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# Risk preferences and refugee migration to Europe: An experimental analysis

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## Abstract

Although the large majority of Syrians fleeing the civil war remain in neighbouring or nearby countries, others embark on hazardous land or sea crossings in pursuit of the uncertain prospect of obtaining refugee status in Europe. Understanding in what ways Syrian migrants who stay in nearby countries differ from those who seek asylum in Europe can help to better target European asylum policies. We address this issue by combining two experimental databases of refugees in Egypt and Luxembourg. First, we measure original risk preferences on the Egypt sample and show that Cumulative Prospect Theory (CPT) is better suited for modelling refugee behaviour under risk than Expected Utility Theory (EUT). Second, we compare the risk preference parameters of the two samples under the CPT framework and find that, on average, refugees in Egypt are more loss averse and overweight low probabilities more than their counterparts who migrated to Luxembourg. These results suggest a possible self-selection process among refugees migrating to Europe based on their risk preferences, which challenges current policy schemes.

**Keywords:** refugee decision making, asylum policy, loss aversion, probability weighting, perceptions

**JEL Codes:** C93, D81, F22, K37

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*“Existing [asylum] policies are also poorly targeted: they select those that have energy, enterprise and resources to risk drowning at sea or falling into the hands of unscrupulous people smugglers, and not necessarily those that are most in need of humanitarian protection”*

([Hatton, 2017](#))

# 1 Introduction

The Syrian crisis has compelled millions of people to seek asylum. Between 2011 and 2018 more than 6.5 million Syrians were forced to leave their country ([UNHCR, 2019](#)). Though the large majority of them stayed in neighbouring or nearby countries, a small proportion managed to migrate further and seek refuge in Europe. Many of these arrived in Europe as “spontaneous asylum seekers” and gained unauthorised entry after a perilous and risky migration.<sup>1</sup> Indeed, before reaching their destination countries, economic and forced migrants who embark on illegal migration to Europe face different levels of risk and uncertainty including physical violence, kidnapping, slavery and even death ([Mbaye, 2014](#); [Bah et al., 2018](#); [Aksoy and Poutvaara, 2021](#)). These uncertainties are far from being completely resolved even after they manage to reach the destination country. Once arriving at their destination, they face other kinds of uncertainties, for instance regarding the processing time of their application, its final outcome, and the prospect of repatriation in the case of a rejected application ([Bertoli et al., 2022](#)). Under these circumstances, it can be argued that the decision of refugees to migrate to Europe may be influenced by their risk preferences, and that those who remain in neighbouring or nearby countries differ in these specific characteristics in comparison to those who migrate to distant countries (see for example [Umblijs \(2012\)](#) for a discussion of risk preferences and self-selection among migrants).

In general, with regard to self-selection, the economics of migration literature assumes (and has provided ample evidence) that migrants differ from non-migrants in a number of ways. This literature has focused primarily on the selection of economic migrants by skill or educational level ([Borjas, 1987](#); [Moraga, 2011](#); [Abramitzky et al., 2012](#); [Belot and Hatton, 2012](#); [Borjas et al., 2019](#)) while there are only a few and recent studies that examine the self-selection of refugees. One such study is [Guichard \(2020\)](#)’s analysis of self-selection among asylum seekers from five source countries in Germany. He finds that those from Afghanistan, Iraq, and Syria are more likely to have attained a tertiary level of education than non-migrants, while those from Albania and Serbia are less likely to have been educated to tertiary level than non-migrants. [Aksoy and Poutvaara \(2021\)](#) extend his analysis to other European countries and find that refugees are positively self-selected with respect to human capital.

Regarding the self-selection of forced migrants based on their risk preferences, to the best of our knowledge, only two papers address this issue ([Ceriani and Verme, 2018](#); [Mironova et al., 2019](#)).

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<sup>1</sup>Spontaneous asylum seekers migrate from their country of origin on their own initiative and by their own means, rather than as part of an organised programme

[Ceriani and Verme \(2018\)](#) use the Quantile Maximisation framework to evaluate the risk preferences of people living in and fleeing conflict areas in Nigeria. They found that stayers are more risk-tolerant than those who flee. [Mironova et al. \(2019\)](#) report similar findings, using a modified version of the [Eckel and Grossman \(2002\)](#) risk game. Their study shows that both combatants and non-combatants in rebel-held conflict zones exhibit greater risk tolerance than Syrians living elsewhere in the country or those residing in Turkey. As in these two studies, this paper focuses on self-selection based on risk preferences. However, we distinguish between two stages of refugee migration when analysing self-selection. The initial phase of selection is related to the decision to remain or depart from an unsafe country of origin and the second the decision to engage in a more risky re-migration to a country further away e.g. to a country in Europe. Both [Ceriani and Verme \(2018\)](#) and [Mironova et al. \(2019\)](#) papers primarily address the first stage.

Our analysis focuses on the second stage. It provides an exploratory analysis of the pattern of selection of Syrian refugees to Europe according to their risk preferences. In other words, this paper examines whether Syrians who seek refuge in nearby countries differ from those who migrate to Europe. The analysis is based on two experimental databases. One was kindly provided by [Bocquého et al. \(2023a\)](#). The authors aimed to develop a model of refugee migration under risk, and ran simulations under two theoretical decision frameworks, Expected Utility Theory (EUT) and Cumulative Prospect Theory (CPT). This latter framework is richer because it accounts for two particular cognitive biases: loss aversion and nonlinear probability weighting. The experimental part, based on [Tanaka et al. \(2010\)](#)'s setup, was used to feed the simulation part with estimates of risk preference parameters. The authors implemented their experiment on a sample of 218 asylum seekers in Luxembourg.

We complement this database with our own data, collected from a sample of 77 Syrian refugees in Egypt through a similar experimental setup. Respondents are asked to make choices between series of lotteries designed by [Tanaka et al. \(2010\)](#). We first analyse the relevance of the EUT and CPT frameworks to model the behaviour of refugees in such risky situations. Our results show that, at the aggregate level, the CPT framework is more suited than the EUT framework to model refugee behaviour, in line with [Bocquého et al. \(2023a\)](#).

Second, we compare the risk preferences of the two samples under CPT. Simulations by [Bocquého et al. \(2023a\)](#) revealed that refugees who are more loss-averse are more likely to renounce migration to Europe, and therefore to remain in nearby countries. We test this hypothesis more directly and expect refugees in Egypt to be more loss-averse than those in Luxembourg. Our second hypothesis

is related to probability distortion. Syrian refugees who stay in Egypt can be expected to overweight low probabilities and underweight high probabilities more, compared to those who choose to migrate to Luxembourg. Indeed, they may perceive low-probability extreme events such as dying en route as more likely than they objectively are. Our results confirm both expectations. We find that, on average, refugees in Egypt are more loss-averse and overweight more the low probabilities than those in Luxembourg.

Our findings point to a possible self-selection of refugees based on their risk preferences. In line with [Hatton \(2017\)](#), they may question the current European asylum policies, with regard to where asylum applications are processed. Indeed, the vast majority of asylum applications are processed once refugees are inside or at the borders of the European Union. Therefore, the current system encourages asylum seekers to make hazardous maritime or overland crossings in pursuit of the uncertain prospect of obtaining refugee status. Thus, the refugees seeking asylum in Europe are those who have been able to undertake this dangerous migration. This selection would be all the more open to criticism especially if the self-selection of refugees into Europe based on their risk preferences corresponds to an anti-selection with regard to their protection needs. If this were the case, i.e. if self-selection based on risk preferences were equivalent to anti-selection based on protection needs, it would imply that the existing European asylum system poorly targets refugees within the same population.<sup>2</sup> While more research is needed on the impact of war or violence on risk preferences, [Brown et al. \(2019\)](#) find that people most exposed to violence - perhaps those most in need of protection - are also the most risk-averse. Our findings argue for a reform of the system through a substantial refugee resettlement programme that would help those most in need of protection and eliminate the risks refugees are exposed to.<sup>3</sup> Our analysis also challenges the notion of “forced migrants”. We describe refugee migration as a two-stage process, emphasising that in the second stage, refugees have more freedom of choice and can self-select based on individual characteristics such as risk preferences.

The remainder of the paper is structured as follows. Section 2 proposes a description of refugee migration as a two-stage process and explains how refugees’ CPT risk preferences may matter in this context. Section 3 presents the sample characteristics, describes the experiment conducted in Egypt,

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<sup>2</sup>We distinguish refugee policy from regular immigration policy. As [Hatton \(2020\)](#) argues, the latter can be interpreted as serving the interests of the host country, for example through selective labour migration. Refugees, on the other hand, are admitted on the basis of the benefit to them of escaping persecution and the only objective criterion by which refugees should be selected is the legitimacy of their claim. The host society’s rationale for granting asylum is indirect: to meet basic humanitarian concerns ([Hatton, 2020](#)).

<sup>3</sup>The number of refugees resettled in European countries remains woefully low. According to the United Nations High Commissioner for Refugees, about 25,000 refugees were resettled in one of the European Union countries in 2019 (see [www.unhcr.org/resettlement.html](http://www.unhcr.org/resettlement.html), accessed: February 29th, 2024). In the same year, the region received 744,810 applications (see [www.consilium.europa.eu/en/infographics/asylum-applications-eu/](http://www.consilium.europa.eu/en/infographics/asylum-applications-eu/), accessed: February 29th, 2024).

discusses the differences compared to the experiment carried out in Luxembourg, and presents the methodology for estimating individual CPT risk parameters. Section 4 presents the results while section 5 concludes.

## 2 Refugee migration as a risky two-stage prospect

Refugee migration can be described as a two-stage process, in which the decision to leave the country of origin and the choice of the country of final destination are made separately and at different times.<sup>4</sup> Each of these stages is subject to different risks and uncertainties. The initial stage concerns the decision to leave the country of origin and includes the risks and uncertainties associated with remaining in an unsafe country. The second stage, after refugees have found protection in a first and nearby country of asylum, is related to the decision to move to a country further away and involves the risks and uncertainties associated with an unsafe land or sea crossing in order to possibly obtain refugee status and perhaps better material conditions. (Hatton, 2017; Aksoy and Poutvaara, 2021).

In the first stage, refugees remain in their country of origin until circumstances force them to leave and seek refuge in another country. This is usually a neighbouring or nearby country. In the case of war refugees, such as Syrians, it can be assumed that at the time of their flight, the intensity of the war had become a serious threat to their lives and they were in imminent danger. Consequently, at this stage, those who leave their country of origin are considered to have been forced to do so. In the second stage, refugees decide whether or not to migrate to another country that they prefer to their first country of asylum. This decision is more voluntary than the first one. It is also assumed that both the first country of asylum and the intended country of final asylum are safe for the refugees, but that they differ in the material conditions they offer.<sup>5</sup> This is particularly the case for Syrian refugees in the two countries we have selected, namely Egypt and Luxembourg.<sup>6</sup> However, refugees face numerous risks and uncertainties when migrating via land and sea routes. These include the possibility of being captured by unscrupulous people smugglers or dying en route. Furthermore, refugees face additional risks and uncertainties even after successfully arriving in their intended destination country. These include uncertainty about the processing time of their application, the likelihood of being granted

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<sup>4</sup>Our analysis is restricted to genuine refugees, i.e. individuals who are fleeing from war or persecution. We exclude voluntary or economic migrants who use the asylum system to enable their migration project. For further discussion on immigrant strategies to maximise their likelihood of successful migration, see Bedi (2024).

<sup>5</sup>It may be that refugees' first migration takes them to another unsafe country. In this case, they may engage in further forced migration until they find a first safe country of asylum.

<sup>6</sup>Syrian refugees in Egypt enjoy relatively good security conditions. They have never experienced refugee camps and enjoy the same access to healthcare, education, and the job market as Egyptians (Hassan et al., 2022).

refugee status, and the possibility of repatriation if their application is rejected (Bertoli et al., 2022).<sup>7</sup> In summary, refugees in this second stage of migration are faced with two options: they can either choose to remain in the nearby safe asylum country or undertake a risky migration to a distant country.

Behaviour under risk typically results from the interplay of the risk level faced by decision-makers and their own risk preferences (Bocquého et al., 2014). It could therefore be argued that refugees who undertake this dangerous migration have different risk preferences to those who remain in neighbouring countries, as suggested by Hatton (2017). To test this hypothesis, we compare the risk preferences of two samples of Syrian refugees located in different countries: Egypt, a nearby and safe country for Syrian refugees, and Luxembourg, which is also safe but considerably more distant. To overcome some of the anomalies of the standard EUT theoretical framework in modelling behaviour in risky situations (see for example the paradoxes of Allais (1953) and Ellsberg (1961)), we rely on the richer CPT (Tversky and Kahneman, 1992). This framework takes into account two important and common cognitive biases: loss aversion and probability distortion.

Loss aversion refers to the fact that individuals are more sensitive to losses than gains of the same extent. Probability distortion refers to individuals' tendency to distort objective probabilities non linearly into subjective decision weights, via a transformation function called the probability weighting function.<sup>8</sup> These two features may play an important role in refugee migration. To begin with, the decision to migrate from the first safe asylum country to another country implies renouncing a safe shelter for an uncertain prospect of finding another, perhaps better, one. Therefore, it can be assumed that refugees who stay in nearby countries demonstrate a higher level of loss aversion compared to those who migrate from these countries. Second, this migration involves different levels of risk which refugees may not perceive in the same way. For example, for the period under consideration, Syrian refugees enjoyed very high rates of recognition in European Union countries. The average between 2008 and 2018 was above 94% (Hatton, 2023). At the same time, the number of migrants dying en route represented less than 2% of total arrivals as reported by the UNHCR.<sup>9</sup> These two risks can be considered as lower and upper extremes in the set of losses and gains of this migration stage and important determinants of refugees' migration choices. Focusing on them, it is arguable that

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<sup>7</sup>Our analysis focuses on the conditions at the time refugees decide to migrate. However, as an anonymous referee pointed out, asylum policies change over time and these changes may affect refugees' migration choices. For example, Denmark is now revoking Syrian refugee permits because officials claim it is safe to return (McKernan, 2021). The present paper does not address the questions of whether and how these changes may affect refugees' migration choices. However, these questions offer interesting prospects for extending our research.

<sup>8</sup>Other terms used for the decision weights in the literature are "beliefs" and "subjective probabilities". As pointed out by Wakker (2010), these last terms can be used interchangeably.

<sup>9</sup>See <https://data.unhcr.org/en/situations/mediterranean> (Accessed: February 29th, 2024).

Syrian refugees who stay in nearby countries overweight the low probability of dying en route, and underweight the high probability of being recognised as refugees in the European Union. Moreover, for loss-averse refugees, such extreme potential losses such as death may particularly offset potential gains like being granted asylum.

### 3 Experimental setup

We start by presenting the descriptive statistics of the two samples we use, then we describe the experimental protocol implemented in Egypt, followed by a discussion on the differences with the Luxembourg experiment.<sup>10</sup> The section ends with a description of the method for estimating the CPT risk parameters.

#### 3.1 Samples and descriptive statistics

In Egypt, we randomly recruited 77 Syrian refugees who had been in Egypt since at least 2011, having fled the civil war in their country of origin.<sup>11</sup> The experiment in Luxembourg involved 218 refugees composed mainly of Syrians (58%). Table 1 provides some descriptive statistics of these samples. The main differences between our two samples concern the proportions of women and of married individuals. Women make up 58% of the Egyptian sample and 24% of the Luxembourg one. This figure rises to 32% when focusing only on Syrian refugees in the Luxembourg sample. On the contrary, the proportion of married people is higher in the Luxembourg sample than in the Egyptian one: 55% for the Luxembourg sample as a whole, 67% when restricted to Syrians, and 49% for the Egyptian one. The average age of participants and number of children were respectively 33.7 and 1.62 in the Luxembourg sample (respectively 34.54 and 2.18 if we restrict these figures to Syrians) and 33.01 and 1.80 in the Egyptian sample. The distribution of the two samples by educational level is nearly identical. Only about 1% of the Egyptian sample and 2% of the Luxembourg sample had not received any formal education, 17% of the Egyptian sample and 11% of the Luxembourg sample had completed primary education, while 54% of the Egyptian sample and 50% of the Luxembourg sample were educated to secondary level. Finally, 27% of the Egyptian sample and 35% of the Luxembourg sample had attended college or university.

In Egypt, we collected information on participants' experiences and intentions with regard to migration. This concerns the time since leaving their country of origin, the time already spent in

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<sup>10</sup>For details concerning the experiment conducted in Luxembourg see [Bocquého et al. \(2023a\)](#).

<sup>11</sup>In 2018, Egypt was the sixth most popular destination for Syrian refugees, with about 132,900 refugees ([UNHCR, 2019](#)).

Egypt and their intention to settle in Egypt. Summary statistics are presented at the bottom of the Table 1. On average, at the time of our experiment, the participants had left Syria seven years earlier and spent six years in Egypt. About 47% of them wanted to settle permanently in Egypt, meaning they did not intend to re-migrate.

	Luxembourg sample						Egypt sample		
	All			Syrians only			Mean	sd	Obs
Age	33.70	9.60	218	34.54	10.54	126	33.01	11.21	77
Dummy if female	0.24	0.43	218	0.32	0.47	126	0.58	0.50	77
Dummy if married	0.55	0.5	218	0.67	0.47	126	0.49	0.50	77
Number of children	1.62	1.99	218	2.18	2.11	126	1.80	1.78	77
Highest education level obtained:									
No education	0.02	0.13	217	0.02	0.13	125	0.01	0.11	77
Primary education	0.11	0.32	217	0.14	0.35	125	0.17	0.38	77
Secondary education	0.5	0.50	217	0.52	0.50	125	0.54	0.50	77
College or University education	0.35	0.48	217	0.31	0.46	125	0.27	0.45	77
Other education	0.02	0.13	217	0.01	0.09	125	/	/	/
Country of origin:									
Syria	0.58	0.5	218	/	/	/	/	/	/
Iraq	0.21	0.41	218	/	/	/	/	/	/
Other origin	0.21	0.4	218	/	/	/	/	/	/
Migratory characteristics:									
Length of time since fleeing country (in years)	/	/	/	/	/	/	7.32	1.51	64
Length of time spent in Egypt (in years)	/	/	/	/	/	/	6.04	2.90	62
Dummy if wanting to settle in Egypt permanently	/	/	/	/	/	/	0.47	0.50	77

Table 1 Summary characteristics of the Luxembourg and Egyptian samples

### 3.2 Experimental design and procedure

We adapt the [Tanaka et al. \(2010\)](#) risk task to elicit the risk preferences of Syrian refugees (Table 2). The task consists of three choice series, which are variants of [Holt and Laury \(2002\)](#)'s multiple price lists. Specifically, each series features two binary lotteries, a safe lottery (Route A) and a risky lottery (Route B). During the experiment, participants were asked to put themselves in the role of a taxi driver and indicate the route they wanted to take depending on the level of congestion on the road. The profit or loss of the journey depended on the level of congestion.<sup>12</sup> The monetary payoffs shown are similar to those in [Tanaka et al. \(2010\)](#), except that they are expressed in Egyptian pounds (EGP) rather than Vietnamese dong (VND). In the first rows of Table 2, the expected value of Route A is higher than that of Route B. Moving down the rows, the expected value of Route B gradually increases and exceeds that of Route A. Participants are asked to choose one of the two lotteries in each row. To ensure monotonicity, and following [Tanaka et al. \(2010\)](#)'s original protocol, they must

<sup>12</sup>This framing was chosen because gambling is heavily restricted in Egypt and forbidden by the Koran.

indicate the row in which they begin to express a preference for Route B as opposed to Route A. In the EUT framework, in Series 1, highly risk-tolerant people may choose the risky lottery from the very first row. Risk-neutral individuals under EUT are expected to choose Route A first and switch to Route B when the expected payoff difference becomes negative in each of the three series. Highly risk-averse individuals, on the other hand, may always choose Route A, meaning they never switch.

The experiment was run on computer using LimeSurvey. After showing up for the experiment, participants were randomly assigned to a work place with a unique identification code to ensure anonymity. Once the experiment had been completed, participants answered a questionnaire on socio-demographic characteristics. Overall, the experiment and questionnaire took an average of 37 minutes to complete, and the average gain was 382 EGP, which was equivalent to 21 EUR at the time of the experiment. This amount includes the initial 250 EGP endowment that participants received before starting the experiment in addition to their gains or losses.

### 3.3 Differences with the Luxembourg experiment

Although we used the experimental risk setup of [Tanaka et al. \(2010\)](#) as per [Bocquého et al. \(2023a\)](#), there are still certain protocol and design differences between the two experiments that should be discussed.

- **Sampled population:** In Egypt, we recruited Syrians regardless of their formal protection status. In contrast, [Bocquého et al. \(2023a\)](#) worked exclusively with a population of asylum seekers in the strict sense of the term, i.e. people who had applied for the refugee status but whose application had not yet been processed. Their main argument is that asylum seekers' preferences may change once their application is approved. This argument can be mitigated by the fact that, at the time of their study, the recognition rate of Syrians - which make up the majority of their sample and with which it is most appropriate to make comparisons - in European countries was very high. In fact, as [Hatton \(2023\)](#) shows for the period 2008-2018, asylum seekers from Syria had the highest overall recognition rate (94.7%) across 20 European countries, including Luxembourg. As a result, those who applied were almost automatically granted legal protection. Arguably, asylum seekers knew about this before they applied, so the outcome of the application would have had little or no effect on their risk preferences. Consequently, we do not expect their sampling restriction to affect the comparability of the two samples - at least for the Syrians.

Series 1	ROUTE A: (30% chance of congestion)	ROUTE B: (10% chance of congestion)	Expected payoff difference (A-B)
1	40 (if congestion) or 10 (if no congestion)	68 (if congestion) or 5 (if no congestion)	7.7
2	40 (if congestion) or 10 (if no congestion)	75 (if congestion) or 5 (if no congestion)	7
3	40 (if congestion) or 10 (if no congestion)	83 (if congestion) or 5 (if no congestion)	6.0
4	40 (if congestion) or 10 (if no congestion)	93 (if congestion) or 5 (if no congestion)	5.2
5	40 (if congestion) or 10 (if no congestion)	106 (if congestion) or 5 (if no congestion)	3.9
6	40 (if congestion) or 10 (if no congestion)	125 (if congestion) or 5 (if no congestion)	2
7	40 (if congestion) or 10 (if no congestion)	150 (if congestion) or 5 (if no congestion)	-0.5
8	40 (if congestion) or 10 (if no congestion)	185 (if congestion) or 5 (if no congestion)	-4
9	40 (if congestion) or 10 (if no congestion)	220 (if congestion) or 5 (if no congestion)	-7.5
10	40 (if congestion) or 10 (if no congestion)	300 (if congestion) or 5 (if no congestion)	-15.5
11	40 (if congestion) or 10 (if no congestion)	400 (if congestion) or 5 (if no congestion)	-25.5
12	40 (if congestion) or 10 (if no congestion)	600 (if congestion) or 5 (if no congestion)	-45.5
13	40 (if congestion) or 10 (if no congestion)	1000 (if congestion) or 5 (if no congestion)	-85.5
14	40 (if congestion) or 10 (if no congestion)	1700 (if congestion) or 5 (if no congestion)	-155.5
Series 2	ROUTE A: (90% chance of congestion)	ROUTE B: (70% chance of congestion)	
15	40 (if congestion) or 30 (if no congestion)	54 (if congestion) or 5 (if no congestion)	-0.3
16	40 (if congestion) or 30 (if no congestion)	56 (if congestion) or 5 (if no congestion)	-1.7
17	40 (if congestion) or 30 (if no congestion)	58 (if congestion) or 5 (if no congestion)	-3.1
18	40 (if congestion) or 30 (if no congestion)	60 (if congestion) or 5 (if no congestion)	-4.5
19	40 (if congestion) or 30 (if no congestion)	62 (if congestion) or 5 (if no congestion)	-5.9
20	40 (if congestion) or 30 (if no congestion)	65 (if congestion) or 5 (if no congestion)	-8
21	40 (if congestion) or 30 (if no congestion)	68 (if congestion) or 5 (if no congestion)	-10.1
22	40 (if congestion) or 30 (if no congestion)	72 (if congestion) or 5 (if no congestion)	-12.9
23	40 (if congestion) or 30 (if no congestion)	77 (if congestion) or 5 (if no congestion)	-16.4
24	40 (if congestion) or 30 (if no congestion)	83 (if congestion) or 5 (if no congestion)	-20.6
25	40 (if congestion) or 30 (if no congestion)	90 (if congestion) or 5 (if no congestion)	-25.5
26	40 (if congestion) or 30 (if no congestion)	100 (if congestion) or 5 (if no congestion)	-32.5
27	40 (if congestion) or 30 (if no congestion)	110 (if congestion) or 5 (if no congestion)	-39.5
28	40 (if congestion) or 30 (if no congestion)	130 (if congestion) or 5 (if no congestion)	-53.5
Series 3	ROUTE A: (50% chance of congestion)	ROUTE B: (50% chance of congestion)	
29	receive 25 (if congestion) or lose 4 (if no congestion)	receive 30 (if congestion) or lose 21 (if no congestion)	6
30	receive 4 (if congestion) or lose 4 (if no congestion)	receive 30 (if congestion) or lose 21 (if no congestion)	-4.5
31	receive 1 (if congestion) or lose 4 (if no congestion)	receive 30 (if congestion) or lose 21 (if no congestion)	-6
32	receive 1 (if congestion) or lose 4 (if no congestion)	receive 30 (if congestion) or lose 16 (if no congestion)	-8.5
33	receive 1 (if congestion) or lose 8 (if no congestion)	receive 30 (if congestion) or lose 16 (if no congestion)	-10.5
34	receive 1 (if congestion) or lose 8 (if no congestion)	receive 30 (if congestion) or lose 14 (if no congestion)	-11.5
35	receive 1 (if congestion) or lose 8 (if no congestion)	receive 30 (if congestion) or lose 11 (if no congestion)	-13

Table 2 Series of the risk task

Note: Table adapted from [Tanaka et al. \(2010\)](#). Lottery payoffs are in EGP. Expected value information is not displayed to respondents.

- **Emotional framing:** In the Luxembourg experiment, the authors tested different emotional framings (neutral, happy and sad) but found no significant effect on individual decisions (Bocquého et al., 2018). The Egyptian experiment also tested emotional framing by comparing sadness with neutrality and also found no significant effect. Therefore, We do not expect these emotional framings to affect the comparison of the Luxembourg and Egyptian samples.
- **Experimenter and currency:** The experiments were carried out by different experimenters and with different currencies in the two countries. Such experimental artefacts may bias the comparison, but it is not easy to establish in which direction. However, because the local experimenters in the two countries were trained in the same way we can expect the potential biases to be attenuated.

### 3.4 Measurement of risk preference parameters

We follow Tversky and Kahneman (1992), Tanaka et al. (2010) and Bocquého et al. (2014) in assuming that the value of any binary lottery  $(y_1, p; y_2)$  is given by:

$$PU(y_1, p; y_2) = \begin{cases} w(p).u(y_1) + [1 - w(p)].u(y_2) & \text{if } y_1 \geq y_2 \geq 0 \text{ or} \\ & y_1 \leq y_2 \leq 0 \\ w(p).u(y_1) + w(1 - p).u(y_2) & \text{if } y_1 < 0 < y_2 \end{cases} \quad (1)$$

where  $w(\cdot)$  is the probability weighting function, for which, as per Tanaka et al. (2010), we have chosen the one-parameter probability function of Prelec (1998):<sup>13</sup>

$$w(p) = \frac{1}{\exp[\ln(1/p)]^\gamma} \quad (2)$$

The function is constant, equal to 1, and there is no probability distortion if  $\gamma = 1$  as it is under the EUT framework. If  $\gamma > 1$ , then the weighting function is S-shaped, i.e. individuals underweight small probabilities and overweight large probabilities. Finally, if  $\gamma < 1$ , the weighting function is inverse S-shaped, i.e., individuals overweight small probabilities and underweight large probabilities. The function has an invariant fixed inflection point at  $p = 0.37$ . Regarding the function  $u(\cdot)$  of equation 1, Tanaka et al. (2010) opt for a power function, which can be written as follows:

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<sup>13</sup>In our specification of the probability weighting function, the same parameter applies in the gain and loss domains. In more elaborate CPT models, distinct probability weighting parameters can operate in each of the gain and loss domains. However, in this case, the usual empirical finding is close values, leading to a similar behaviour with respect to losses and gains in terms of probability distortion (Bocquého et al., 2023b).

$$u(y) = \begin{cases} y^\sigma & \text{if } y > 0 \\ 0 & \text{if } y = 0 \\ -\lambda(-y)^\sigma & \text{if } y < 0 \end{cases} \quad (3)$$

In this specification, for gains,  $\sigma$  is an anti-index of the concavity of that utility function, while for losses,  $\sigma$  is an anti-index of its convexity. The utility function is linear when  $\sigma = 1$ . Parameter  $\lambda$  measures the degree of loss aversion. In the EUT case,  $\lambda$  is equal to 1.

These three individual parameters  $\sigma$ ,  $\gamma$  and  $\lambda$  can be deduced from the correspondence between the switching points in the experiment and the interval values of the parameters. Indeed, the experimental design used is such that each combination of choices in the three series corresponds to a particular interval for each CPT parameter. The bounds for  $\sigma$  and  $\gamma$  are jointly inferred from the switching points of Series 1 and Series 2. In turn, the bounds of the loss aversion parameter is identified from the switching point in the third series, conditional on the value of  $\sigma$  previously elicited. Once the appropriate intervals are found, we follow [Tanaka et al. \(2010\)](#) and approximate the value of each parameter by taking the midpoint of the intervals (or the lower and upper bounds for the semi-open intervals that correspond to extreme switching points).

## 4 Results

### 4.1 Estimates of risk preferences

Table 3 describes the distribution of choices made by the participants by sample for every series of the risk task. For each subject we calculate the corresponding CPT parameters, and the sample means are presented in Table 4.

On average, the parameter  $\sigma$  controlling utility curvature is equal to 0.56 for the Egyptian sample and 0.70 for the Luxembourg one (0.61 if restricted to Syrians). This indicates that on average the utility is concave for both samples. The average loss aversion parameter  $\lambda$  for the Egyptian sample is 3.49, 2.20 for the whole Luxembourg sample, and 2.46 for the Syrians in the Luxembourg sample. This means that, in these samples, individuals are more impacted by losses than by gains of the same extent. In other words, on average, participants in both samples overweight losses compared to gains. Finally, the average probability weighting parameter  $\gamma$  is 0.70 for the Egyptian sample, 0.94 for the whole Luxembourg sample and 1.01 for the Syrians in the Luxembourg sample. This

result indicates that on average, Syrian refugees in Egypt distort probabilities by overweighting low probabilities and underweighting high probabilities.<sup>14</sup> This is also true, but to a lower extent, for the whole Luxembourg sample. However, on average, Syrians in the Luxembourg sample do not distort objective probabilities. Overall, the estimates we obtain are in line with those calculated on different populations using similar methods.<sup>15</sup>

Regarding the relevance of the EUT and CPT frameworks to model refugees' choices, the Wald test results in Table 4 show that the mean loss aversion and probability weighting parameters ( $\lambda$  and  $\gamma$ ) are significantly different from 1 for both the Egyptian and Luxembourg samples. This suggests that CPT is better suited to model refugees' behaviour in risky situations.<sup>16</sup>

Switching point	Proportion of respondents								
	Luxembourg - All			Luxembourg - Syrians only			Egypt		
	Series 1	Series 2	Series 3	Series 1	Series 2	Series 3	Series 1	Series 2	Series 3
1	22.9	50.5	29.8	16.7	51.6	26.2	18.2	24.7	33.8
2	0.9	2.8	31.2	0.0	0.8	27.0	1.3	1.3	9.1
3	1.8	6	5.5	0.0	5.6	6.3	2.6	2.6	5.2
4	1.4	6	5.5	1.6	5.6	6.3	3.9	3.9	7.8
5	2.8	1.4	8.7	2.4	0.8	11.1	1.3	2.6	9.1
6	0.9	4.1	5.5	0.0	5.6	7.9	3.9	1.3	7.8
7	4.1	3.7	11	4.0	5.6	11.9	5.2	2.6	15.6
8	1.8	2.3		0.8	2.4		1.3	5.2	
9	1.4	2.3		0.8	1.6		1.3	2.6	
10	3.2	1.4		4.0	1.6		6.5	3.9	
11	3.2	2.3		3.2	1.6		6.5	3.9	
12	4.1	4.6		3.2	3.2		9.1	7.8	
13	5.5	0.5		6.3	0.8		13.0	9.1	
14	4.1	4.6		7.1	5.6		6.5	7.8	
never	41.7	7.8	2.8	50.0	7.9	3.2	19.5	20.8	11.7
Total	100	100	100	100	100	100	100	100	100
Observations	218	218	218	126	126	126	77	77	77

Table 3 Distribution of switching points by sample and sub-sample

## 4.2 Risk preferences and refugees' destination

This subsection analyses the differences in CPT risk parameters between the two samples of migrants. The aim is to find out whether Syrian refugees in Egypt differ from the refugees in Luxembourg with respect to their risk preferences. Table 5 presents the average values of the risk parameters for different

<sup>14</sup>Figure A.1 in appendix A presents the estimated probability weighting function.

<sup>15</sup>See the studies of Tanaka et al. (2010) on rural Vietnamese people, Liu and Huang (2013) on Chinese farmers, Bocquého et al. (2014) on French farmers, and Campos-Vazquez and Cuijly (2014) on Mexican students.

<sup>16</sup>This conclusion also holds for the Syrian refugees in the Luxembourg sample. Although their mean probability weighting parameter is not significantly different from 1, their loss aversion parameter is.

	Luxembourg sample				Egypt sample	
	All		Syrians only		Mean	Wald test
	Mean	Wald test	Mean	Wald test		
$\sigma$	0.70	0.000***	0.61	0.000***	0.56	0.000***
$\lambda$	2.20	0.000***	2.46	0.000***	3.49	0.000***
$\gamma$	0.94	0.011**	1.01	0.647	0.70	0.000***

Table 4 Mean CPT parameters by sample and sub-sample

Note: The Wald test assesses whether the parameter is equal to 1. The number displayed in the corresponding column is the p-value. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

sub-samples. First, panel A focuses exclusively on the Syrian refugees in Egypt and compares the risk preferences of those who want to stay in Egypt with those who do not and would prefer to re-migrate. The utility curvature parameter ( $\sigma$ ) is on average higher for the latter (0.44 versus 0.67), but the difference is statistically insignificant. The same is true for the difference in the probability weighting coefficient ( $\gamma$ ): the average estimate is 0.69 for those willing to stay in Egypt and 0.71 for those who do not. However, the two samples differ significantly in their level of loss aversion. The mean value of the parameter for those willing to stay is 4.70 while for those not willing to stay it is 2.44. Expressed differently, this result shows that the Syrian refugees in Egypt who are willing to stay in the country are almost twice as sensitive to losses as opposed to gains compared to those who do not want to stay in the country and would prefer to re-migrate.

The remaining panels of Table 5 focus on the comparison between the Egyptian and Luxembourg samples. Panel B compares the two samples as a whole and the differences are statistically significant for all three parameters. The average utility curvature parameter of the Syrian refugees in Egypt (0.56) is lower than that of the refugees in Luxembourg (0.70) - but the difference is only significant at 10%. The former also have a lower probability distortion parameter (0.70) than the latter (0.94) and the difference is significant at 1%. This means that, the Syrian refugees in Egypt distort probabilities more than the asylum seekers in Luxembourg. Specifically, as expected, they overweight low probabilities and underweight high probabilities more than the latter. Regarding the loss aversion parameter, its average value is 3.50 for the Egyptian sample but only 2.20 for the Luxembourg sample. This difference is statistically significant at 5% and this finding suggests that refugees who migrated to Luxembourg are less sensitive to losses compared to those who stayed in Egypt. It is also consistent with the previous comparison between those willing to stay in Egypt and those not willing to stay, and provides additional support for the initial hypothesis.<sup>17</sup>

<sup>17</sup>As a robustness check, we implement a mean-comparison t-test between the Egypt and Luxembourg samples on the total number of risky choices (right hand-side lotteries) per individual and per series. This is a simple measure

In panels C and D of Table 5, the Egyptian sample remains unchanged. However, the Luxembourg sample is restricted to Syrians. Panel C includes all of them, while panel D excludes those who reported having entered Luxembourg with a visa. The rationale for this is that those who entered Luxembourg in possession of a visa are more likely to have arrived by air - perhaps from a nearby asylum country - thus avoiding the perilous and risky illegal migration routes.<sup>18</sup> Turning to the results, there is no ordinal change between the samples in either of these two panels compared to the previous ones. However, the differences have shifted towards less statistical significance. The differences in the mean utility curvature parameter are no longer statistically significant. Regarding the loss aversion coefficient, the mean difference between the Syrian in Egypt and those in Luxembourg is statistically significant at 10%, but no longer when we exclude those who say they entered with a visa. Finally, only the differences in the mean probability weighting parameters remain strongly significant in these two panels, at the 1% level. Note that the probability weighting parameter is neutral both when we restrict the Luxembourg sample to Syrians and when we further exclude those who entered Luxembourg with a visa. This result reinforces the idea that forced migrants in Europe and nearby asylum countries may be self-selecting based on their perceptions of probabilities. While Syrian refugees in Luxembourg do not distort probabilities, those who stayed in Egypt overweight low probabilities and underweight high probabilities.

In Table 6, we run OLS regressions with the risk parameters as dependent variables to check whether the results about the mean comparisons still hold after controlling for individual characteristics. All the regressions control for gender, age, number of children, marital status and educational attainment. In panel B of the table, we also control for nationality. Starting with panel A, which only includes the Syrians in Egypt, the results show that no individual characteristic is statistically significant for any of the dependent variables. The coefficient of the *If want to stay in Egypt* dummy for the loss aversion parameter is positive and significant at 5%, which supports the mean comparison result. Those willing to stay are more sensitive to losses, compared to those who do not want to. This dummy is also statistically insignificant for the probability weighting parameter, again in line with

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of risk behaviour which depends neither on the decision model, nor on the functional forms. We find a significant difference for Series 2 and 3 only, at the 1% and 5% levels respectively. As expected, refugees from the Egypt sample make less risky choices than those from the Luxembourg sample in both series. The absence of difference in Series 1 can be explained by the specific structure of the lotteries involved. The right hand-side lotteries have a higher variance, but at the same time feature a low-probability good event. As a consequence, subjects with a more concave utility function would value more the safe lotteries and switch later, and those overweighting stronger the low probabilities would value the risky lotteries more and switch earlier. The refugees in the Egypt sample typically combine these two behavioural traits, which makes them act in opposite ways in Series 1. This explanation further highlights the value of CPT in refining the analysis of behaviour and disentangling confounding factors.

<sup>18</sup>Table A.1 in Appendix compares the Egyptian sample with the sub-sample of those who entered in Luxembourg with a visa. The differences in loss aversion and probability distortion still hold in the same direction.

previous results. In contrast, there is now a weakly significant effect (at 10%) on the utility curvature parameter.

Panels B, C and D include the Egyptian and Luxembourg samples. The dummy *If Egyptian sample* takes the value 1 for the refugees in Egypt and 0 for those in Luxembourg. In panel B, both samples are included entirely and the regression results are consistent with the mean comparisons. Only the effect on the utility curvature parameter is no longer statistically significant, while it still holds for the loss aversion and the probability weighting parameters (at 10% and 1% respectively). It is also worth noting that the nationality dummies (*Syrian* and *Iraqi*) are significant for some of the preference parameters, suggesting possible heterogeneities with respect to the origin. In panels C and D of Table 6, the estimates are restricted to the Syrian refugees in both Egypt and Luxembourg. Again, the results are fully consistent with those in Table 5. Syrian refugees in Egypt are more loss averse than those in Luxembourg. They also have a lower probability weighting parameter, which means that on average they tend to distort probabilities more than their counterparts in Luxembourg. Only this last result remains significant when the Luxembourg sample is restricted to the Syrian refugees who entered to Luxembourg without a visa (panel D).

In relation to other individual characteristics, the regressions indicate a slight decrease in the probability weighting parameter with *Age*. The results also suggest that there may be a similar relationship between educational attainment and probability distortion. Indeed, the coefficients of both the secondary and tertiary education dummies (*Secondary education* and *College or University education*) are all negative. However, only the secondary education dummy is statistically significant, at the 10% level only. Loss aversion also tends to be inversely related to the level of education (secondary and tertiary), **but the effect is not significant**. The *Other education* dummy identifies refugees who did not follow the formal education system, but rather other forms such as Koranic schools. However, these refugees few in number, exclusively in the Luxembourg sample, which makes difficult to interpret the corresponding coefficients.

	Panel A				Panel B				Panel C				Panel D				
	Not willing		Willing		Luxembourg		Egypt		Luxembourg		Egypt		Luxembourg		Egypt		
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	
sigma ( $\sigma$ )	0.67	0.51	0.44	0.48	0.23	0.48	0.51	0.14*	0.61	0.44	0.56	0.51	0.05	0.45	0.56	0.51	0.05
lambda ( $\lambda$ )	2.44	3.06	4.70	3.86	-2.27**	2.20	2.64	-1.29**	2.46	2.72	3.50	3.62	-1.04*	2.82	3.50	3.62	-0.91
gamma ( $\gamma$ )	0.71	0.24	0.69	0.25	0.03	0.94	0.35	0.24	1.01	0.35	0.70	0.24	0.31***	0.35	0.70	0.24	0.29***
$N$	41		36		77	218	77	295	126	77	77	203	104	77	77	181	

Table 5 Mean CPT parameters across refugee groups

Note: Panel A: Syrian refugees in Egypt only. The sample is split according to the migration intention between those who want to stay in Egypt and those who do not. Panel B: Combines the sample of Syrian refugees in Egypt with the total sample of asylum seekers in Luxembourg. Panel C: Includes only the Syrians in both countries. Panel D: Includes only the Syrians in both countries, but excludes those who entered Luxembourg with a visa. The t-test is used to test the significance of the difference between the means.  $p^{***} < 0.01$ ,  $p^{**} < 0.05$ ,  $p^* < 0.1$ .

	Panel A			Panel B			Panel C			Panel D		
	(1) sigma ( $\sigma$ )	(2) lambda ( $\lambda$ )	(3) gamma ( $\gamma$ )	(4) sigma ( $\sigma$ )	(5) lambda ( $\lambda$ )	(6) gamma ( $\gamma$ )	(7) sigma ( $\sigma$ )	(8) lambda ( $\lambda$ )	(9) gamma ( $\gamma$ )	(10) sigma ( $\sigma$ )	(11) lambda ( $\lambda$ )	(12) gamma ( $\gamma$ )
If want to stay in Egypt	-0.246* (0.125)	2.189** (0.888)	-0.031 (0.053)									
If Egyptian sample												
Female	-0.074 (0.133)	-0.036 (0.966)	-0.090 (0.064)	-0.028 (0.072)	0.996* (0.510)	-0.326*** (0.044)	-0.042 (0.073)	0.988* (0.523)	-0.324*** (0.044)	-0.040 (0.077)	0.822 (0.553)	-0.299*** (0.046)
Age	0.001 (0.008)	-0.041 (0.058)	0.001 (0.004)	-0.002 (0.004)	0.020 (0.025)	-0.005** (0.002)	-0.006 (0.004)	0.037 (0.033)	-0.006* (0.003)	-0.005 (0.005)	0.021 (0.036)	-0.008*** (0.003)
Number of children	-0.012 (0.063)	-0.160 (0.447)	-0.007 (0.033)	0.010 (0.022)	-0.004 (0.146)	0.024* (0.014)	0.030 (0.026)	-0.130 (0.203)	0.019 (0.017)	0.030 (0.027)	-0.159 (0.211)	0.033* (0.017)
Married	-0.094 (0.144)	0.264 (1.039)	-0.014 (0.053)	-0.029 (0.071)	0.212 (0.408)	-0.036 (0.044)	-0.098 (0.082)	0.456 (0.537)	-0.021 (0.054)	-0.096 (0.093)	0.645 (0.569)	-0.019 (0.053)
Secondary education	0.037 (0.157)	-0.448 (1.031)	-0.111 (0.082)	0.054 (0.081)	-0.423 (0.531)	-0.109* (0.059)	-0.047 (0.087)	-0.163 (0.618)	-0.119* (0.064)	-0.020 (0.093)	-0.129 (0.697)	-0.140** (0.068)
College or University education	0.092 (0.200)	-0.581 (1.448)	0.008 (0.074)	0.137 (0.090)	-0.490 (0.574)	-0.079 (0.065)	0.108 (0.103)	-0.538 (0.717)	-0.130* (0.074)	0.143 (0.114)	-0.563 (0.805)	-0.133* (0.079)
Other education				0.694*** (0.125)	-1.906*** (0.610)	-0.351*** (0.072)	0.968*** (0.111)	-2.515*** (0.829)	-0.481*** (0.075)	0.996*** (0.117)	-2.766*** (0.903)	-0.461*** (0.077)
Syrian				-0.049 (0.081)	0.699 (0.431)	0.161** (0.064)						
Iraqi				0.229** (0.101)	0.658 (0.524)	0.015 (0.072)						
Constant	0.697** (0.288)	4.425** (2.007)	0.797*** (0.125)	0.687*** (0.151)	1.199 (0.926)	1.087*** (0.102)	0.828*** (0.150)	1.292 (0.988)	1.293*** (0.106)	0.768*** (0.170)	1.859 (1.149)	1.336*** (0.114)
N	77	77	77	294	294	294	202	202	202	180	180	180

Table 6 OLS regressions of CPT parameters on covariates

Note: Robust standard errors in parenthesis are given under the coefficient estimate. Panel A includes only Syrian refugees in Egypt. Panel B: includes the full sample from both Egypt and Luxembourg. The total number of observations is reduced to 294, as one participant in Luxembourg did not provide information on educational attainment. Panel C: includes Syrians in both countries. Panel D: includes Syrians in both countries, but excludes those who reported having entered Luxembourg with a visa.  $p^{***} < 0.01$ ,  $p^{**} < 0.05$ ,  $p^* < 0.1$ .

## 5 Conclusion

How important are risk preferences in explaining refugees' destination choices? Although exploratory, this paper has provided an initial analysis of this question. First, we have sought to establish an appropriate theoretical framework to model refugee behaviour in risk situations. More specifically, using the experimental design of [Tanaka et al. \(2010\)](#) we measured refugees' risk preferences in Egypt and Luxembourg. Our findings advocate for the CPT framework for modelling refugee behaviour under risk. By accounting for loss aversion and nonlinear probability weighting, CPT appears as a more elaborate alternative to EUT and which can arguably improve our understanding of refugees' destination choices.

Second, we compared the CPT risk preferences of the two refugee samples in Egypt and Luxembourg. We find that, on average, the two samples differ in terms of their sensitivity to loss and in the way they perceive objective probabilities. More precisely, Syrian refugees in Egypt are more sensitive to losses, compared to refugees in Luxembourg. They also distort probabilities more, i.e. they overweight low probabilities and underweight high probabilities to a larger extent.

These findings suggest that refugees arriving in Europe may be self-selecting on the basis of their risk preferences, which would challenge the current European asylum system. In a well-designed system, the only selection criterion for granting asylum should be the legitimacy of claims. Unfortunately, by encouraging asylum seekers to undertake risky land or sea crossings in the hope of the uncertain prospect of being granted refugee status, the current European asylum system may select refugees on the basis of their risk preferences, and thus fail to meet the protection need criterion. Our findings align with [Hatton \(2017\)](#)'s proposal to reform the system towards one that eliminates risks to refugees. Concretely, this means increasing resettlement and cooperation with neighbouring countries.

In this paper, our analysis has focused on refugees' risk preferences and the risks of refugee migration. However, the hazardous migration of refugees by land or sea also involves many uncertainties. Therefore, a valuable extension of our study would be to consider preferences with respect to ambiguity, which apply to situations where the objective probabilities of potential outcomes are unknown. Our analysis could also be extended to the self-selection of illegal economic migrants, who face specific risks and uncertainties. Finally, future research could replicate our study with refugees from other countries or extend it to countries of first and last asylum.

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## A Additional results

	Panel A					Panel B				
	Luxembourg		Egypt		Diff	Luxembourg		Egypt		Diff
	Mean	sd	Mean	sd		Mean	sd	Mean	sd	
sigma ( $\sigma$ )	0.66	0.43	0.56	0.51	0.10	0.61	0.42	0.56	0.51	0.05
lambda ( $\lambda$ )	1.69	1.87	3.50	3.62	-1.81***	1.87	2.14	3.50	3.62	-1.63*
gamma ( $\gamma$ )	1.05	0.37	0.70	0.24	0.35***	1.10	0.34	0.70	0.24	0.40***
$N$	31		77		108	22		77		99

Table A.1 Comparison of Syrians in Egypt and refugees who entered Luxembourg with a visa

Note: Panel A compares the sample of Syrian refugees in Egypt with the sub-sample of asylum seekers who entered Luxembourg with a visa. Panel B compares the sample of Syrian refugees in Egypt with the sub-sample of Syrian asylum seekers who entered Luxembourg with a visa.  $p^{***} < 0.01$ ,  $p^{**} < 0.05$ ,  $p^* < 0.1$ .

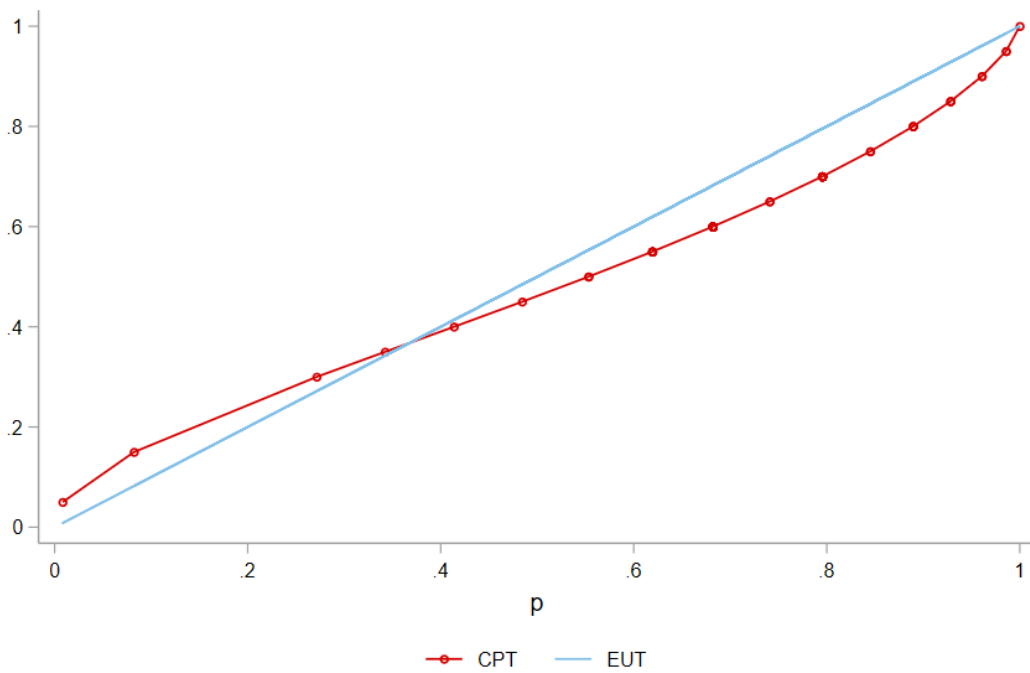


Figure A.1: Probability weighting function

Note: The graph shows the probability weighting function under the CPT and EUT. Simple average of  $\gamma$  over the 77 Syrian refugees. **Colours not required for printing**

## B Instructions

We invite you to participate in a research study about decision making. If you agree to be part of the research study, you will be asked about your current situation as well as past experiences. Your participation is completely voluntary and all of your responses will be kept confidential and used for research purposes only. It is anonymous. Your identity will not be noted. You will receive a 250 EGP payment for participating in the study. If you finish it, you can win or lose an additional amount depending on your choices. At the end of the experiment, you will receive at least 229 Egyptian pounds. The interview will take approximately 30 minutes.

### Part 0: Consent

Q.0 Please read the following points carefully before proceeding:

- I am aware that if at any time during the session I do not want to participate and leave the room, I am free to leave after informing the researcher.
- I am aware that I am not supposed to communicate with the other participants in the room.
- I am aware that there are no wrong or right answers. It is only my own choices.
- I am aware that my earnings will depend on my choices and on which scenario will materialize according to its probability.
- I am aware that at the end of the session, I might receive different earnings than other people.
- I am aware that my identity will remain anonymous during the session and even after the session. No other participant will be informed about my earnings.

I understand that by pressing **Next** I am going to start the survey. **I understand the previous statements fully and I am giving my consent on them. I confirm that I want to participate in the survey.**

Q.1 Please enter your PC code number.

## Part 1: Preparatory information

Q.2 Next to your computer, there is a letter (A or B). Please check the box corresponding to the letter.

## Part 2: Life experiences

Q.3 We are interested in understanding your general daily experiences. This could be anything. Could you describe an event from the past year that was important or significant for your life?  
(Only if Q.2 = B)

Q.4 We are interested in understanding your daily experiences that may make you fearful or anxious. This could be anything, for example getting sick, experiencing violence, losing a job, etc. Could you describe one event in the past year that caused you fear or anxiety? (Only if Q.2 = A)

## Part 3: Examples

This is an experiment aimed at understanding your decisions. It will allow you to earn some money, depending on chance and the choices you make in the games, some choices leading to gains and some others to losses. We ask you to play three games. There are no right or wrong answers, only different choices that reflect different personal preferences.

### Q.5 Example relative to the first game

We provide you with an initial show-up fee of 250 EGP. We then add to the show-up fee the gains you earn or deduct from the show-up fee the losses you incur. The experiment was designed so as to ensure a final positive payoff, whatever your choices. The final amount is determined at the end of the experiment.

All payments will be made individually with discretion, and we will ask you to sign a receipt.

In the following three tables, you are to imagine in that you are a taxi driver taking clients to Tahrir Square. You can only make this one trip today. You can offer your clients one of two routes (route A or route B). Your earnings will depend on traffic congestion. You cannot know how congested the traffic is on each of these routes when you make your choice. The more congestion there is, the more you earn. The exact earnings are given in the tables.

The two routes have different probabilities of traffic congestion. To make you visualise the probabilities, we have represented them by urns containing 10 different coloured balls. In urn 1 there are 3 black balls, representing congestion, and 7 white balls representing free flow. At the end of the game, one ball will be drawn. Depending on the choice you made, you will receive the payoff corresponding to this traffic outcome.

**As an example**, let's consider the table below, which includes 5 lines. There are two different urns (routes). The urn of route A contains 3 black balls and 7 white balls, meaning that there are 3 chances out of 10 (or a 30% chance) that the ball drawn is black and that there is congestion; and there are 7 chances out of 10 (or a 70% chance) that the ball drawn is white and that there is no congestion. The urn of route B contains 1 black ball and 9 white balls, or 10% chance of congestion and 90% chance of free roads. Payoffs of route B vary over lines.

For each line, you must choose the route, A or B, that you prefer. You can either

1. at some point switch from A to B,
2. always choose route A,
3. always choose route B.

	Urn A : 3 BLACK + 7 WHITE	Urn B : 1 BLACK + 9 WHITE
	<b>ROUTE A : 30% chance of congestion</b>	<b>Route B : 10% chance of congestion</b>
1	20 EGP (if congestion) or 10 EGP (if no congestion)	35 EGP (if congestion) or 6 EGP (if no congestion)
2	20 EGP (if congestion) or 10 EGP (if no congestion)	40 EGP (if congestion) or 6 EGP (if no congestion)
3	20 EGP (if congestion) or 10 EGP (if no congestion)	45 EGP (if congestion) or 6 EGP (if no congestion)
4	20 EGP (if congestion) or 10 EGP (if no congestion)	50 EGP (if congestion) or 6 EGP (if no congestion)
5	20 EGP (if congestion) or 10 EGP (if no congestion)	55 EGP (if congestion) or 6 EGP (if no congestion)

Let us assume that you choose route A for lines 1 to 3, and route B for lines 4 to 5. You then note that your switching point is 4 (the first line that you choose B). If you always choose A, note 0 as switching point. If you always choose B, choose 1 (this is the first line you choose B for).

Please write your choice on the paper provided, as well online.

At the very end of the experiment, one choice is randomly selected for real payment. In practice, the experimenter will pick one ticket from a bag which determines which line of the games is actually played. All tickets have the same probability to be drawn. Each ticket is associated with only one decision. It follows that each choice has the same probability to be selected.

### Example of payment

With the example above, if you pick line **no. 4** as switching point, and if line no. 3 is drawn for payment (so your choice is route A) and the experimenter draws a black ball from urn A, then your earnings are 20 EGP (in addition to the 250 EGP).

## Part 4: Preparation games

### Q.6 Test A

Consider the table below. Assume now that you always prefer route A. Please note the switching point.

[Help: If you always choose A, note 0 as switching point. If you always choose B, choose 1 (this is the first line you choose B for).]

	<b>ROUTE A : 30% chance of congestion</b>	<b>Route B : 10% chance of congestion</b>
1	20 EGP (if congestion) or 10 EGP (if no congestion)	35 EGP (if congestion) or 6 EGP (if no congestion)
2	20 EGP (if congestion) or 10 EGP (if no congestion)	40 EGP (if congestion) or 6 EGP (if no congestion)
3	20 EGP (if congestion) or 10 EGP (if no congestion)	45 EGP (if congestion) or 6 EGP (if no congestion)
4	20 EGP (if congestion) or 10 EGP (if no congestion)	50 EGP (if congestion) or 6 EGP (if no congestion)
5	20 EGP (if congestion) or 10 EGP (if no congestion)	55 EGP (if congestion) or 6 EGP (if no congestion)

### Q.7 Test B

Consider the table below. Assume now that you always prefer route B. Please note the switching point.

[Help: If you always choose A, note 0 as switching point. If you always choose B, choose 1 (this is the first line you choose B for).]

	<b>ROUTE A : 30% chance of congestion</b>	<b>Route B : 10% chance of congestion</b>
1	20 EGP (if congestion) or 10 EGP (if no congestion)	35 EGP (if congestion) or 6 EGP (if no congestion)
2	20 EGP (if congestion) or 10 EGP (if no congestion)	40 EGP (if congestion) or 6 EGP (if no congestion)
3	20 EGP (if congestion) or 10 EGP (if no congestion)	45 EGP (if congestion) or 6 EGP (if no congestion)
4	20 EGP (if congestion) or 10 EGP (if no congestion)	50 EGP (if congestion) or 6 EGP (if no congestion)
5	20 EGP (if congestion) or 10 EGP (if no congestion)	55 EGP (if congestion) or 6 EGP (if no congestion)

### Q.8 Test C

Consider the table below. Assume that you prefer route A for lines 1 and 2 and route B for lines 3 to 5. Which is the number of the first line for which you prefer route B?

[Help: Your switching point is the number of the first line for which you choose B. If you always choose A, note 0 as switching point. If you always choose B, choose 1 (this is the first line you choose B for).]

	<b>ROUTE A : 30% chance of congestion</b>	<b>Route B : 10% chance of congestion</b>
1	20 EGP (if congestion) or 10 EGP (if no congestion)	35 EGP (if congestion) or 6 EGP (if no congestion)
2	20 EGP (if congestion) or 10 EGP (if no congestion)	40 EGP (if congestion) or 6 EGP (if no congestion)
3	20 EGP (if congestion) or 10 EGP (if no congestion)	45 EGP (if congestion) or 6 EGP (if no congestion)
4	20 EGP (if congestion) or 10 EGP (if no congestion)	50 EGP (if congestion) or 6 EGP (if no congestion)
5	20 EGP (if congestion) or 10 EGP (if no congestion)	55 EGP (if congestion) or 6 EGP (if no congestion)

**Q.9 Test D (Only if fail Test C)**

Try again

Consider the table below. Assume that you prefer route A for lines 1 and 2 and route B for lines 3 to 5. Which is the number of the first line for which you prefer route B?

[Help: Your switching point is the number of the first line for which you choose B. If you always choose A, note 0 as switching point. If you always choose B, choose 1 (this is the first line you choose B for).]

	<b>ROUTE A : 30% chance of congestion</b>	<b>Route B : 10% chance of congestion</b>
1	20 EGP (if congestion) or 10 EGP (if no congestion)	35 EGP (if congestion) or 6 EGP (if no congestion)
2	20 EGP (if congestion) or 10 EGP (if no congestion)	40 EGP (if congestion) or 6 EGP (if no congestion)
3	20 EGP (if congestion) or 10 EGP (if no congestion)	45 EGP (if congestion) or 6 EGP (if no congestion)
4	20 EGP (if congestion) or 10 EGP (if no congestion)	50 EGP (if congestion) or 6 EGP (if no congestion)
5	20 EGP (if congestion) or 10 EGP (if no congestion)	55 EGP (if congestion) or 6 EGP (if no congestion)

**Q.10** Please call an interviewer for further explanations. (Only if fail test)

INTERVIEWER: (After explanations) Would you want to continue ?

**Part 5: Game 1**

Now we start the games. Please consider your choices carefully, because they will impact the payment you receive at the end.

**Q.11 Risk 1**

For each line of the following table, consider whether you would choose route A or route B. Note that the probabilities and payments are different from the previous table. Please note the number of the first line for which you would choose route B. If you always choose A, note 0 as switching point. If you always choose B, choose 1. Remember to also note your choice on paper.

	ROUTE A: (30% chance of congestion)	ROUTE B: (10% chance of congestion)
1	40 EGP (if congestion) or 10 EGP (if no congestion)	68 EGP (if congestion) or 5 EGP (if no congestion)
2	40 EGP (if congestion) or 10 EGP (if no congestion)	75 EGP (if congestion) or 5 EGP (if no congestion)
3	40 EGP (if congestion) or 10 EGP (if no congestion)	83 EGP (if congestion) or 5 EGP (if no congestion)
4	40 EGP (if congestion) or 10 EGP (if no congestion)	93 EGP (if congestion) or 5 EGP (if no congestion)
5	40 EGP (if congestion) or 10 EGP (if no congestion)	106 EGP (if congestion) or 5 EGP (if no congestion)
6	40 EGP (if congestion) or 10 EGP (if no congestion)	125 EGP (if congestion) or 5 EGP (if no congestion)
7	40 EGP (if congestion) or 10 EGP (if no congestion)	150 EGP (if congestion) or 5 EGP (if no congestion)
8	40 EGP (if congestion) or 10 EGP (if no congestion)	185 EGP (if congestion) or 5 EGP (if no congestion)
9	40 EGP (if congestion) or 10 EGP (if no congestion)	220 EGP (if congestion) or 5 EGP (if no congestion)
10	40 EGP (if congestion) or 10 EGP (if no congestion)	300 EGP (if congestion) or 5 EGP (if no congestion)
11	40 EGP (if congestion) or 10 EGP (if no congestion)	400 EGP (if congestion) or 5 EGP (if no congestion)
12	40 EGP (if congestion) or 10 EGP (if no congestion)	600 EGP (if congestion) or 5 EGP (if no congestion)
13	40 EGP (if congestion) or 10 EGP (if no congestion)	1000 EGP (if congestion) or 5 EGP (if no congestion)
14	40 EGP (if congestion) or 10 EGP (if no congestion)	1700 EGP (if congestion) or 5 EGP (if no congestion)

## Part 6: Game 2

### Q.12 Risk 2

For each line of the following table, consider whether you would choose route A or route B.

Note that the probabilities and payments are different from the previous table.

Please note the number of the first line for which you would choose route B. If you always choose A, note 0 as switching point. If you always choose B, choose 15.

Remember to also note your choice on paper.

	ROUTE A: (90% chance of congestion)	ROUTE B: (70% chance of congestion)
15	40 EGP (if congestion) or 30 EGP (if no congestion)	54 EGP (if congestion) or 5 EGP (if no congestion)
16	40 EGP (if congestion) or 30 EGP (if no congestion)	56 EGP (if congestion) or 5 EGP (if no congestion)
17	40 EGP (if congestion) or 30 EGP (if no congestion)	58 EGP (if congestion) or 5 EGP (if no congestion)
18	40 EGP (if congestion) or 30 EGP (if no congestion)	60 EGP (if congestion) or 5 EGP (if no congestion)
19	40 EGP (if congestion) or 30 EGP (if no congestion)	62 EGP (if congestion) or 5 EGP (if no congestion)
20	40 EGP (if congestion) or 30 EGP (if no congestion)	65 EGP (if congestion) or 5 EGP (if no congestion)
21	40 EGP (if congestion) or 30 EGP (if no congestion)	68 EGP (if congestion) or 5 EGP (if no congestion)
22	40 EGP (if congestion) or 30 EGP (if no congestion)	72 EGP (if congestion) or 5 EGP (if no congestion)
23	40 EGP (if congestion) or 30 EGP (if no congestion)	77 EGP (if congestion) or 5 EGP (if no congestion)
24	40 EGP (if congestion) or 30 EGP (if no congestion)	83 EGP (if congestion) or 5 EGP (if no congestion)
25	40 EGP (if congestion) or 30 EGP (if no congestion)	90 EGP (if congestion) or 5 EGP (if no congestion)
26	40 EGP (if congestion) or 30 EGP (if no congestion)	100 EGP (if congestion) or 5 EGP (if no congestion)
27	40 EGP (if congestion) or 30 EGP (if no congestion)	110 EGP (if congestion) or 5 EGP (if no congestion)
28	40 EGP (if congestion) or 30 EGP (if no congestion)	130 EGP (if congestion) or 5 EGP (if no congestion)

## Part 7: Game 3

### Q.13 Risk 3

For each line of the following table, consider whether you would choose route A or route B. Note that the probabilities and payments are different from the previous table. In the case of no congestion, you now risk losing money.

Please note the number of the first line for which you would choose route B. If you always choose A, note 0 as switching point. If you always choose B, choose 29.

Remember to also note your choice on paper.

	ROUTE A: (50% chance of congestion)	ROUTE B: (50% chance of congestion)
29	receive 25 EGP (if congestion) or lose 4 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 21 EGP (if no congestion)
30	receive 4 EGP (if congestion) or lose 4 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 21 EGP (if no congestion)
31	receive 1 EGP (if congestion) or lose 4 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 21 EGP (if no congestion)
32	receive 1 EGP (if congestion) or lose 4 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 16 EGP (if no congestion)
33	receive 1 EGP (if congestion) or lose 8 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 16 EGP (if no congestion)
34	receive 1 EGP (if congestion) or lose 8 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 14 EGP (if no congestion)
35	receive 1 EGP (if congestion) or lose 8 EGP (if no congestion)	receive 30 EGP (if congestion) or lose 11 EGP (if no congestion)

## Part 8: Cognitive reflection test

Feel free to take your time and to take notes before answering this question. The answer may not be as simple as it looks. Do not worry if your answers turn out to be incorrect. In a test on Harvard students, only 20% got all three questions right and 20% got none of them right!

Q.14 A bat and a ball cost 11 EGP in total. The bat costs 10 EGP more than the ball. How much does the ball cost? (in EGP)

Q.15 If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? (in minutes)

Q.16 In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake? (in days)

## Part 9: Demographics

Q.17 What is your year of birth?

Q.18 What is your gender?

Q.19 What is your marital status?

- Married
- Widowed
- Divorced
- Separated
- Single

Q.20 How many children do you have? (Not for single)

Q.21 What is your religion?

- Muslim (Sunni)
- Muslim (Shia)
- Druze
- Christian (Protestant, Catholic, Orthodox)
- Single
- Other

## Part 10: Initial Conditions

Q.22 When did you leave your country?

[Help: If you don't know the exact date, make an approximation]

Q.23 What is the highest education level you completed?

- No education
- Kindergarten
- Primary level
- Secondary level
- Undergraduate (college or university)
- Postgraduate
- Religious Institution

Q.24 In which of the following ranges did your total income per month (including your spouse's) fall in in your country of origin before the war started?

If you prefer to write it in your own currency, please feel free to do so by choosing "no answer" and writing it in the comment.

- Less than 14 K EGP/year
- Between 14 K and 28 K EGP/year
- Between 28 K and 45 K EGP/year
- Between 45 K and 80 K EGP/year
- Over 80 K EGP/year
- No answer

Q.25 Please write your income level in your local currency (**Only if "No answer" in the previous question**)

Q.26 From the list below, classify the main reasons why you left your country.

- Civil Insecurity
- Political/ religious problems
- Lack of educational opportunities
- Economic difficulties
- Over 80 K EGP/year
- No answer

Q.26 What drove your decision to leave your country most?

- Concern for your immediate future
- Concern for your long term future

Q.27 When did you arrive in Egypt?

Q.28 Do you feel as safe in Egypt as you thought you would before migrating?

- Yes
- No

Q.29 Did you lose someone close to you during your journey to Egypt?

- Yes
- No

Q.30 Did you lose someone close to you during the war in your home country?

- Yes
- No

Q.31 Did you have any other traumatic experience in your home country?

- Yes
- No

Q.32 Do you want to stay in Egypt for good (settle)?

- Yes
- No

Q.33 From the list below, classify the main reasons why you want to stay in Egypt? (**Only if want to settle in Egypt**)

- Language
- Economic reasons
- Diaspora
- Culture
- Other

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