at the end of the exam. The coefficient is 0.521 and *t*-stat is 19.56, suggesting that students have tried to answer sincerely to our questions on grade expectations.

In the specification in which we split the *Good Omen* in its two components (column 4), both the two lucky numbers have a positive effect: the coefficient on *Thirty* is positive (1.18) and significant at the 5% level, while that on *Thirteen* is positive (1.01) and significant at the 10% level.

In the second specification (columns 2 and 5) we add among controls student's gender and measures of individual ability – represented by the variables *Lyceum*, *High School Grade* and *Regular*. Also with these controls, we find that the exposition to a positive stimulus is an important driver of the formation of student's expectations. The positive relationship between the *Good Omen* and the expected grade at the exam remains statistically significant in both columns. The coefficient of the *Bad Omen* remains negative but not statistically significant.

Finally, in the third specification (columns 3 and 6) we include controls for family background (parents' average years of education).[64] Also in this specification the relationship between the *Good Omen* and the expected grade remains positive and statistically significant: students exposed to a positive stimulus have an expected grade of about 1 point higher than students in the control group. Results do not change for the *Bad Omen*'s coefficient (not significant).

[Table 3 Here]

As far as control variables are concerned, females expect lower grades, but the coefficient is not statistically significant at conventional levels. *High School Grade* and *Regular* seem to be two important determinants of the expected grade. Students that score a higher grade at High School tend to expect lower grades compared to students with a lower High School grade. Being a regularly enrolled student increases expected performance, probably because these students are younger compared to the reference category. It does not emerge a statistically significant effect for students' family background.

Table 4 presents the results of OLS estimates for the same specifications reported in Table 3, but considering as dependent variable the level of absolute *Overconfidence*, i.e. the difference between the *Expected Grade* and the effective *Grade* obtained at the exam by each student. In the specifications reported in Table 4 we do not control for *Grade* since it is used in the computation of students' overconfidence.

Preliminarily, regressing *Overconfidence* only on a constant, we verify that *Overconfidence* is statistically different from zero (t-stat=11.94): students systematically expect grades higher than their effective grades.

The results in Table 4, by and large, confirm the results shown in Table 3. Females appear to be less overconfident than males (however, the statistical significance of *Female* is rather low, p-value=0.22). Students with higher *High School Grade* or coming from academic oriented schools (*Lyceums*) are significantly less overconfident, maybe because more skilled individuals are more able to assess the level of their cognitive ability. *Regular*

[64] Controlling also for the type of employment of parents does not change our results.

students are instead more overconfident, maybe because they are younger. *Parents' education*, once controlling for measures of students' academic abilities, does not seem to produce any effect on *Overconfidence*.

More importantly for the aims of our paper, from Table 4 it emerges a positive and statistically significant relationship between the *Good Omen* and students' overconfidence. The coefficient of *Good Omen* in the specification including all the control variables (column 3) shows that being exposed to a positive stimulus increases students' absolute overconfidence by 1.14 points. From the estimates in column (6) it also emerges that students' overconfidence is mostly affected by the superstition linked to the number 13. On the other hand, being exposed to the *Bad Omen* exerts a negative effect on *Overconfidence*, although its statistical significance is not very high (p-value=0.11).

We run the same estimates controlling also for the effective *Grade* (see Table A1). The latter turns out to be strongly negatively correlated to *Overconfidence*: obviously, students performing better seem to have underestimated their performance and viceversa. As regards the effects of our interest, again we find that *Good Omen* has a positive impact and *Bad Omen* has a negative impact on *Overconfidence*.

[Table 4 Here]

4.3.2. Relative Expected Grade and Relative Overconfidence

Usually, when people consider their achievements or their abilities, they not only think in absolute terms, but also use to compare their conditions with those of other individuals with whom they interact. In this section, we focus our attention on this aspect of human behaviour in order to study whether students' relative judgment is influenced by superstition, mood and emotions.

The estimates reported in Table 5 underline an effect of emotional stimuli on students' expected grade relative to the average grade that they expect to be obtained by the other students sitting the exam in the same session. Being in the *Good Omen* group is positively correlated with students' relative expectation. In particular, students that have a

seat and an exam form with the number 30 expect to get a grade that is 1.13 points higher than the grade they expect their peers are going to obtain (see column 4). Also in this case, the *Bad Omen* group does not present statistically significant differences in the relative expectations compared with the control group.

[Table 5 Here]

In Table 6 we replicate the same estimates presented in Table 4 to investigate whether students' relative overconfidence is influenced by the treatments administered in our experiment. The effect of a positive stimulus on *Relative Overconfidence* is similar to the one on absolute *Overconfidence*. In the specification including all the control variables (column 3) the coefficient of *Good Omen* is 1.02, statistically significant at the 10% level, while when we split the *Good Omen* in its two components, although still positive, only the coefficient of the number 13 is statistically significant. The impact of *Bad Omen* is negative (about -1.3) even if the statistical significance is not high (*p*-value around 0.11 in specifications with the whole set of our controls).

[Table 6 Here]

4.4 HETEROGENEOUS IMPACT OF OMENS ACCORDING TO GENDER

In this section we investigate whether the reactions of students in terms of overconfidence to the *Good Omen* and the *Bad Omen* differ according to gender. A large and increasing economic and psychological literature shows that woman and men are different in many domains including their degree of confidence, risk aversion and preferences for competition. We investigate whether gender differences are relevant also in shaping individuals' responses to factors that generate positive and negative feelings. In our

framework, we analyze whether women are particularly sensitive to lucky or unlucky numbers and whether their behavior is similar to the one shown by men.

In columns (1) and (2) of Table 7 we report OLS estimates obtained by re-estimating the specification in column (3) of Table 3, including all our controls, separately for females and males, respectively. Results very similar to those reported in Table 3 are found also estimating a regression without covariates (see Table A2). It emerges that the impact of the *Bad Omen* is negative and statistically significant (the coefficient is -1.65, significant almost at the 5 percent level) only for females, while for males the coefficient on *Bad Omen* is far from being statistically significant. On the other hand, females do not react to the *Good Omen*, while males show a strong and highly statistically significant reaction (+2.13, significant at the 1 percent level).

In column (3), to investigate whether differences between males and females are statistically significant, we estimate our model on the whole sample including among regressors the dummy *Female* and two interaction terms between the treatments status and *Female*. Both interaction terms are statistically significant, implying significant gender differences in overconfidence responses to emotions. We confirm that for males only *Good Omen* has a positive impact on the expected grade (+1.99; *t*-stat=3.11), while for females only *Bad Omen* has a negative impact (-1.63=0.55-2.18; *t*-stat=-1.80).

In columns (4), (5) and (6) we replicate specifications reported in columns (1), (2) and (3), but we consider as dependent variable *Overconfidence*. Also in this case we find that males and females react differently to the *Good Omen* and the *Bad Omen*: females react negatively to the *Bad Omen* while males react positively to the *Good Omen*.

Similar results are obtained when we split *Good Omen* considering the two different lucky numbers assigned to students (13 and 30). Both the two *Good Omens* positively affect men's overconfidence, while no effect emerges for women. Again the *Bad Omen* affects exclusively women (see Table A3).

These results are in line with gender differences in psychological reactions emerged in a number of other studies (Croson and Gneezy, 2009; Bertrand, 2010) finding, for example, that females report more intense stress and fear than males in anticipation of negative outcomes (Roberts and Nolen-Hoeksema, 1989; Fujita, Diener, Sandvik, 1991; Brody, 1993). Similarly, Loewenstein et al. (2001) show evidence of women's pessimism

at the time of making a risky decision; Silverman and Kumka (1987), Flynn et al. (1994) and Spigner et al. (1993) suggest that pessimism may also cause women to overestimate the probability of negative outcomes.

[Table 7 Here]

In Table 8 we replicate the same specifications of Table 7 considering as dependent variables the *Relative Expected Grade* (columns 1, 2 and 3) and the *Relative Overconfidence* (columns 4, 5 and 6). Results support our previous findings: on the one hand, while the *Bad Omen* has a negative impact on women's relative expectations and overconfidence, it has virtually no impact on men; on the other hand, the *Good Omen* exclusively affects males' relative expectations and overconfidence.

[Table 8 Here]

We have also analysed whether the treatment effects are heterogeneous according to student's ability or family background. More precisely, we have looked at the effects of *Bad* and *Good Omen* for students of ability above and below the average *High School Grade* and for parents' education above and below High School level. Quite surprisingly, we do not find heterogeneous effects: results are similar for students with high or low ability and for students with low and high levels of parental education.

All in all, our results suggest that females tend to absorb especially negative "signals" while males' attention is attracted by positive elements. This may explain why women tend to be less confident and more risk averse than men. Moreover, the finding that females, in comparison to males, react to unlucky numbers but do not react to lucky numbers might be suggestive of a more general female tendency to stay focused on negative sides and to give more attention to negative experiences or information over

positive ones. If this tendency is true, being conscious of it would help individuals to make better decisions.

4.5 PLACEBO REGRESSIONS

The estimated effects of the *Good* and *Bad Omen* on overconfidence might reflect genuine responses by students or they might reflect spurious reactions not related to superstitions or emotions.

If these spurious effects were driving our results, we should find them also for numbers that are not associated by popular culture to good and bad omen. To verify this aspect, we estimate some placebo regressions defining some "fake" treatment groups composed, respectively, by students assigned to number 1 (*Placebo:1*)[65] and by students assigned to numbers 11 and 28 (*Placebo:11_28*).

As shown in Table 9, in which we consider as dependent variable *Overconfidence* and report estimates of the specification including the full set of control variables separately for females (columns 1 and 4), males (columns 2 and 5) and for the whole sample (columns 3 and 6), in no specification we do find evidence that the placebo treatment has had a statistically significant impact on students' overconfidence.[66]

No effect emerges also using alternative numbers as placebo treatments. These results reassure us that our estimates of the *Good* and *Bad Omen* effects on overconfidence are not spurious, but are related to superstitions and popular culture. Exactly the same results are obtained if the *Good* and *Bad Omen* are not included in our falsification test.

No effect emerges also when considering as dependent variable *Relative Overconfidence* (see Table A4).

[Table 9 Here]

[65] All seats in the classroom are very similar. However, one might think that since the seat 30 is the last in the row, these seats could be a bit quieter, which might improve the feelings during the exam. Even if we know this is not the case, we have decided to consider as a placebo treatment the seat 1, which has a very similar position in the classroom as the seat 30.

[66] Very similar results are obtained also from a regression without covariates.

4.6 IS EFFECTIVE PERFORMANCE AFFECTED BY GOOD AND BAD OMEN?

In this section we investigate whether student's effective performance has been affected by our treatments. We estimate by OLS the specification including the full set of control variables considering as dependent variable the effective *Grade* obtained by students at exams. Results are qualitatively the same also without controls (see Table A5). In column (1) of Table 10 we consider the whole sample, while in columns (2) and (3) we report our estimation results separately for females and males, respectively. We find that neither the *Bad Omen* nor the *Good Omen* produce any statistically significant effect on the effective grades obtained by students.

Therefore, although the expectations of students have been affected by superstitions and good and bad omens, their performance at examinations does not seem to be affected.

[Table 10 Here]

4.7 CONCLUDING REMARKS

Economic and psychological literature has consistently found that individuals' own-estimated performance exceeds their actual performance and the performance they expect to be obtained by their peers. Since overconfidence and relative overconfidence represent deviations from the traditional perfect rationality assumption, it is interesting to investigate which factors determine their realization.

In this paper, we have analysed if and how overconfidence is affected by superstitious beliefs and emotions arising from these beliefs. At this aim we have run a field experiment involving about 700 Italian students who were randomly assigned to numbered seats in their written final exam. According to widespread popular superstitions, some numbers are considered lucky, while others are considered unlucky. As a consequence, our investigation strategy was aimed at inducing feelings through positive and negative stimuli associated to

superstitions related to the assigned number. We compute our indicators of overconfidence and relative overconfidence using information, gathered at the end of the examination, about the grade students expect to get and the grade they expect to be obtained by their peers.

In line with a robust evidence, we find that students tend to be systematically overconfident. In addition, from our analysis it emerges that both absolute and relative overconfidence are positively affected by being assigned to a lucky number, whilst there is an imprecisely estimated negative effect for the bad omen stimulus. No effect emerges, instead, when considering the impact of the positive and negative treatment on students' effective performance. Our results are robust to alternative specifications of our model and controlling for individual background characteristics and individual ability.

Consistently with results found in other studies, overconfidence is higher among males. We also find that males and females react differently to the lucky and unlucky numbers. On the one hand, females tend to expect lower grades when assigned to unlucky numbers, while they are not affected by being assigned to lucky numbers. On the other hand, males are not affected by being assigned to unlucky numbers but they expect higher grades when assigned to lucky numbers. These results show that not only males and females differ in relation to a number of non-cognitive skills but they also show different psychological reactions. Our evidence suggests that a reason why females end up being less confident than males is because the former focus more on negative emotions.

Clearly, our evidence pertains only to a sample of students who were exposed to a very particular experiment and this does not allow us to reach any general statement. However, additional research investigating whether males and females differ in their tendency to focus on positive and negative aspects would be of great interest as it would help to better understand individual decision process. A deeper knowledge of gender differences in reactions to positive and negative experiences, information and emotions could also be useful to train individuals at correcting negative and positive biases. For example, an improvement in female's educational and labor market outcomes could be obtained by inducing females to focus more on the positive side of each choice.

Table 1. Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Expected Grade	719	20.720	6.304	0	31
Grade	719	18.033	8.602	0	31
Overconfidence	719	2.687	6.035	-22.5	27
Relative Expected Grade	719	1.672	6.259	-20.2	13.3
Relative Overconfidence	719	1.672	6.133	-24.179	23.723
Bad Omen	719	0.085	0.279	0	1
Good Omen	719	0.150	0.358	0	1
Female	719	0.592	0.492	0	1
High School Grade	719	88.982	9.068	60	100
Lyceum	719	0.458	0.499	0	1
Regular	719	0.772	0.420	0	1
Parents' Education (avg.)	719	11.322	3.383	3	18
Microeconomics	719	0.423	0.494	0	1
Macroeconomics	719	0.152	0.359	0	1
Personnel Ec.	719	0.367	0.482	0	1
Econometrics	719	0.058	0.235	0	1
First Session	719	0.444	0.497	0	1
Year: 2010-2011	719	0.654	0.476	0	1

Notes: Grades in each class ranges from 18 to "30 cum laude" (set equal to 31). High School Grade ranges from 60 to 100.

Table 2. Students' characteristics across treatment and control groups

Variables	Means			Differences (s.e.)		
	Good Omen	*Bad Omen*	Control	Good Omen v. Control	Bad Omen v. Control	*F*-stat (*p*-value)
Female	0.602	0.492	0.602	-0.000	-0.110	1.399
				(0.051)	(0.068)	(0.248)
High School Grade	87.815	87.705	89.353	-1.537	-1.648	1.965
				(0.981)	(1.294)	(0.141)
Lyceum	0.398	0.459	0.469	-0.071	-0.010	0.914
				(0.052)	(0.068)	(0.402)
Parents' Education	11.060	11.303	11.375	-0.315	-0.072	0.390
				(0.356)	(0.457)	(0.676)
Regular	0.759	0.787	0.773	-0.013	-0.014	0.088
				(0.045)	(0.055)	(0.915)
Microeconomics	0.481	0.393	0.414	0.067	-0.021	0.945
				(0.053)	(0.066)	(0.389)
Macroeconomics	0.157	0.147	0.152	0.006	-0.003	0.019
				(0.038)	(0.048)	(0.981)
Personnel economics	0.287	0.393	0.380	-0.093	-0.013	1.779
				(0.049)	(0.066)	(0.170)
Econometrics	0.074	0.065	0.055	0.019	0.011	0.343
				(0.027)	(0.033)	(0.709)
Observations	108	61	550			

Notes: Standard errors are reported in parentheses. In the last column we report the *F*-stat and *p*-value for a test of equality of variables' means across all three groups.

Table 3. Superstition, Emotional Stimuli and Students' Grade Expectations: OLS Estimates

Variables	Expected Grade (1)	Expected Grade (2)	Expected Grade (3)	Expected Grade (4)	Expected Grade (5)	Expected Grade (6)
Grade	0.5214***	0.5424***	0.5424***	0.5212***	0.5423***	0.5423***
	(0.0267)	(0.0282)	(0.0282)	(0.0267)	(0.0283)	(0.0283)
Bad Omen	-0.3768	-0.5637	-0.5676	-0.3763	-0.5628	-0.5667
	(0.6225)	(0.6172)	(0.6173)	(0.6230)	(0.6178)	(0.6179)
Good Omen	1.0940***	1.0319***	1.0299***			
	(0.3930)	(0.3852)	(0.3845)			
Female		-0.3536	-0.3788		-0.3494	-0.3749
		(0.3486)	(0.3458)		(0.3533)	(0.3508)
Regular		0.9625**	0.9779**		0.9670**	0.9819**
		(0.4652)	(0.4681)		(0.4661)	(0.4689)
High School Grade		-0.0564***	-0.0565***		-0.0564***	-0.0564***
		(0.0204)	(0.0204)		(0.0204)	(0.0204)
Lyceum		-0.4131	-0.3683		-0.4138	-0.3693
		(0.3392)	(0.3510)		(0.3398)	(0.3521)
Parents' Education (avg.)			-0.0216			-0.0214
			(0.0523)			(0.0524)
Good Omen: Thirty				1.1848**	1.0919**	1.0846**
				(0.5058)	(0.5001)	(0.4991)
Good Omen: Thirteen				1.0071*	0.9749*	0.9779*
				(0.5215)	(0.5201)	(0.5196)
Constant	10.7940***	14.9655***	15.1897***	10.8005***	14.9608***	15.1835***
	(0.8009)	(1.7858)	(1.8746)	(0.8029)	(1.7849)	(1.8727)
Observations	719	719	719	719	719	719
Adjusted R-squared	0.514	0.521	0.520	0.514	0.520	0.520

Notes: The dependent variable is *Expected Grade*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 4. Emotional Stimuli and Students' Absolute Overconfidence: OLS Estimates

Variables	Over-confidence (1)	Over-confidence (2)	Over-confidence (3)	Over-confidence (4)	Over-confidence (5)	Over-confidence (6)
Bad Omen	-0.7865	-1.2456	-1.2503	-0.7877	-1.2500	-1.2550
	(0.7994)	(0.7780)	(0.7786)	(0.7999)	(0.7786)	(0.7792)
Good Omen	1.4992***	1.1435**	1.1409**			
	(0.5797)	(0.5415)	(0.5410)			
Female		-0.5187	-0.5496		-0.5457	-0.5787
		(0.4410)	(0.4488)		(0.4443)	(0.4523)
Regular		1.2030**	1.2219**		1.1726*	1.1919*
		(0.6060)	(0.6077)		(0.6071)	(0.6086)
High School Grade		-0.1871***	-0.1871***		-0.1872***	-0.1872***
		(0.0240)	(0.0240)		(0.0239)	(0.0239)
Lyceum		-1.3100***	-1.2551***		-1.3039***	-1.2460***
		(0.4223)	(0.4206)		(0.4223)	(0.4198)
Parents' Education (avg.)			-0.0264			-0.0277
			(0.0675)			(0.0676)
Good Omen: Thirty				1.1924	0.7465	0.7371
				(0.7272)	(0.6690)	(0.6683)
Good Omen: Thirteen				1.7923**	1.5204**	1.5241**
				(0.8056)	(0.7603)	(0.7592)
Constant	2.6845***	18.7128***	18.9866***	2.6718***	18.7363***	19.0250***
	(0.7964)	(2.2608)	(2.3848)	(0.7961)	(2.2552)	(2.3835)
Observations	719	719	719	719	719	719
Adjusted R-squared	0.043	0.124	0.123	0.042	0.124	0.123

Notes: The dependent variable is *Overconfidence*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 5. Emotional Stimuli and Students' Relative Expected Grade: OLS Estimates

Variables	Relative Expected Grade (1)	Relative Expected Grade (2)	Relative Expected Grade (3)	Relative Expected Grade (4)	Relative Expected Grade (5)	Relative Expected Grade (6)
Grade	0.5172***	0.5396***	0.5396***	0.5169***	0.5393***	0.5394***
	(0.0262)	(0.0278)	(0.0278)	(0.0263)	(0.0278)	(0.0278)
Bad Omen	-0.3070	-0.5137	-0.5198	-0.3060	-0.5120	-0.5181
	(0.6200)	(0.6109)	(0.6106)	(0.6205)	(0.6115)	(0.6112)
Good Omen	0.9525**	0.8664**	0.8632**			
	(0.3934)	(0.3809)	(0.3802)			
Female		-0.5391	-0.5782*		-0.5310	-0.5702
		(0.3484)	(0.3449)		(0.3531)	(0.3500)
Regular		0.7107	0.7346		0.7196	0.7426
		(0.4702)	(0.4736)		(0.4713)	(0.4745)
High School Grade		-0.0558***	-0.0558***		-0.0557***	-0.0557***
		(0.0205)	(0.0205)		(0.0205)	(0.0205)
Lyceum		-0.5827*	-0.5133		-0.5839*	-0.5153
		(0.3375)	(0.3489)		(0.3381)	(0.3502)
Parents' Education (avg)			-0.0333			-0.0330
			(0.0519)			(0.0520)
Good Omen: Thirty				1.1304**	0.9838*	0.9726*
				(0.5298)	(0.5168)	(0.5157)
Good Omen: Thirteen				0.7820	0.7547	0.7592
				(0.4969)	(0.4920)	(0.4911)
Constant	-8.1825***	-3.7374**	-3.3906*	-8.1698***	-3.7466**	-3.4031*
	(0.8046)	(1.8052)	(1.8883)	(0.8063)	(1.8052)	(1.8870)
Observations	719	719	719	719	719	719
Adjusted R-squared	0.506	0.514	0.513	0.506	0.513	0.513

Notes: The dependent variable is *Relative Expected Grade*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 6. Emotional stimuli and students' Relative Overconfidence: OLS Estimates

Variables	Relative Over-confidence (1)	Relative Over-confidence (2)	Relative Over-confidence (3)	Relative Over-confidence (4)	Relative Over-confidence (5)	Relative Over-confidence (6)
Bad Omen	-0.8188	-1.2911	-1.2957	-0.8198	-1.2951	-1.2999
	(0.8168)	(0.7972)	(0.7976)	(0.8174)	(0.7977)	(0.7981)
Good Omen	1.4137**	1.0233*	1.0208*			
	(0.5971)	(0.5541)	(0.5539)			
Female		-0.6746	-0.7044		-0.6990	-0.7307
		(0.4470)	(0.4545)		(0.4505)	(0.4585)
Regular		0.7888	0.8070		0.7613	0.7799
		(0.6168)	(0.6195)		(0.6184)	(0.6208)
High School Grade		-0.1863***	-0.1863***		-0.1863***	-0.1864***
		(0.0247)	(0.0247)		(0.0246)	(0.0246)
Lyceum		-1.5033***	-1.4503***		-1.4978***	-1.4421***
		(0.4273)	(0.4313)		(0.4275)	(0.4310)
Parents' Education (avg.)			-0.0254			-0.0267
			(0.0685)			(0.0686)
Good Omen: Thirty				1.1779	0.6637	0.6547
				(0.7809)	(0.7102)	(0.7105)
Good Omen: Thirteen				1.6390**	1.3646*	1.3682*
				(0.8067)	(0.7653)	(0.7651)
Constant	0.5509	16.9687***	17.2327***	0.5411	16.9900***	17.2675***
	(0.8141)	(2.3425)	(2.4406)	(0.8144)	(2.3366)	(2.4385)
Observations	719	719	719	719	719	719
Adjusted R-squared	0.053	0.134	0.133	0.052	0.133	0.132

Notes: The dependent variable is *Relative Overconfidence*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 7. Heterogeneous Effects of Good and Bad Omens according to Gender: OLS Estimates

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Expected Grade			Overconfidence		
	Females	Males	Whole	Females	Males	Whole
Grade	0.5212***	0.5859***	0.5426***			
	(0.0390)	(0.0416)	(0.0282)			
Bad Omen	-1.6547*	0.6222	0.5534	-2.0585**	-0.2589	-0.4582
	(0.8868)	(0.8158)	(0.8108)	(0.9144)	(1.1918)	(1.2003)
Good Omen	0.4590	2.1333***	1.9996***	0.2372	2.6475***	2.5425***
	(0.4871)	(0.7128)	(0.6433)	(0.7093)	(0.9206)	(0.8709)
Female			0.0688			-0.0460
			(0.4142)			(0.5298)
Regular	1.9433***	-0.3792	0.9801**	2.7698***	-0.6756	1.2097**
	(0.6505)	(0.6062)	(0.4634)	(0.7989)	(0.8702)	(0.6065)
High School Grade	-0.0703***	-0.0500	-0.0596***	-0.2264***	-0.1480***	-0.1913***
	(0.0257)	(0.0333)	(0.0203)	(0.0294)	(0.0400)	(0.0240)
Lyceum	-0.4191	-0.5107	-0.3726	-1.4978***	-1.0035	-1.2552***
	(0.4708)	(0.5576)	(0.3508)	(0.5446)	(0.6901)	(0.4195)
Parents' Education (avg.)	0.0164	-0.1127	-0.0221	0.0749	-0.2198*	-0.0243
	(0.0610)	(0.0978)	(0.0520)	(0.0763)	(0.1248)	(0.0672)
(Bad Omen)*Female			-2.1836*			-1.5006
			(1.2158)			(1.5481)
(Good Omen)*Female			-1.6146**			-2.3286**
			(0.8091)			(1.1193)
Constant	14.9067***	16.9178***	15.2884***	19.9994***	19.4686***	19.1709***
	(2.2559)	(3.3456)	(1.8637)	(2.8817)	(4.1510)	(2.3783)
Observations	426	293	719	426	293	719
Adjusted R-squared	0.520	0.536	0.523	0.136	0.141	0.126

Notes: In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 8. Heterogeneous effects of Good and Bad Omens according to gender: OLS Estimates

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Relative Expected Grade			Relative Overconfidence		
	Females	Males	Whole	Females	Males	Whole
Grade	0.5122***	0.5860***	0.5396***			
	(0.0383)	(0.0412)	(0.0277)			
Bad Omen	-1.7749**	0.8158	0.7580	-2.2437**	-0.2063	-0.3937
	(0.8871)	(0.7772)	(0.7799)	(0.9746)	(1.1953)	(1.2074)
Good Omen	0.2578	2.0891***	1.8868***	0.1347	2.5729***	2.3880***
	(0.4839)	(0.6993)	(0.6246)	(0.7523)	(0.9029)	(0.8504)
Female			-0.0903			-0.1919
			(0.4145)			(0.5341)
Regular	1.7104**	-0.7033	0.7362	2.5302***	-1.3576	0.7953
	(0.6621)	(0.6003)	(0.4685)	(0.8263)	(0.8738)	(0.6187)
High School Grade	-0.0701***	-0.0498	-0.0592***	-0.2241***	-0.1527***	-0.1905***
	(0.0263)	(0.0329)	(0.0204)	(0.0305)	(0.0400)	(0.0247)
Lyceum	-0.5550	-0.6873	-0.5205	-1.7685***	-1.1391*	-1.4538***
	(0.4625)	(0.5539)	(0.3477)	(0.5646)	(0.6849)	(0.4297)
Parents' Education (avg.)	-0.0187	-0.0868	-0.0342	0.0580	-0.1835	-0.0239
	(0.0593)	(0.0997)	(0.0516)	(0.0777)	(0.1269)	(0.0682)
(Bad Omen)*Female			-2.4956**			-1.7247
			(1.1943)			(1.5865)
(Good Omen)*Female			-1.7067**			-2.2737**
			(0.7938)			(1.1333)
Constant	-3.6943	-1.7841	-3.2864*	17.8806***	18.1423***	17.4128***
	(2.2978)	(3.3387)	(1.8796)	(3.0244)	(4.1170)	(2.4358)
Observations	426	293	719	426	293	719
Adjusted R-squared	0.510	0.536	0.516	0.160	0.127	0.136

Notes: In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 9. Placebo Regressions. Impact of Fictitious Treatments on Overconfidence. OLS Estimates

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Overconfidence			Overconfidence		
	Females	Males	Whole	Females	Males	Whole
Bad Omen	-2.0500**	-0.2966	-1.2680*	-2.0672**	-0.1749	-1.2159
	(0.9197)	(1.1973)	(0.7822)	(0.9263)	(1.2132)	(0.7882)
Good Omen	0.2454	2.6089***	1.1233*	0.2287	2.7243***	1.1736**
	(0.7142)	(0.9280)	(0.5461)	(0.7210)	(0.9451)	(0.5524)
Placebo: 1	-0.1180	-0.7174	-0.2594			
	(1.0254)	(1.2237)	(0.8007)			
Placebo: 11_28				-0.0551	0.4341	0.2012
				(0.8526)	(0.9036)	(0.6284)
Female			-0.5458			-0.5462
			(0.4492)			(0.4498)
Regular	2.7729***	-0.6467	1.2229**	2.7731***	-0.6430	1.2214**
	(0.8035)	(0.8725)	(0.6075)	(0.7991)	(0.8638)	(0.6083)
High School Grade	-0.2268***	-0.1484***	-0.1867***	-0.2265***	-0.1488***	-0.1871***
	(0.0298)	(0.0400)	(0.0241)	(0.0293)	(0.0401)	(0.0240)
Lyceum	-1.4962***	-1.0288	-1.2604***	-1.4981***	-1.0288	-1.2597***
	(0.5447)	(0.6989)	(0.4211)	(0.5455)	(0.7001)	(0.4213)
Parents' Education (avg.)	0.0747	-0.2188*	-0.0260	0.0750	-0.2226*	-0.0271
	(0.0766)	(0.1251)	(0.0677)	(0.0765)	(0.1249)	(0.0677)
Constant	20.0141***	19.5939***	18.9825***	20.0149***	19.4589***	18.9494***
	(2.9001)	(4.1658)	(2.3867)	(2.8745)	(4.1543)	(2.3847)
Observations	426	293	719	426	293	719
Adjusted R-squared	0.134	0.139	0.122	0.134	0.139	0.122

Notes: The dependent variables is *Overconfidence*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table 10. The Impact of Good and Bad Omens on Effective Performance. OLS Estimates

Variables	(1)	(2)	(3)
		Grade	
	Whole	Females	Males
Bad Omen	1.4921	0.8432	2.1281
	(1.1033)	(1.3110)	(1.7503)
Good Omen	-0.2427	0.4633	-1.2418
	(0.7487)	(0.9503)	(1.2709)
Female	0.3732		
	(0.6257)		
Regular	-0.5332	-1.7261	0.7158
	(0.8671)	(1.1199)	(1.3167)
High School Grade	0.2856***	0.3260***	0.2366***
	(0.0324)	(0.0419)	(0.0547)
Lyceum	1.9381***	2.2527***	1.1902
	(0.6211)	(0.7792)	(1.0521)
Parents' Education (avg.)	0.0105	-0.1222	0.2586
	(0.0944)	(0.1151)	(0.1697)
Constant	-8.2982***	-10.6356***	-6.1605
	(3.0560)	(3.8473)	(5.1239)
Observations	719	426	293
Adjusted R-squared	0.167	0.200	0.140

Notes: The dependent variables is *Grade*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A1. Further specifications not commented in the text: Emotional Stimuli and Students' Absolute Overconfidence controlling also for Grade. OLS Estimates

Variables	Over-confidence (1)	Over-confidence (2)	Over-confidence (3)	Over-confidence (4)	Over-confidence (5)	Over-confidence (6)
Bad Omen	-0.3768	-0.5637	-0.5676	-0.3763	-0.5628	-0.5667
	(0.6225)	(0.6172)	(0.6173)	(0.6230)	(0.6178)	(0.6179)
Good Omen	1.0940***	1.0319***	1.0299***			
	(0.3930)	(0.3852)	(0.3845)			
Grade	-0.4786***	-0.4576***	-0.4576***	-0.4788***	-0.4577***	-0.4577***
	(0.0267)	(0.0282)	(0.0282)	(0.0267)	(0.0283)	(0.0283)
Female		-0.3536	-0.3788		-0.3494	-0.3749
		(0.3486)	(0.3458)		(0.3533)	(0.3508)
Regular		0.9625**	0.9779**		0.9670**	0.9819**
		(0.4652)	(0.4681)		(0.4661)	(0.4689)
High School Grade		-0.0564***	-0.0565***		-0.0564***	-0.0564***
		(0.0204)	(0.0204)		(0.0204)	(0.0204)
Lyceum		-0.4131	-0.3683		-0.4138	-0.3693
		(0.3392)	(0.3510)		(0.3398)	(0.3521)
Parents' Education (avg.)			-0.0216			-0.0214
			(0.0523)			(0.0524)
Good Omen: Thirty				1.1848**	1.0919**	1.0846**
				(0.5058)	(0.5001)	(0.4991)
Good Omen: Thirteen				1.0071*	0.9749*	0.9779*
				(0.5215)	(0.5201)	(0.5196)
Constant	10.7940***	14.9655***	15.1897***	10.8005***	14.9608***	15.1835***
	(0.8009)	(1.7858)	(1.8746)	(0.8029)	(1.7849)	(1.8727)
Observations	719	719	719	719	719	719
Adjusted R-squared	0.470	0.477	0.477	0.469	0.476	0.476

Notes: The dependent variable is *Overconfidence*. In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A2. Further specifications not commented in the text: Heterogeneous Effects of Good and Bad Omens according to Gender without covariates. OLS Estimates

Variables	(1)	(2)	(3)
	Expected Grade		
	Females	Males	Whole
Grade	0.5100***	0.5495***	0.5265***
	(0.0359)	(0.0406)	(0.0269)
Bad Omen	-1.4679*	0.5318	0.5813
	(0.9051)	(0.8054)	(0.7997)
Good Omen	0.4638	1.9548***	1.9353***
	(0.4793)	(0.6460)	(0.6382)
Female			-0.1229
			(0.4089)
(Bad Omen)*Female			-2.0491*
			(1.2045)
(Good Omen)*Female			-1.4464*
			(0.7897)
Constant	11.3628***	10.7814***	11.1751***
	(0.8485)	(0.8933)	(0.6374)
Observations	426	293	719
Adjusted R-squared	0.504	0.525	0.513

Notes: Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A3. Further specifications not commented in the text: Heterogeneous Effects of Good and Bad Omens according to Gender by splitting the Good Omen in its two components. OLS Estimates

Variables	(1)	(2)	(3)
	Overconfidence		
	Females	Males	Whole
Grade			
Bad Omen	-2.0591**	-0.2629	-0.4618
	(0.9171)	(1.1945)	(1.2026)
Good Omen: Thirty	-0.1265	2.0936**	1.8391*
	(0.9251)	(0.9999)	(0.9780)
Good Omen: Thirteen	0.4736	3.5304**	3.7086***
	(0.9283)	(1.4783)	(1.4072)
Female			-0.0494
			(0.5302)
Regular	2.7315***	-0.6946	1.1719*
	(0.8089)	(0.8769)	(0.6120)
High School Grade	-0.2272***	-0.1465***	-0.1914***
	(0.0292)	(0.0398)	(0.0239)
Lyceum	-1.4821***	-1.0172	-1.2484***
	(0.5467)	(0.6925)	(0.4199)
Parents' Education (avg.)	0.0738	-0.2212*	-0.0258
	(0.0765)	(0.1247)	(0.0672)
(Bad Omen)*Female			-1.4987
			(1.5502)
(Good Omen: Thirty) *Female			-2.1241
			(1.3666)
(Good Omen: Thirteen) *Female			-3.1661*
			(1.6693)
Constant	20.0882***	19.3720***	19.2101***
	(2.8744)	(4.1448)	(2.3779)
Observations	426	293	719
Adjusted R-squared	0.136	0.140	0.125

Notes: In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A4. Further specifications not commented in the text: Placebo Regressions. Impact of Fictitious Treatments on Overconfidence. OLS Estimates with Dependent Variable Relative Overconfidence

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Relative Overconfidence			Relative Overconfidence		
	Females	Males	Whole	Females	Males	Whole
Bad Omen	-2.2125**	-0.2689	-1.3137	-2.2254**	-0.0200	-1.2067
	(0.9806)	(1.2014)	(0.8017)	(0.9856)	(1.2147)	(0.8065)
Good Omen	0.1634	2.5061***	1.0028*	0.1512	2.7401***	1.1052*
	(0.7572)	(0.9128)	(0.5591)	(0.7651)	(0.9252)	(0.5651)
Placebo: 1	0.3497	-1.1391	-0.2647			
	(1.0392)	(1.0561)	(0.7997)			
Placebo: 11_28				0.0777	0.9768	0.5197
				(0.8417)	(0.9640)	(0.6415)
Female			-0.7005			-0.6956
			(0.4547)			(0.4548)
Regular	2.5362***	-1.3004	0.8080	2.5222***	-1.2730	0.8056
	(0.8309)	(0.8766)	(0.6194)	(0.8250)	(0.8695)	(0.6196)
High School Grade	-0.2250***	-0.1531***	-0.1859***	-0.2238***	-0.1544***	-0.1862***
	(0.0309)	(0.0401)	(0.0247)	(0.0305)	(0.0400)	(0.0247)
Lyceum	-1.7594***	-1.1777*	-1.4557***	-1.7637***	-1.1945*	-1.4624***
	(0.5649)	(0.6912)	(0.4319)	(0.5654)	(0.6948)	(0.4319)
Parents' Education (avg.)	0.0579	-0.1826	-0.0251	0.0581	-0.1904	-0.0274
	(0.0780)	(0.1272)	(0.0687)	(0.0779)	(0.1263)	(0.0685)
Constant	17.9165***	18.3319***	17.2285***	17.8510***	18.1111***	17.1366***
	(3.0418)	(4.1329)	(2.4424)	(3.0292)	(4.1171)	(2.4457)
Observations	426	293	719	426	293	719
Adjusted R-squared	0.159	0.126	0.132	0.158	0.127	0.133

Notes: In all specifications we control for dummies for class attended, academic year and examination session. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

Table A5. Further specifications not commented in the text: The Impact of Good and Bad Omens on Effective Performance without covariates. OLS Estimates

Variables	(1)	(2)	(3)
		Grade	
	Whole	Females	Males
Bad Omen	0.8955	-0.0096	2.1506
	(1.1547)	(1.4787)	(1.7763)
Good Omen	-1.2519	-1.5198	-0.8471
	(0.8259)	(1.0234)	(1.3797)
Constant	18.1455***	18.8429***	17.0913***
	(0.3743)	(0.4835)	(0.5871)
Observations	719	426	293
Adjusted R-squared	0.001	-0.001	0.001

Notes: The dependent variables is *Grade*. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

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