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Discounting and Expropriation Risk

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Abstract

This paper investigates the association between discounting and risk of expropriation and provides the theoretical conditions that make a positive association consistent with rationality. Moreover, using a national representative sample and a representative sample of the 50+ in eleven European countries, we show that discounting increases with expropriation risk. The two surveys give direct measures of discount rate as well as measures derived from households consumption decisions and provide proxies for expropriation from government and expropriation from criminal offenses.

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Contents

1 Introduction

This paper investigates the relationship between discount rate and risk of expropriation. One instance is that individuals facing a higher expropriation risk, are more impatient. This happens because they anticipate consumption when they perceive that their wealth will be stolen or confiscated at some future dates. Another possibility is that the risk of expropriation makes individuals more patient, because it increases the need for saving today to face future losses of wealth. Therefore, the relation between risk of expropriation and discounting might go either ways. This paper identifies conditions that make each of these two ways consistent with the optimality of the individual behavior. Moreover, we carry an estimation exercise to establish whether discounting increases or decreases with expropriation risk.

The paper contributes both to the substantial literature addressing the normative issue of the appropriate rate of discount for policy evaluation, as well as to the literature that studies the behavioral properties of individual rates of time preferences. Recent contributions to the former are Gollier (2002a,b) and Weitzman (2001), who compute the optimal discount factor, while the latter is surveyed in Frederick, Loewenstein, and O'Donoghue (2002).

The theoretical analysis reveals that all risk averse agents, who bear or perceive a greater risk of expropriation in the sense of First Order Stochastic Dominance should have a smaller discount rate. Moreover, we show that all prudent agents, who bear a greater risk of expropriation in the sense of Second Order Stochastic Dominance (with constant mean), should have a higher discount rate.

On the empirical side, the paper departs in some respects from the literature. First, instead of employing an experimental structure with small samples, as most literature does, we use two large surveys, the Bank of Italy Survey on Households Income and Wealth (SHIW) and the Survey on Health, Ageing and Retirement in Europe (SHARE). [1] The use of SHIW and SHARE allows us to exploit the ample variation across households in the perceived risk of expropriation and to control for other factors which might explain heterogeneity in preferences. Furthermore, our data can help measuring the expropriation

[1] A notable exception is the paper by Viscusi and Huber (2006), that examines revealed rates of time preference for public goods, using a survey on environmental quality.

from the government as well as expropriation coming from criminal offenses. Finally, we might use measures of impatience based both on direct questions, such as lottery and windfall gain questions, and on people choice.

The remaining of the paper is organized as follows. Section 2 gives the theoretical background and isolate the conditions that sign the association between discounting and expropriation risk. Data are described in Section 3, where we introduce our measures of discounting and of expropriation risk. Section 4 discusses the results from the empirical exercises and conclusions are drawn in Section 5.

2 Theoretical underpinnings

In this section we provide a model with one period and two dates, $t = 0, 1$. There is an agent who maximizes a weighted sum EU of the expected utility of the dates 0 and 1:

$$EU = u(c_0) + E^i v(c_1 - x^i).$$

Functions u and v are thrice-continuous increasing von Neumann-Morgenstern utility functions of the agent at dates 0 and 1. We assume that $v^{ii}(\cdot) \leq 0$ and $v^{iii}(\cdot) > 0$. Consumption is c_0 and $c_1 - x^i$ respectively at dates 0 and 1, where x^i is the random loss due to expropriation. The support of x^i is in $[0, c_1]$ with density $f^i(x)$ and cumulative distribution function $F^i(x)$, where $i = 1, 2..., n$ is the risk of expropriation either real or perceived by the agent. The distribution of the expropriation risk x^i is exogenous.

Following Gollier (2002a), suppose that the agent is considering the possibility to make an investment at date 0 that would pay at date 1 a return r, that is the investment entails an outflow of 1 unit at date 0 and gives an inflow of $1 + r$ with certainty at date 1. Think for instance to an health prevention investment like expenditure for mineral water and for equipments to filter and purify the water from the tap. Should our agent do the investment?

The answer is in the affirmative if $-u^{'}(c_0) + (1 + r)E^i v^{'}(c_1 - x^i) \geq 0$, or defining the discount rate as $\delta^i = \frac{u^{'}(c_0)}{E^i v^{'}(c_1 - x^i)} - 1$, if $-1 + \frac{1+r}{1+\delta^i} \geq 0$. Notice that δ^i is the discount rate that an agent facing an expropriation risk x^i should use to evaluate any project.

While the socially optimal δ^i depends on many elements, Gollier (2002a) compares the socially optimal discount rate in an economy where the growth rate is deterministic with one where it is stochastic and he shows that uncertainty reduces the discount rate and this

effect is larger the shorter the time horizon.[2]

In this paper, on the contrary, we are interested in evaluating the effect of a change in the perceived risk of expropriation on the optimal discount rate. To do this, we compare δ^i and δ^j, the optimal discount rates of two agents characterized respectively by perceived risk x^i and x^j.

First of all notice that:

$$\delta^i \leq \delta^j \iff E^i v'(c_1 - x^i) \geq E^j v'(c_1 - x^j). \tag{1}$$

It is intuitive that the previous condition will depend, both on the properties of the utility function and on the conditions on the distribution functions of x^i and x^j. In the following, we will consider two natural ways to compare random outcomes: according to the level of returns, first-order stochastic dominance (FSD) and according to the dispersion of returns, second-order stochastic dominance (SSD). The first comparative statics result for a FSD increase in risk relies on the risk aversion of the agent.

Proposition 1 *All agents, who bear (or perceive) a greater risk of expropriation in the sense of FSD, should have a smaller discount rate δ.*

Proof. Expression (1) may be rewritten as

$$\delta^i \leq \delta^j \iff \int_0^{c_1} v'(c_1 - x) \left[f^i(x) - f^j(x) \right] dx \geq 0$$

Integrating by parts and simplifying we get:

$$\delta^i \leq \delta^j \iff \int_0^{c_1} v''(c_1 - x) \left[F^i(x) - F^j(x) \right] dx \geq 0. \tag{2}$$

Considering the assumed risk aversion, $v''(.) \leq 0$, a sufficient condition for $\delta^i \leq \delta^j$ is $F^i(x) \leq F^j(x)$ for any x, that is x^i FSD x^j.[3] ■

[2]Formally, he compares $\delta = \frac{u'(c)}{Ev'(c(1+g))} - 1$ with $\delta^c = \frac{u'(c)}{v'(c(1+Eg))} - 1$, where g is the per capita growth rate of consumption.

[3]FSD is also necessary, in fact if $\exists\, x$ such that $F^i(x) > F^j(x)$ it is always possible to find an utility function $v(.)$ such that $E^i v'(c_1 - x^i) < E^j v'(c_1 - x^j)$. Just take an utility function almost linear, $v'' \cong 0$,except in the interval where $F^i(x) > F^j(x)$, where v'' takes a great value.

In words, expecting greater risk in the sense of a distribution x^i yielding unambiguously higher loss than a distribution x^j, should make the consumer more patient. Going back to our leading example, the agent should increase his expenditure for mineral water and for equipments to filter tap water. First-order stochastic dominance involves the idea of higher versus lower. We want now to introduce a comparison based on dispersion. To avoid confusion with the trade-off between returns and risk we restrict ourselves to distributions with the same mean. This leads to provide the following proposition, which relies on the convexity of $v^{'}$.

Proposition 2 *All agents, who bear (or perceive) a greater risk of expropriation in the sense of SSD (with constant means), should have an higher discount rate δ.*

Proof. From (2) integrating by parts and simplifying we get

$$\delta^i \geq \delta^j \iff v^{''}(0) \int_0^{c_1} \Big(F^i(t) - F^j(t)\Big)\, dt + \int_0^{c_1} v^{'''}(c_1 - x) \left[\int_0^x \Big(F^i(t) - F^j(t)\Big)\, dt\right] dx \geq 0.$$

Integrating once more by parts and using constant means to simplify we have

$$\delta^i \geq \delta^j \iff \int_0^{c_1} v^{'''}(c_1 - x) \left[\int_0^x \Big(F^i(t) - F^j(t)\Big)\, dt\right] dx \geq 0. \tag{3}$$

Assuming prudence, $v^{'''}(.) > 0$, a sufficient condition for $\delta^i \geq \delta^j$ is $\int_0^x F^i(t)dt \geq \int_0^x F^j(t)dt$ for any t, that is x^j SSD x^i. ■

This means that expecting a greater risk in the sense of SSD, should make the consumer more impatient. This individual should then decrease his expenditure for mineral water and for equipments to filter tap water. [4]

The convexity of marginal utility is a necessary and sufficient condition for an increase in future risk to increase savings. Kimball (1990) used the term prudent to define people that behave in this way. There are two arguments showing that prudence is an assumption as realistic as risk aversion. First, many empirical studies have shown that people that are more subject to future income risks save more (see, for instance, Guiso, Jappelli and Terlizzese, 1996 and Browning and Lusardi, 1996). Second, prudence is necessary for the widely accepted assumption that absolute risk aversion is decreasing. The comparative

[4] x^j SSD x^i (with constant mean) is equivalent to x^i is a mean-preserving spread of x^j.

statics gives then different predictions about people optimal behaviour when they face or perceive different future risks. How people intertemporal choices are affected by different perceived future risks? The objective of the empirical analysis is to investigate this question.

3 Data

In order to bring the model to the data, one has to find reasonable proxies for δ and x. The discount rate can be elicited through direct questions or from people's choice. The two approaches come with their own advantages and disadvantages, which are surveyed in Frederick, Loewenstein, and O'Donoghue (2002). In this paper, we use a direct measure of discount rate as well as a measure derived from households consumption decisions.

The literature on institutions has often focussed on the risk of expropriation by government. In a number of papers, which are surveyed by Glaeser, La Porta, Lopez-de-Silanes, and Shleifer (2004), the risk of expropriation is measured as the risk of "outright confiscation and forced nationalization" of property. In this paper, we take a less extreme view and measure the risk of expropriation by the household perception of the tax system inefficiency. Furthermore, since expropriation might come from criminal offenses, the risk of expropriation is also measured here as the perceived security from crime.

For the empirical exercise presented here, we use two surveys, the Bank of Italy Survey on Households Income and Wealth (SHIW) and the Survey on Health, Ageing and Retirement in Europe (SHARE). The SHIW is a representative sample of the Italian households population, the SHARE surveys the population of household headed by the 50+ in eleven European countries:Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden and Switzerland.

The SHIW is run on a regular basis, on a bi-annual frequency since mid-eighties. More details on sampling, response rates, processing of results and comparison of survey data with macroeconomic data are provided by Brandolini and Cannari (1994) and by Biancotti, D'Alessio, Faiella and Neri (2004).

The SHARE is a relatively new data collection effort that has provided cross-country and multidisciplinary data on the European old and oldest old. The survey asks detailed questions on demographics, physical and mental health, employment, income, assets, social activities, and expectations. All questions are standardized across countries, allowing

consistent international comparisons. More details on the survey are available from Börsch-Supan et al. (2005) to which the interest reader is referred.

3.1 Security

For our purposes, both the SHIW and the SHARE have a number of advantages. The SHIW 1993 wave records information on the perceived security from criminal offenses. Households are asked to rate between 1 and 10 the security of his/her neighborhood. The average grade is 5.27, a number, which hides considerable variation within regions and among households. Between Italian regions, Trentino-Alto Adige, in the far North-East, scores the highest 7, while Puglia and Campania, in Southern Italy, the households grade security 3.38 and 3.46, respectively. The between regional variation is documented in figure 1, which shows the map of Italy where more secure regions are displayed in dark colors. The trend in perceived security confirms the North and South divide, a distinguishing feature of the Italian economy. Furthermore, in smaller regions, such as Basilicata and Molise security is relatively high. But the variation is also large within each region. For instance in Sicily the average grade is 3.92, the standard deviation is 2.23, while in Emilia Romagna, which belongs to the club of virtuous regions, the standard deviation is much lower, 1.79.

A similar question is available from the drop-off questionnaire in SHARE, where the respondents are asked to rate the degree of security in the area they live. The question is worded as: "How about the area immediately surrounding your accommodation, would you say it suffers from vandalism or crime". The response is coded as a yes or not. 88% of the respondent find the area they live secure from vandalism and crime. Figure 2 shows that there are patterns of cross-country differences, the northern being more secure than the southern countries, but also differences within the same country at the individual level.

In order to measure the risk of expropriation by government we use the SHIW 2004, where it is asked about people perception of the tax system and related matters. Interviewed households are asked to express their agreement (or disagreement) on a number of statements that refer to the Italian tax system on a scale between 1 (no agreement) to 5 (full agreement). Among such statements, the closest to the amount of expropriation entailed by taxes is the following: "People try to avoid paying tax because they know the Government spends the money badly". While 10.88 percent of the respondents disagree with this statement, 14.35 fully agrees and 30.67 agrees quite a lot with it. This means that

according to almost half of the sample the Government inefficiency is a good reason for not paying taxes. We take this as evidence that a non-negligible share of Italians perceive the tax system as highly predatory.

3.2 Impatience

Impatience is also measured using SHIW 1993, SHIW 2004, and SHARE. Patient households engage in health prevention investment. A such investment is the expenditure for mineral water and for equipments to filter and purify the water from the tap, which is recorded in the 1993 wave of the SHIW. We are not the first to use such information as proxy for the degree of people impatience. Viscusi and Huber (2006) use hypothetical questions to elicit people willingness to pay for water quality improvement. We focus, however, on actual expenditure and can control for the perceived quality of water in the neighborhood of residence of the respondent. Around 65 percent of the sample buy mineral water or filters and the annual expenditure among those who buy is 232 euros in 2004 prices.

The 2004 SHIW provides two proxies for the discount factor, both built from hypothetical questions. The first measure of impatience is based on the following question: "Imagine you were told you had won on the lottery the equivalent of your households net annual income. The sum will be paid to you in a years time. However, if you give up part of the sum you can have the rest immediately". The respondent is then routed in a series of questions. First, he is asked whether he would give up 5 percent to get money right away. If he answers yes, he is then asked if he would give up 10 percent; if he answers no, he is asked if he would give up 3 percent. Those who are willing to give up 10 percent are then asked if they are willing to give up more, up to 20 percent, while those who are not willing to give up 3 percent are asked if they are willing to give up 2 percent. The routing proceeds in such a way that the respondents might want give up between 0 and 20 percent, which implies a discount factor ranging between 0.8 and 1. Figure 3 helps to visualize how the discount factor is elicited and figure 4 plots the distribution of the question. For 12.28% of the respondents the discount factor is 0.8 or less, 17.80% between 0.8 and 0.9 percent, while for almost 26 percent of the sample the discount factor is between .98 and 1.

Our first measure of discount factor is based on a choice task and is potentially plagued by procedural nuances, as it happens for many experimental elicitation procedure. [5] There-

[5] Anchoring is a common problem: the first choice they make between different alternatives affect subse-

fore, we also employ alternative measures of impatience. One, from the SHIW, is based on the following question: "If you had a windfall equal to your households net monthly income would you (1) spend it, (2) save a small part, (3) save about half, (4) save most of it, (5) save it?". While not affected by anchoring effects, this question offers a less direct measure of impatience: the respondents provide the propensity to consume out of a transitory shock, which in turn is affected by patience, as well as by other factors, such as age, that will be controlled for in the next section. As shown in Figure 5, 30% of household in the SHIW would spend about half of the amount, and 28% almost equally divide between spending and saving the whole of the sum. Figure 6 documents the degree of coherence between the distribution of our two measures of impatience. It is apparent from the figure that the percentage of those who would spend the entire windfall gain is larger among those who are willing to give up at least 20% to cash in the lottery prize one year in advance. Conversely, those who would save the entire windfall are more prevalent among the respondents who are not willing to give up anything to cash in the lottery prize in advance.

A question similar to this is available in SHARE. Individuals are asked how much they would invest or save out of a gift of 12,000 euro. Individuals would save on average 32% of the gift, and 14% would save the entire amount. [6]

Beyond the windfall gain indicator, SHARE provides other variables that have been used to proxy impatience in the literature on the behavioral properties of individual rates of time preferences. Recent papers by Della Vigna and Paserman (2005) and Drago (2006) focus on whether an individual smokes or drinks. This information is available for the SHARE sample, together with the frequency of physical exercise, which we see as another health prevention investment. Individuals are asked whether they smoke at the time of interview, how frequently they drink hard liquor, how frequently they do physical exercise. The smoking variable is coded as a dichotomous variable that is equal to 1 for those who smokes at the time of the interview, and to zero for those who quit smoking.[7] Around 20% of European old and oldest old still smoke at the time of interview.

The share of smokers ranges from 30% in Sweden, to 60% in Greece, and is generally

quent choices.

[6] The numbers for Italy in SHARE are not far from SHIW: 26% of the respondents would save the entire amount, and 28% about half.

[7] This question is asked only to those who ever smoked in their lives.

higher in Southern than in Northern countries. [8]

The other two variables are instead polychotomous ordered variable. The drinking variable ranges from 1 to 7 and is equal to one for those who did not drink hard liquor in the the 6 months before the interview and to 7 for those who drink hard liquor almost every day. Most old and oldest old Europeans, just below 69%, do not drink hard liquor, and the share of those who drink hard liquor every day is 1.5%, but is particularly high in the Netherlands (4%).

The physical exercise variable ranges from 1 to 4 and is equal to 1 for those who hardly ever or never exercise and to 4 for those who do physical exercise more than once a week.[9] A non negligible share of respondents do some physical exercise more than once a week (37%) and around 38% never exercise. The share of those who exercise more than once a week is higher in Northern than in Southern Europe and ranges from 47% in Denmark to 28% in Spain.

4 Results

In the estimation exercise we need to control for the other factors, beyond the risk of expropriation and perceived security, which might affect the degree of people impatience. We therefore control for age, education, family size, marital status, consumption, income and type of job dummies. Age is a proxy for time horizon: the young expect to face a longer horizon than the old and therefore is likely to be more patient, as shown in Viscusi and Huber (2006). On the other hand, some theories predict that discounting decreases over the lifespan and others that middle-aged discount less than young and old (see Read and Read, 2004, and references therein). Moreover, in several non-exponential discounting utility models tastes change over time. Recent psychological and economic literature has emphasized differences between genders in discounting and attitude towards risk (for a survey, see Croson and Gneezy, 2004). We therefore add a gender dummy to our specification. We also include a dummy for the couples, to allow for couples having a different time-horizon than singles.

Education proxies for permanent income and is therefore likely to affect discounting.

[8] The exception is Denmark, where the share of smokers is 47%, which is much higher than in any other northern countries.

[9] The wording of the question is the following: "How often do you engage in vigorous — physical activity, such as sports, heavy housework, or a job that — involves physical labour?"

Wealthier individuals are less likely to be constrained and therefore more willing to incur in expenses that improve future well-being. The interpretation for income is similar. Furthermore, more educated individuals might reveal their-selves as more patient, by the very fact that they postponed to enter the job market.[10]

Differences in attitude towards the future can make people to select into different occupations. We therefore add to our regressions two type of job dummies, one for private and the other for public employees, to ascertain the differences vis-à-vis self-employed, which are often believed to be more willing to take risk.

Table 2 reports the results for the Italian data. The first column of the table shows the coefficients from a probit where the dependent variable is equal to one for those who purchase mineral water or equipment to filter the tap water and zero otherwise. Our specification also includes the perceived quality of the water from the tap. The attached coefficient is negative, in line with expectations, and statistically significant. The results reveal that our measure of security positively affect the probability of purchasing mineral water (or equipment to filter the water from the tap). This means that those who find their neighborhoods less secure, and perceive a higher expropriation risk, are less likely to engage in health prevention expenditure, and therefore are more impatient. Age and age square are not significant, which does not help to disentangle the different theories on the relation between discounting and lifespan. On the other hand, education, which is entered as a dummy equal to one for high school graduates or more, and income are positively related to the probability of buying mineral water. This might due to the fact the mineral water is a normal good, but we cannot rule out that the more educated and the well-do feature more patience.[11]

As for the type of job, public employees are more likely to buy mineral water. If public employees are more risk averse than private employees and self-employed, this result suggests that risk averse individuals are more willing to incur in health prevention expenditure. Finally, we see that couples are more likely to buy mineral water and that family size negatively affect the choice of purchasing mineral water. Couples typically have a longer

[10]Becker and Mulligan (1997) in their modelling of individual future valuation assume that future utilities increase according to their vividness. Therefore, they continue, schooling through repeated practice at problem solving helps children learn the art of scenario simulation, so that educated people should be more patience.

[11]Using other proxies of economic well-being, such as wealth or consumption, do not affect the results.

planning horizon than singles, and might therefore be more inclined to invest in health prevention. Family size instead might be a further proxy for economic conditions. Larger families are more likely to lie in the bottom percentiles of the income distribution.

To distinguish the effect of the factors affecting the decision to buy mineral water form those affecting the amount spent for mineral water (or equipment to filter the water from the tap), we regress the log-expenditure for mineral water on our proxy for expropriation risk, the perceived quality of tap water, age, age squared, income, consumption, education, marital status, family size and employment dummies. The results are reported in the second column of table 2 and confirm that health prevention expenditure decreases with risk of expropriation. The sign of the other coefficients is the same across the two columns of table 2, except that of family size, which turns to be positive, in line with the idea that conditional on buying, larger families consume more than smaller ones.

The estimation also focuses on the risk of expropriation by government and relates it to impatience, as measured by the two hypothetical questions described above. The results are presented in the last four columns of 2. The third column of the table concentrates on the proxy of impatience based on the lottery question, which ranges from 1 (discount factor less 80 percent) to 6 (100 %). In column fourth the dependent variable is obtained from the windfall gain question and takes 5 values, 1 if the whole windfall gain is spent, 5 if it is saved. Since the dependent variable, whatever measure of impatience is considered, are ordered polycothomous estimation employs an ordered probit model.

The results imply that patience decreases with the risk of expropriation from the government: the higher tax efficiency, the larger the discount factor. The coefficients on the other variables, whenever significant, broadly confirm the evidence reported in the first two columns of table 2. Overall, the results imply that the risk of expropriation, whether private or public, makes individual more impatient.

One might wonder if the results are biased by omitted factors, such as the degree of people optimism. For instance, suppose that optimistic individuals perceive a lower risk of expropriation. Depending on whether they engage in more or less health prevention activities, the relation between discounting and risk of expropriation will be biased in one way or in the other. Therefore, to account for the possibility that psychological traits lie behind our results, we estimate our model using a proxy for the degree of happiness, which is provided by the 2004 SHIW. Individuals are asked to rate their degree of happiness on

a scale between 1 ("Very unhappy") and 10 ("Very happy").[12] The results are reported in the last two columns of 2 and show that the estimated coefficients are not affected, and that the variable measuring the degree of happiness is significant for the lottery question proxy and positively signed.

Looking at the other proxies for patience taken from the European data-set does not alter the overall picture. The results show that the higher the perceived security from criminal offenses, the lower the probability of smoking, of drinking heavily, and the higher the probability of doing physical exercise and the propensity to save a windfall gain. Table 3 reports in the first column the results from regressing the propensity to save out of a windfall gain. These and the other estimates with the SHARE data are obtained accounting for the fact that missing data have been imputed. Details on the imputation of missing data can be found in Börsch-Supan et al. (2005).[13] The coefficient on our proxies for the degree of security from criminal offenses is positive, suggesting that more security is associated with a higher propensity to save out of a windfall gain, and therefore to more patience. The second column of table 3 estimates a probit for the smoking variable. Here, the coefficient on security is negative, which implies that more security is associated with less smoking and therefore confirms that individuals perceiving a lower risk of expropriation engage more in health prevention behaviors, and thus are more patient. The results in the last two columns refer to the hard liquor and to the physical exercise variables. Perceiving a lower risk of expropriation (high security) means a lower propensity to drink hard liquor and a higher propensity to do physical exercise, which is in line with the idea that more security entails more patience.

Finally, we check whether the results are driven by some psychological trait, such as optimism or happiness, which causes patience and perceived security to move together. Table 4 modifies the baseline specification to account for people answers to the following question: "Please tell us how much you agree or disagree with the statement: I'm always optimistic about my future".[14] Controlling for the degree of people optimism does not

[12]The wording of the question is: "Looking at every aspect of your life, how happy would you say you are?"

[13]In SHARE missing data are imputed using a multiple imputation methodology based on van Buuren, Brand, Groothuis-Oudshoorn and Rubin (2005). The imputation procedure generates five implicates and the models are estimated on each implicate. The results from the estimation on each implicate are combined following Rubin (1987).

[14]The respondent is asked to either strongly agree, or agree, or neither agree or disagree, or disagree or

change the overall picture, as shown in table 4: the signs and orders of magnitude are similar to that of table 3.

5 Conclusions

This paper addresses the following question: individuals facing higher expropriation risk are more (or less) impatient? The theoretical analysis identifies the conditions that make a positive (negative) association between discounting and expropriation risk consistent with individual optimizing behavior. It is shown that all risk averse individuals who bear a greater risk of expropriation in the sense of FSD should have a smaller discount rate, and that all prudent agents, who bear a greater risk of expropriation in the sense of SSD (with constant means), should have an higher discount rate.

We also provide an empirical exercise, which exploit the ample cross-sectional variability offered by a national representative sample, the SHIW, and by a representative sample of the 50+ in eleven European countries. The two surveys give direct and indirect measures of discounting and provides proxies for expropriation from government and expropriation from criminal offenses. The results suggest that discounting increases with expropriation risk, which is consistent with optimality if prudent individuals perceive a greater risk of expropriation as an increase in the dispersion of returns.

strongly disagree.

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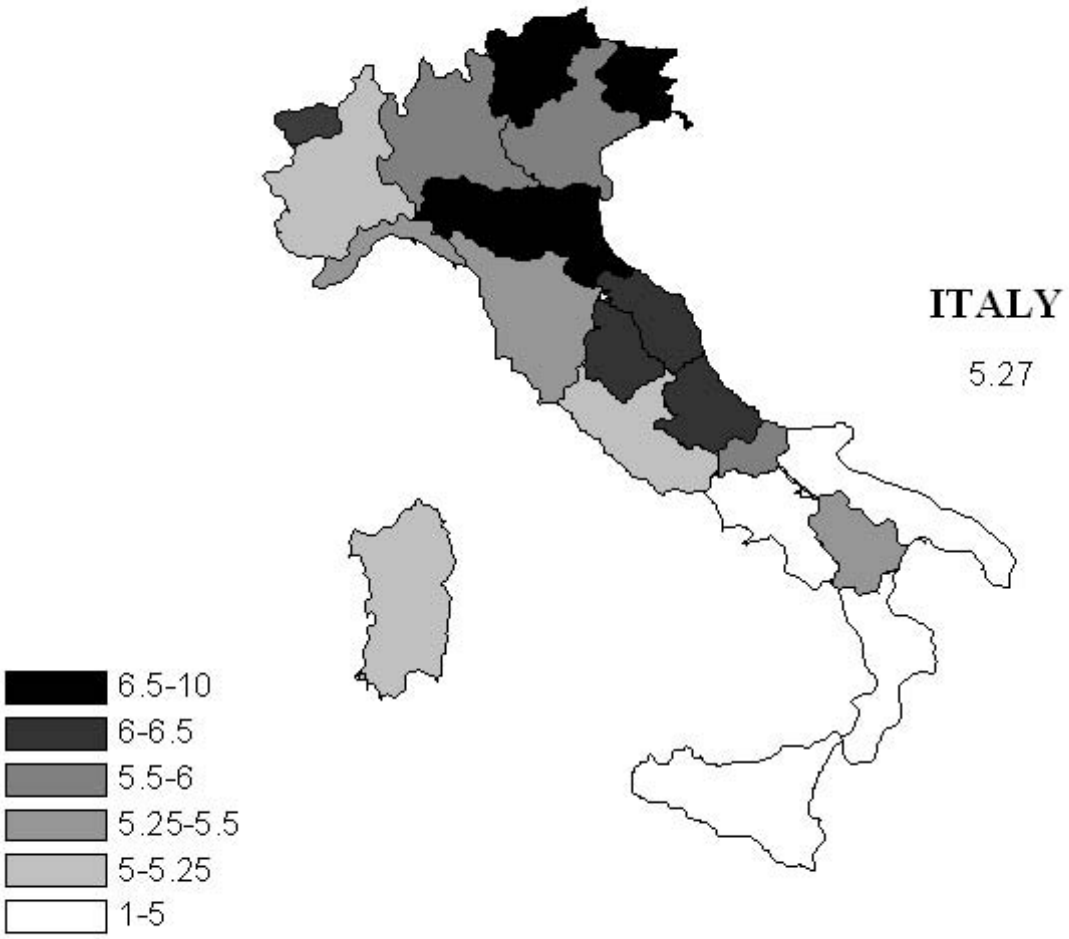

Figure 1: Security between Italian regions

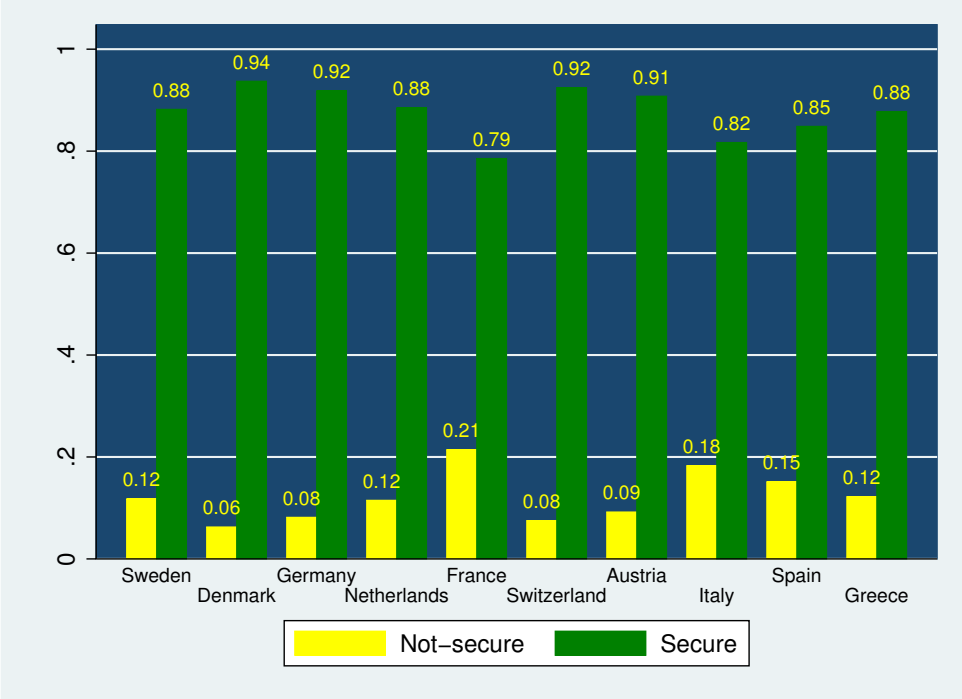

Figure 2: Security between European countries

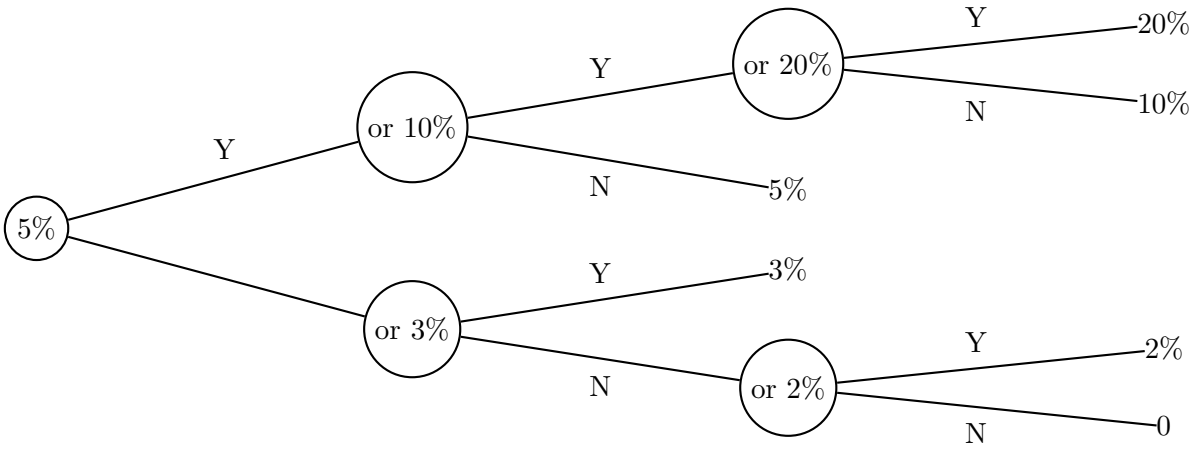

Figure 3: Imagine you were told you had won on the lottery the equivalent of your households net annual income. The sum will be paid to you in a years time. However, if you give up part of the sum you can have the rest immediately. To get the money right away would you give of this sum?

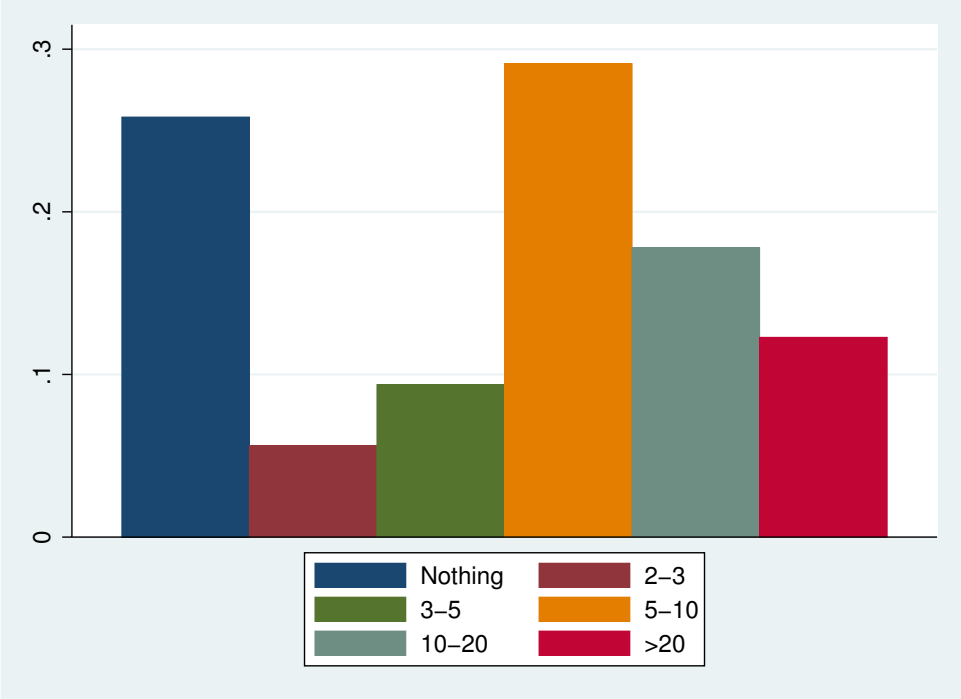

Figure 4: Imagine you were told you had won on the lottery the equivalent of your households net annual income. The sum will be paid to you in a years time. However, if you give up part of the sum you can have the rest immediately. To get the money right away would you give of this sum?

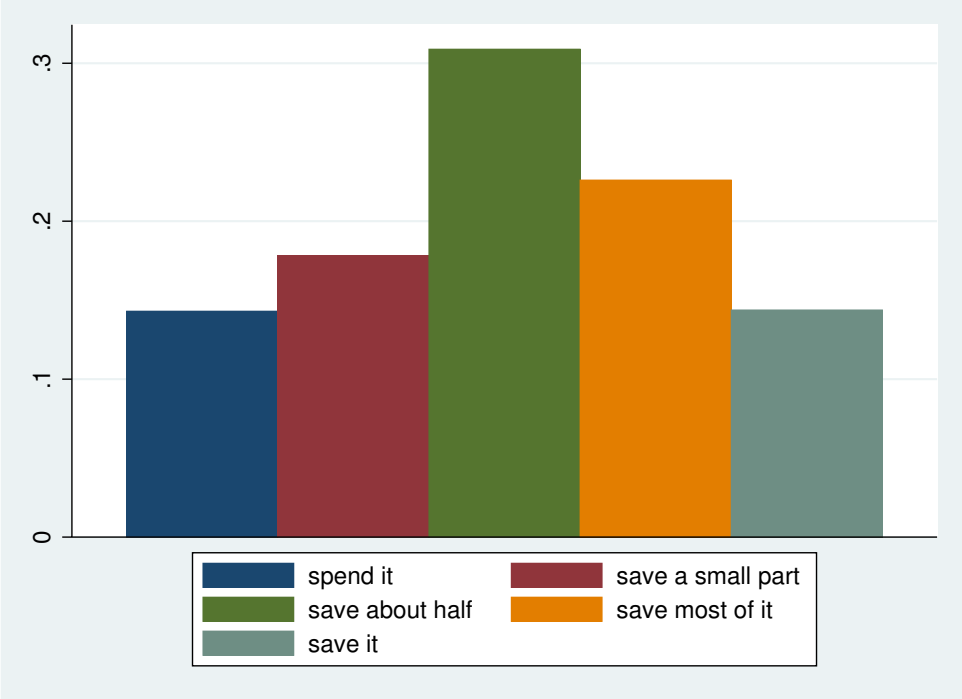

Figure 5: If you had a windfall equal to your households net monthly income would you

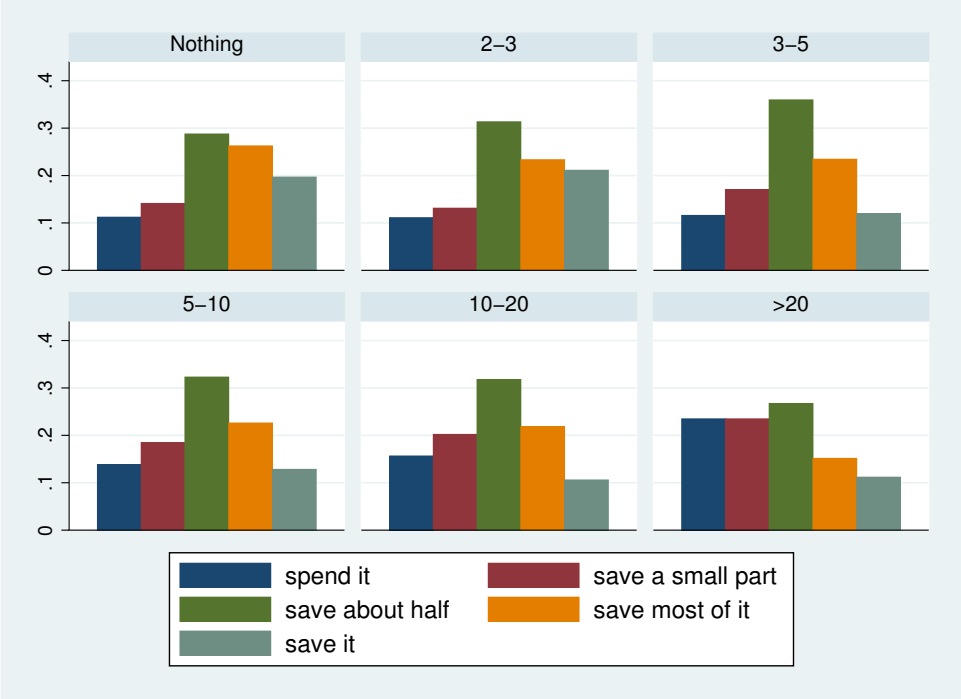

Figure 6: Two measures of impatience

Table 1: Summary statistics

	SHIW 1993		SHIW 2004		SHARE	
	Mean	Median	Mean	Median	Mean	Median
Age	53.72	53.00	55.18	54.00	65.08	64
Disposable income	28.72	23.05	30.26	24.04	143.87	30.99
Male	0.72		0.61		0.449	
High school or more	0.27		0.39		0.50	
Couple	0.70		0.62		0.75	
Family size	2.85	3.00	2.52	2.00	2.21	2
Public employees	0.14		0.11		0.04	
Private employees	0.22		0.23		0.23	
Self-employed	0.18		0.16		0.07	

The reported statistics are computed using sample weights. Income is expressed in thousands 2004 euro.

Table 2: Mineral Water and Windfall gain

	Mineral Water			Windfall gain		
Security:						
Criminal offenses	0.020	0.011	0.158			
	(0.008)*	(0.005)*	(0.057)**			
Tax system				0.130	0.141	0.130
				(0.056)*	(0.057)*	(0.056)*
Age	-0.003	0.008	0.016	-0.005	0.019	-0.005
	(0.008)	(0.005)	(0.008)*	(0.008)	(0.008)*	(0.008)
Age square	0.000	-0.000	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)*	(0.000)	(0.000)*	(0.000)
Disposable income	0.010	0.005	0.004	-0.000	0.003	-0.000
	(0.001)***	(0.001)***	(0.001)***	(0.001)	(0.001)***	(0.001)
Male	-0.066	0.005	-0.019	-0.037	-0.021	-0.037
	(0.052)	(0.031)	(0.041)	(0.041)	(0.041)	(0.041)
High school or more	0.291	0.003	0.054	-0.025	0.037	-0.025
	(0.043)***	(0.025)	(0.041)	(0.041)	(0.042)	(0.041)
Couple	0.189	0.107	0.138	0.117	0.094	0.115
	(0.055)***	(0.033)**	(0.050)**	(0.050)*	(0.051)	(0.051)*
Family size	-0.076	0.108	0.003	-0.003	0.003	-0.003
	(0.019)***	(0.012)***	(0.021)	(0.020)	(0.021)	(0.020)
Public employees	0.192	0.049	0.109	0.028	0.095	0.028
	(0.060)**	(0.036)	(0.066)	(0.065)	(0.066)	(0.065)
Private employees	0.080	0.012	0.006	0.017	-0.000	0.016
	(0.055)	(0.035)	(0.058)	(0.057)	(0.058)	(0.057)
Self-employed	0.060	0.019	0.027	0.016	0.020	0.016
	(0.060)	(0.038)	(0.068)	(0.067)	(0.068)	(0.067)
Quality of tap water	-0.216	-0.080				
	(0.007)***	(0.004)***				
Happiness					0.050	0.001
					(0.010)***	(0.010)
Observations	7783	5101	3798	3798	3798	3798

Standard errors in parentheses. One star means significant at 5%; two significant at 1%; three at 0.1%. In the first column the dependent variable is an indicator that takes value one for those who purchase mineral water or equipment to filter the tap water. In the second column the dependent variable is the log of such expenditure. In the third and fifth column the dependent variable is our indicator of discounting, which ranges from 1 (discount factor less 80 percent) to 6 (100 %). In the fourth and sixth column the dependent variable is an indicator which takes 5 values, 1 if the whole windfall gain is spent, 5 if it is saved. The first column reports probit estimates, the second OLS estimates and the third to the sixth ordered probit estimates. The variable security measures risk of expropriation from criminal offenses in the first and second column and from the state in the third to sixth column. All regressions feature regional dummies.

Table 3: Discounting in Europe: Baseline specification

	Windfall gain	Smoking	Heavy drinking	Physical activity
Security	0.028	-0.144	-0.115	0.062
	(0.009)**	(0.045)**	(0.037)**	(0.029)*
Age	-0.003	-0.036	-0.012	-0.023
	(0.000)***	(0.002)***	(0.002)***	(0.001)***
Income before taxes	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.032	-0.265	0.523	0.101
	(0.006)***	(0.031)***	(0.024)***	(0.019)***
High school or more	-0.021	-0.109	0.046	0.026
	(0.007)**	(0.034)**	(0.027)	(0.022)
Couple	-0.003	-0.226	-0.050	0.136
	(0.008)	(0.044)***	(0.035)	(0.026)***
Family size	-0.001	-0.011	-0.014	-0.012
	(0.004)	(0.019)	(0.016)	(0.012)
Public employee	0.007	-0.191	-0.044	-0.070
	(0.016)	(0.072)**	(0.057)	(0.048)
Private employee	-0.003	-0.072	-0.027	0.154
	(0.009)	(0.041)	(0.033)	(0.027)***
Self-employed	0.013	0.001	0.084	0.339
	(0.013)	(0.059)	(0.045)	(0.039)***
Health status				
Very Good	0.021	0.093	0.048	-0.176
	(0.010)*	(0.046)*	(0.034)	(0.029)***
Good	0.012	0.090	0.002	-0.367
	(0.010)	(0.046)	(0.035)	(0.030)***
Fair	0.012	0.094	-0.093	-0.746
	(0.012)	(0.057)	(0.046)*	(0.036)***
Poor	-0.004	0.246	-0.310	-1.233
	(0.017)	(0.083)**	(0.083)***	(0.058)***
Observations	14230	7697	11518	15886

Standard errors in parentheses. Standard errors in parentheses. One star means significant at 5%; two significant at 1%; three at 0.1%. In the first column the dependent variable is the percentage of a windfall gain that the respondent would save. In the second column the dependent variable is a dichotomous variable equal to 1 if the respondent in smoking and zero otherwise. In the third column the dependent variable is polychotomous ordered that ranges from 1 to 7 and is equal to one for those who did not drink hard liquor in the the 6 months before the interview and to 7 for those who drink hard liquor almost every day. In the fourth column the dependent variable is polychothomous ordered variable that ranges from 1 to 4 and is equal to 1 for those who hardly ever or never exercise and to 4 for those who do physical exercise more than once a week. In the first column a linear model is estimated, in the second column, a probit model, in the third and fourth an ordered probit. All models are estimated via maximum likelihood, except for the linear model, which is estimated via ordinary least squares. All regressions feature country dummies.

Table 4: Discounting in Europe: Robustness checks

	Windfall gain	Smoking	Heavy drinking	Physical activity
Security	0.029	-0.144	-0.122	0.060
	(0.009)**	(0.046)**	(0.037)**	(0.029)*
Age	-0.004	-0.036	-0.012	-0.023
	(0.000)***	(0.002)***	(0.002)***	(0.001)***
Income before taxes	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.033	-0.265	0.528	0.098
	(0.006)***	(0.032)***	(0.025)***	(0.019)***
High school or more	-0.021	-0.101	0.043	0.029
	(0.007)**	(0.034)**	(0.027)	(0.022)
Couple	-0.000	-0.225	-0.054	0.130
	(0.009)	(0.044)***	(0.036)	(0.026)***
Family size	-0.001	-0.013	-0.012	-0.012
	(0.004)	(0.019)	(0.016)	(0.012)
Public employee	0.006	-0.194	-0.047	-0.063
	(0.016)	(0.073)**	(0.057)	(0.048)
Private employee	-0.004	-0.080	-0.026	0.156
	(0.009)	(0.042)	(0.033)	(0.027)***
Self-employed	0.012	-0.005	0.087	0.338
	(0.013)	(0.059)	(0.046)	(0.040)***
Health status				
Very Good	0.018	0.104	0.049	-0.167
	(0.010)	(0.046)*	(0.034)	(0.030)***
Good	0.006	0.101	0.013	-0.347
	(0.010)	(0.047)*	(0.036)	(0.030)***
Fair	0.004	0.107	-0.069	-0.721
	(0.012)	(0.058)	(0.047)	(0.037)***
Poor	-0.013	0.254	-0.302	-1.184
	(0.018)	(0.085)**	(0.085)***	(0.060)***
Optimistic about the future				
Agree	-0.006	0.476	0.169	0.173
	(0.018)	(0.063)***	(0.046)***	(0.044)***
Neither agree or disagree	0.376	0.259	-0.208	0.187
	(0.015)***	(0.063)***	(0.045)***	(0.039)***
Disagree	0.308	0.164	-0.254	0.104
	(0.014)***	(0.055)**	(0.045)***	(0.038)**
Strongly disagree	0.214	0.156	0.301	-0.136
	(0.016)***	(0.074)*	(0.049)***	(0.044)**
Observations	13960	7558	11285	15580

Standard errors in parentheses. Standard errors in parentheses. One star means significant at 5%; two significant at 1%; three at 0.1%. In the first column the dependent variable is the percentage of a windfall gain that the respondent would save. In the second column the dependent variable is a dichotomous variable equal to 1 if the respondent in smoking and zero otherwise. In the third column the dependent variable is polychotomous ordered that ranges from 1 to 7 and is equal to one for those who did not drink hard liquor in the the 6 months before the interview and to 7 for those who drink hard liquor almost every day. In the fourth column the dependent variable is polychothomous ordered variable that ranges from 1 to 4 and is equal to 1 for those who hardly ever or never exercise and to 4 for those who do physical exercise more than once a week. In the first column a linear model is estimated, in the second column, a probit model, in the third and fourth an ordered probit. All models are estimated via maximum likelihood, except for the linear model, which is estimated via ordinary least squares. All regressions feature country dummies.