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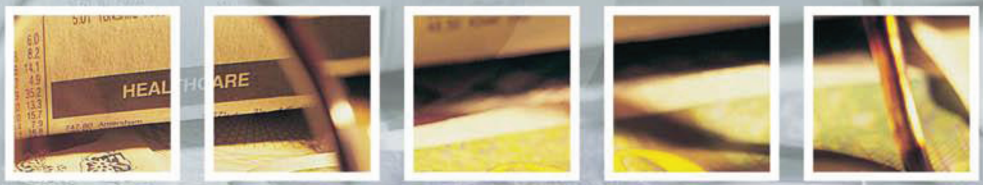
Local Finance and the Demand for Property-Casualty Insurance



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LOCAL FINANCE AND THE DEMAND FOR PROPERTY-CASUALTY INSURANCE

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ABSTRACT. Interest rates affect both non-life insurance supply and demand, possibly in opposite directions. Insurers issue contingent debt contracts and invest the funds until they are needed to pay the claims, so interest rates are a source of revenue for the insurers and an opportunity-cost for the insured, with conflicting effects on equilibrium turnover. Moreover, if the insured is a net borrower he will incur a financing, rather than an opportunity cost. We extend the standard model of optimal insurance to partial or total borrowing, describing the negative effect of the borrowing-lending spread on demand. To isolate this last effect empirically, we observe a panel of Italian provinces over five years. At this level, the insured face local borrowing conditions while both the insurers' and the insureds' returns are uniform. We bring evidence that demand for non-life insurance is in fact decreasing with the interest rate on borrowing. This result is robust across a number of specifications. Spatial econometric techniques are employed to ensure consistent inference. We conclude that credit conditions are a significant driver of non-life insurance development, and an important limiting factor in the particular case of Southern Italy.

Keywords: Insurance demand, Financial returns, Regional data, Spatial panels
JEL codes: G21, G22, D12, C23

PRELIMINARY AND INCOMPLETE - DO NOT CITE WITHOUT PERMISSION

1. Introduction

According to economic theory, the interest rate affects both supply of and demand for non-life insurance, possibly in opposite directions. Insurers issue contingent debt contracts and invest the funds until they are needed to pay the claims, so higher rates of return allow to set lower prices for insurance coverage. On the opposite side, the same returns

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are an opportunity-cost for the insured, therefore a negative effect on demand should be expected. Yet the theory is inconclusive about this latter effect (see Falciglia (1980)), and empirical evidence is scant.

We concentrate on insurance demand by possibly cash-constrained individuals facing a borrowing-lending spread, whereby the borrowing rate (measuring the cost of obtaining money for paying the insurance premium) is higher than the return one may gain from investing (which in turn measures the opportunity cost of insuring). Individuals (or small firms) are considered price-takers, as confronting relatively few insurance companies of much bigger scale ready to provide any desired amount of coverage at the given price. In turn, the price (loading) set by the insurer decreases with the return on technical reserves.

We derive the optimal solution for the case where the insured must borrow part, or all, of the amount needed to pay the premium, giving conditions for the optimal amount of coverage to be decreasing with the borrowing-lending spread.

From the theoretical analysis, if at least part of the insureds are net borrowers, either from the beginning or after detracting the insurance premium, then a negative effect of local borrowing rates on insurance expenditure should be observable in the aggregate data.

Empirical verification is made difficult by the coexistence in the model of the three interest rates: returns on the insurers' technical reserves, which affect supply as one of the two key sources of profitability (the other being technical profitability as measured by the loading); returns on investments for the insured; and borrowing rates faced by the insured.

In order to isolate the effect on demand, we resort to a particular observational context: a sub-regional panel dataset. We notice that while consumers and (not too big) firms face the borrowing conditions prevalent in the geographical region surrounding them, the financial returns of insurers are independent from the spatial location of the insured, at least at the sub-regional level. Therefore such a setting, neutral from the point of view of supply, allows to separate the effect of interest rates on demand.

As for the financial returns for the insured (opportunity cost of insurance), they can be roughly assumed to be cross-sectionally invariant, as depending on investment opportunities at the national scale (treasuries, bank products, listed shares). Hence our observational perspective, provided one controls for common time shifts, can be expected to isolate the effect of the borrowing rate on insurance demand.

Drawing on a panel database of 103 Italian provinces over the years 1998-2003 and elaborating on the results of a companion paper by Millo & Carmeci (2011), we bring evidence that demand for non-life insurance is in fact decreasing with the interest rate on borrowing.

This result is robust across a number of specifications. Spatial econometric techniques are employed to account for the particular nature of the dataset and to allow consistent inference. Controls are added to ensure that the effect of interest rates does not pick up that of any omitted regressor related to the economic situation prevailing in the region. We conclude that credit conditions are an important driver of non-life insurance development, and an important limiting factor in the particular case of Southern Italy.

2. Optimal Insurance with Borrowing-Lending Spread

In this section we model the decision of an agent (policyholder) on the amount of insurance he needs to purchase in order to cover from a potential loss. The agent can invest his net wealth (after buying insurance) or finance his purchase, in an economy where lending and borrowing rates are different. The elements of the model are the following. The model

- Two dates: at time 0 the insurance decision is made, then the residual wealth is invested, or the deficit is financed, until time 1; at time 1, the proceeds from investing/borrowing are collected/repaid, together with compensation from the insurance claim. Consumption only occurs at time 1.
- The agent suffers a random loss X at time 1; he can buy proportional insurance at time 0 according to a fraction $0 \leq \beta \leq 1$ of the loss, paying a premium
$$P = \beta m \rho,$$
where $m = E[X]$ and $\rho > 0$ is the loading factor, accounting for general and specific expenses, profit, and the insurer's time value of money. At time 1, the policyholder receives the compensation
$$\beta X.$$
Typically, the loading factor can be written as
$$\rho = \frac{1+\alpha}{1+i}$$
where $\alpha \geq 0$ is the loading rate and $i \geq 0$ is the rate of return on technical provisions.
- The insurer is price maker, so that the loading ρ, is taken as given.
- The agent is price taker, nonsatiated and risk averse, and is characterized by a twice differentiable utility function $u : \mathbb{R} \to \mathbb{R}$ with $u' > 0$ and $u'' < 0$.
- The agent initial available wealth is $W \geq 0$; if the wealth net of insurance expense $W - P$ is positive, it is invested until time 1 at the *lending rate* $r \geq 0$; if instead the available wealth is

not sufficient to purchase the desired amount of insurance, the deficit $-(W-P)=P-W$ has to be financed at the *borrowing rate* $r+\Delta$, where $\Delta \geq 0$ is the *borrowing-lending spread.*

Resuming, at time 1 the policyholder's wealth is

$$\begin{aligned}\widetilde{W} &= \begin{cases}(W-P)(1+r)-X+\beta X & \text{if } W \geq P\\ -(P-W)(1+r+\Delta)-X+\beta X & \text{if } W \leq P\end{cases}\\ &= (W-P)_+(1+r)-(W-P)_-(1+r+\Delta)-X+\beta X\end{aligned}$$

where, as usual, $x_+ = \max\{x,0\}$ and $x_- = \max\{-x,0\}$. The policyholder problem is then to choose the insured fraction $0 \leq \beta \leq 1$ so as to maximize the discounted expected utility of time 1 wealth:

$$U(\beta) = E\left[u\left(\widetilde{W}\right)\right]. \tag{2.1}$$

We assume in the following that $m\rho > W$, i.e. the insured initial wealth is not sufficient to buy full insurance; let then $0 \leq \widetilde{\beta} < 1$ be the maximum fraction of insurance the policyholder can buy without borrowing, defined by

$$\widetilde{\beta} = \frac{W}{m\rho}$$

Denoting then by β^* the optimal insured fraction (which exists and it is unique since the function U can be checked to be strictly concave and continuous), the following proposition hold.

Proposition 1.

$$\begin{aligned}\beta^* = 0 \text{ iff } && \psi(0) \leq \underline{\psi}\\ 0 < \beta^* < \widetilde{\beta} \text{ iff } && \psi(\beta^*) = \underline{\psi}\\ \beta^* = \widetilde{\beta} \text{ iff } && \underline{\psi} \leq \psi(\widetilde{\beta}) \leq \overline{\psi}\\ \widetilde{\beta} < \beta^* < 1 \text{ iff } && \psi(\beta^*) = \overline{\psi}\\ \beta^* = 1 \text{ iff } && \psi(1) \geq \overline{\psi}\end{aligned}$$

where

$$\underline{\psi} = \rho(1+r),\ \overline{\psi} = \rho(1+r+\Delta)$$

and the function ψ *is defined by*

$$\psi(\beta) = \frac{E[u'(\widetilde{W})X]}{E[u'(\widetilde{W})]E[X]}.$$

The next result characterizes the optimality of full insurance coverage.

Proposition 2. *Full insurance ($\beta^* = 1$) is optimal if and only if*

$$\rho(1+r+\Delta) \leq 1.$$

Full insurance coverage is then compatible with low premium rates and low interest rates (for borrowing and lending) scenarios. Also, full insurance is never optimal if the loading rate satisfies $\rho \geq 1$. Writing $\rho = \frac{1+\alpha}{1+i}$, full insurance is never optimal if the rate of return on technical provision satisfies $r \geq i$ and either there is a borrowing-lending spread $(\Delta > 0)$ or the loading rate α is positive. Hence, Mossin Theorem (full insurance is optimal when the premium is actuarially fair, $\alpha = 0$) no longer holds when borrowing and lending rates differ and $r \geq i$.

It is particularly interesting to analyse the behaviour of the insurance demand as a function of the lending-borrowing spread Δ.

Inspection of the first order conditions in 1 shows that actually β^* does not depend on Δ if $\beta^* < \widetilde{\beta}$. When $\beta^* = \widetilde{\beta}$, then the wealth $\widetilde{W}$, and in turn the function $\psi(\beta^*)$, does not depend on Δ. Therefore a rise in the spread Δ will have no effect on the optimal coverage. A decrease ion the spread will leave β^* unchanged, unless $\psi(\beta^*) = \overline{\psi}$, in which case a further reduction in the spread will shift the optimal coverage in the region $\widetilde{\beta} < \beta^*$.

The following proposition provides a condition under which the insurance demand decreases with the spread Δ.

Proposition 3. *Suppose* $\widetilde{\beta} < \beta^* < 1$. *If* $u''' < 0$, *then* $\frac{\partial \beta^*}{\partial \Delta} < 0$

Note that the condition $u''' < 0$ implies that the utility function belongs to the IARA class.

In the following, in order to test the general economic results of the paper, we ask ourselves whether credit conditions do play a role among the determinants of (regional differences in-) Italian non-life insurance consumption.

3. Empirical analysis

In order to isolate the effect on demand, we consider a sub-regional panel dataset. While consumers and (not too big) firms face the borrowing conditions prevalent in the geographical region surrounding them, the financial returns of insurers are independent from the spatial location of the insured, at least at the sub-regional level. Therefore such a setting, neutral from the point of view of supply, allows to separate the effect of interest rates on demand. From this viewpoint, a look on simple association plots seems to suggest a negative relationship between interest rates on borrowing and insurance consumption (see left panel of Figure 1), but such evidence must be taken with care as it might well be spurious. In fact, the interest rate, an indicator of economic risk and sometimes distress, uses to be strongly and negatively correlated with GDP (see right panel), in turn the most robust predictor of insurance development.

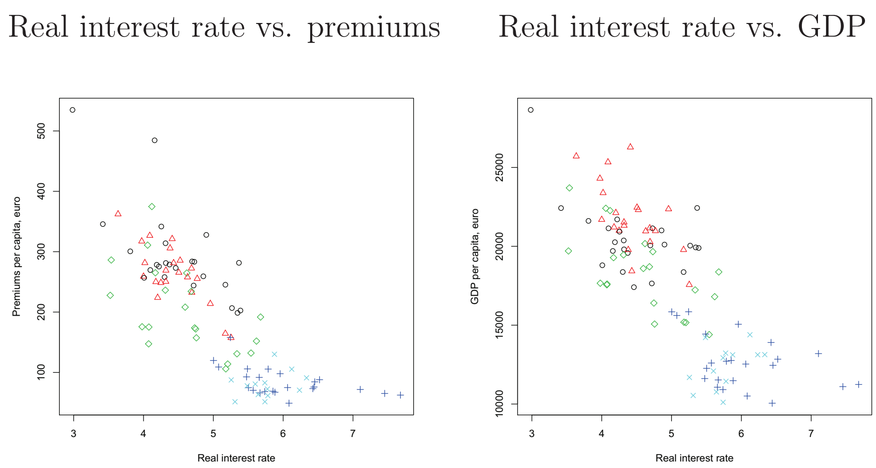

Figure 1. Scatterplots of real interest rates v. insurance density (premiums per capita, euro) and respectively GDP per capita. Data are relative to the year 1999. Symbols and colour codes for macroregions are: ○ North-West; △ North-East; ◇ Centre; + South; × Islands.

In order to assess the net effect of local interest rates on borrowing on local insurance development a multiple regression model will be needed, with controls for all other main regional influences.

The empirical literature on insurance development so far draws on cross-country analyses. Problems: institutional factors (tax system, social security, past inflation, even religion) dominate; relationships of interest are overshadowed by unobserved heterogeneity and measurement issues (see the discussion in Millo & Carmeci (2011)). In this particular respect, at country level the interest rates faced by insurers and insured are highly correlated. To isolate the effect of interest rates on demand only, we resort to a particular observational context: a panel of Italian provinces over five years. At this level, the insured face local borrowing conditions while the insurers' returns are uniform.

One serious methodological issue is that of defining output and price. The issue of defining output has been much discussed in the literature, where premium income, claims paid and sums insured have been proposed as solutions. In our case, even if we agreed on a definition quantities and prices are not observable at the market level. This is a general phenomenon: in the words of Schlesinger (2000), "The two fundamental building blocks of economic theory have no direct counterparts for insurance". We can only observe equilibrium revenue for both sectors as $V = Q \times P$. As is customary in the insurance development literature, we are therefore estimating a model relating (equilibrium) premium revenue to a number of "drivers".

		Total	Life	Non-Life	Motor	Non-Motor
1	United Kingdom	13.3	9.1	4.2	1.3	2.9
2	France	9.3	6.0	3.2	1.1	2.1
3	Italy	7.5	4.9	2.6	1.6	1.0
4	Germany	6.9	3.2	3.7	1.1	2.6
5	Spain	5.6	2.4	3.2	1.4	1.8

Table 1. Insurance penetration in Europe, 2003

4. The Data

Our information set consists of an excerpt for the years 1998-2002 from the GeoStarter database provided by Istituto Tagliacarne, an institution inside SiStaN (the Italian national statistical system). It provides both first-hand data and an organized collection of data from various institutional sources. Insurance data, in particular, are provided by Isvap, the Italian regulatory body.

The Italian non-life insurance market is underdeveloped with respect to those of the main European countries. The penetration ratio (premiums/GDP) is lower than in the other four big economies (Germany, France, United Kingdom and Spain), especially in non-motor business. The class is dominated by MTPL, accounting for more than a half of non-life business. Its penetration is higher than in the rest of Europe both because of the high number of vehicles on the road and because of the steady, cost-driven increase in tariffs of the last years. Non-mandatory classes, on the contrary, are far less developed, with total penetration less than half that of our major European partners.

The composition of non-MTPL non-life is balanced, with property as the leading class, at 12 percent of total non-life revenue, and non-mandatory motor, general liability and accident between 8 and 9 percent. Health insurance is most underdeveloped with respect to the rest of Europe, despite high private health expenditure. Marine, aviation and transit and credit and suretyship, both at little above 2 percent, play a minor role (Table 2).

There are no data available about the share of personal and commercial lines in the revenues of every class, but according to common wisdom this is quite balanced, maybe slightly biased towards personal lines, in property; balanced in accident and health, with comparatively few but huge collective contracts purchased by the firms; and definitely leaning towards the commercial side in liability insurance.

Non-life insurance in Italy is mostly distributed through tied agents, collecting about 85 percent of revenues. The remainder is sold through brokers and, with lesser shares, through bank counters and direct channels (telephone, Internet). The direct channel still accounts only for

	Class	Premiums	Share
1	Accident	2760	8.1
2	Health	1509	4.4
3	Motor other risks	3062	9.0
4	Marine aviation transit	766	2.2
5	Fire	2038	6.0
6	Other damage to property	2158	6.3
7	Motor TPL	17622	51.5
8	General TPL	2798	8.2
9	Credit and suretyship	787	2.3
10	Others	711	2.1
11	Total Non-life	34212	100.0

TABLE 2. Composition of Non-Life insurance

about 3 percent of total revenues, though its importance is steadily increasing.

The regional distribution of insurance consumption in Italy is highly heterogeneous, being much lower in the South of the country (see the choropleth map in Figure 2). All of the last 20 provinces in the overall ranking, both in the life and non-life classes, come from the South and Islands; all but three (in non-life) and one (in life) of the first 20 are northern provinces. Looking at macroregional averages, the insurance penetration over GDP in Northern Italy is not so much lower than in some other developed European countries, while that of Southern Italy is well below the levels prevailing in the Union's new members (see EU10 in Table **??**).

North-West	1.4
North-East	1.1
Centre	1.1
South	0.6
Islands (Sicily and Sardinia)	0.5
(Italy)	1.0
(EU15)	2.3
(EU10)	0.9

TABLE 3. Insurance consumption in Italian macroregions as % of GDP, 2003

On their part, interest rates on short-term borrowing vary in a range of almost 400 bp across Italian provinces, and of over 150 bp across macroregions.

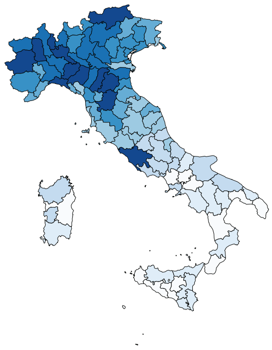

Figure 2. Map of non-life insurance density in Italian provinces (darker is higher)

	Description	Source
rgdp	Real GDP per capita	Ist. Tagliacarne
rbankdep	Real bank deposits per capita	Bank of Italy
density	Density of inhabitants per square Km	Istat
rirs	Real interest rate on short-term borrowing	Ist. Tagliacarne
agencies	Density of insurance agencies per 1000 inhabitants	Isvap
school	Share of people with second-grade schooling or more	Istat
vaagr	Share of value added, agricultural sector	Ist. Tagliacarne
family	Average number of family members	Istat
inef	Judicial inefficiency: years to settle a civil case	Guiso et al. 2004
trust	Survey results to the question "do you trust others?"	World Values Survey

Table 4. Description and sources of the model's regressors

5. The model

The general model specification is taken from Millo & Carmeci (2011) and inspired by the analysis of Beenstock *et al.* (1988). See the references for a description. The regressors included in the model are detailed in Table 4.

Summary statistics, inequality and correlation measures can be found in Tables 5 and, separated by macroregions, in 6.

	Min.	Italy	Max.	Gini	Moran	
rgdp	10051.70	17564.85	28650.07	0.14	11.64	***
rbankdep	3878.30	8388.58	21981.67	0.20	8.69	***
density	36.95	244.92	2646.92	0.46	1.52	.
rirs	2.98	4.99	7.68	0.10	10.70	***
agencies	0.13	0.38	0.59	0.15	11.92	***
school	34.32	41.85	50.00	0.05	11.66	***
vaagr	0.27	3.98	13.03	0.36	3.68	***
family	2.05	2.60	3.07	0.05	11.00	***
inef	1.44	3.79	8.32	0.20	7.29	***
trust	3.03	3.26	3.62	0.02	7.88	***

Table 5. Summary statistics; range, inequality (Gini's coefficient) and spatial correlation tests (Moran's I) for the year 2000.

	N-W	N-E	Centre	South	Islands
rgdp	20475.58	21815.82	18354.19	12677.81	12368.46
rbankdep	10201.66	10514.48	9088.06	5568.43	5303.25
density	301.84	250.97	204.35	270.67	149.61
rirs	4.47	4.43	4.60	6.01	5.76
agencies	0.45	0.45	0.42	0.28	0.26
school	43.54	43.88	44.63	39.01	35.83
vaagr	3.07	3.38	3.01	5.36	5.84
family	2.39	2.48	2.58	2.85	2.79
inef	2.89	2.86	3.71	5.14	4.76
trust	3.32	3.30	3.24	3.20	3.19

Table 6. Macroregional averages, year 2000

As for the specification strategy (see again Millo & Carmeci (2011) for an extensive treatment), the major modelling issues are: spatial correlation: almost all regressors are spatially correlated, see the Moran test statistics in last column of Table 5; serial correlation: insurance contracts are often pluriennial, and even if not so, the need to insure derives from long-term decisions (buying a car/house/machinery), so premiums can be expected to be "sticky"; unobserved heterogeneity: in order to control for both time-invariant unobservable idiosyncratic factors peculiar to each province and for nationwide, time-specific shocks influencing the outcome, we specify a random effects model with, alternatively, either 5 macroregional or 20 regional dummies, and time dummies to control for common time effects.

6. Specification, results and discussion

To assess whether spatial correlation is an issue in the full model, or if on the contrary the spatial structure of premiums is well explained by that of the regressors, we estimate a RE model with serially correlated (AR(1)) errors by maximum likelihood. On the residuals of the latter we then perform Baltagi, Song, Jung and Koh (JE, 2007)'s C.1 conditional test for spatial dependence in errors, which is a LM test drawing on the output of this model to check it against the more general alternative

$$y = X\beta + (i_T \otimes \mu) + u$$
$$u = \lambda(I_T \otimes W)u + \nu$$
$$\nu_t = \rho\nu_{t-1} + \epsilon_t$$

For H_0: no spatial dependence ($\lambda = 0$) we get LM=0.49, p-value=0.4856, hence we conclude against spatial dependence.

We are left with the serial correlation issue: both the LR test on the significance of ρ in the MLE and the Baltagi and Li (JE, 1995) test for AR(1)/MA(1) errors strongly favour the serial correlation hypothesis:

$$\hat{\rho}_{NL} = 0.54; \qquad BLtest = 4.85, p < 10^{-6}.$$
$$\hat{\rho}_{L} = 0.72; \qquad BLtest = 11.47, p < 10^{-15}$$

For the sake of robustness, we estimate many different variants of panel models, taking into consideration the positive result of the above mentioned screening test. A random effects plus macroregional and time dummies model (henceforth RE), controlling for unobserved individual heterogeneity, is estimated together with a White-Arellano covariance matrix (Arellano, 1987) which allows consistent inference in the presence of arbitrary heteroskedasticity and serial correlation in the residuals. Alternatively, we estimate the same specification by maximum likelihood, allowing for an autoregressive term of order one (AR(1)) in the errors. We also estimate an unrestricted feasible generalized least squares specification (GGLS) allowing for arbitrary heteroskedasticity and serial correlation inside every province, but constraining the error covariance structure to be the same across provinces (see Wooldridge, 2002, chap. 10.4.3).

These three specifications are likely to deliver the best combination of efficiency and robustness in this setting; yet for the sake of robustness we also estimate two alternative specifications. First, we relax the assumption that individual effects be uncorrelated with the regressors after controlling for macroregional heterogeneity, estimating a fixed effects (FE) model, both in standard form and again estimating a White-Arellano covariance matrix for diagnostic purposes (FE-HC). A fixed effects specification is the most robust way to incorporate individual heterogeneity; on the downside, as using only the time variability of the regressors, it forces us to dispose of time-invariant regressors and it is likely to be less efficient anyway, as the better part of the variance in our dataset is cross-sectional. Lastly, we estimate a so-called *between* model (BE) on time-averaged variables: this specification is robust to the influence of unobserved, time-varying heterogeneity (Coakley *et al.*, 2006) and, reducing the panel to a cross-section, it is immune from error autocorrelation issues. The BE estimator is considered appropriate for capturing long-term relationships (Baltagi, 2005); therefore in this case, the BE specification shall be able to control for the effects of the well-known *insurance cycle*.

Estimation results are presented in two separate tables: the random effects specifications in Table 7, the fixed effects and between ones in Table 8.

Interest rates are the only variable significant across all of the possible specifications, retaining marginal significance even in the fixed effects case, as observed the most unlikely to deliver sharp results because it disposes of all the cross-sectional variations, and in the other extreme specification, the between model, which suppresses the temporal variability by averaging that dimension out and is therefore completely based on cross-sectional variance. Unsurprisingly, the absolute value of the coefficient is minimum in the FE case, maximum in the BE, where it is very likely to be inflated by unacconted-for individual heterogeneity. Taking these two cases as possible upper and lower bounds for the magnitude of the coefficient elasticity of insurance consumption per capita with respect to the real interest rate , and taking heed of the notoriously poor properties of the GGLS estimator in moderately-sized samples, the best estimate in the sense of consistency and efficiency is likely to be one of the two RE specifications. This would put the coefficient for the real interest rate at between 1.4 and 2.0. Anyway, apart from considerations on the magnitude of the effect, the qualitative finding that higher real interest rates on borrowing negatively influence non-life insurance consumption is strongly supported by our empirical analysis.

7. Conclusions

Interest rates affect both non-life insurance supply and demand, possibly in opposite directions. Insurers issue contingent debt contracts and invest the funds until they are needed to pay the claims, so interest rates are a source of revenue for the insurers and a cost for the insured.

	RE-AR(1)	se		GGLS	se		RE-HC	se	
(Intercept)	-0.8177	1.09		-2.6441	1.01	**	-0.7361	1.22	
log(rgdp)	0.2892	0.09	**	0.4913	0.10	***	0.3394	0.11	**
log(rbankdep)	0.1578	0.04	***	0.2366	0.04	***	0.1467	0.05	**
log(density)	0.0762	0.02	**	0.0632	0.02	***	0.0728	0.02	***
rirs	-0.0139	0.01	*	-0.0221	0.01	**	-0.0201	0.01	*
log(agencies)	0.1608	0.05	**	0.1936	0.05	***	0.1887	0.05	***
school	0.0014	0.00		-0.0014	0.00		-0.0018	0.00	
vaagr	-0.0077	0.00	.	-0.0090	0.00	*	-0.0082	0.00	*
log(family)	-0.1276	0.16		-0.1654	0.16		-0.2075	0.16	
log(inef)	-0.1838	0.07	**	-0.1727	0.05	***	-0.1830	0.06	**
log(trust)	1.6195	0.53	**	1.1184	0.39	**	1.4608	0.55	**

Table 7. Model summary. The dependent variable is the log of non-life premiums per capita.

	FE	se		FE-HC	se		BE	se	
log(rgdp)	-0.1230	0.10		-0.1230	0.13		0.6460	0.20	**
log(rbankdep)	-0.0076	0.04		-0.0076	0.04		0.4174	0.10	***
log(density)	-0.7761	0.24	**	-0.7761	0.31	*	0.0328	0.02	
rirs	-0.0133	0.01	*	-0.0133	0.01	.	-0.0939	0.04	*
log(agencies)	0.0283	0.06		0.0283	0.06		0.2240	0.10	*
school	0.0037	0.00		0.0037	0.00		-0.0042	0.01	
vaagr	0.0001	0.00		0.0001	0.00		-0.0014	0.01	
log(family)	-0.1807	0.16		-0.1807	0.16		-0.2109	0.28	

Table 8. Model summary. The dependent variable is the log of non-life premiums per capita.

More in particular, they are an opportunity-cost for the net lenders, and a financing cost for the net borrowers. Therefore a negative effect of local interest rates on demand should be expected, but empirical tests of this hypothesis are hindered by the unobservability of prices and quantities, which makes the estimation of supply and demand systems impossible. To isolate the effect on demand, we resort to a new observational context: a panel of Italian provinces over five years. At this level, the insured face local borrowing conditions while financial returns are uniform.

Interest rates on short-term borrowing vary in a range of almost 400 bp across Italian provinces, and of over 150 bp across macroregions. At the same time, yearly per-capita expenditure on non-life insurance varies between 50 and over 500 euros. Simple correlation is negative and very high. Controlling for all possible other influences, we bring regression evidence that demand for non-life insurance is in fact decreasing with the interest rate on borrowing. This result is robust across a number of specifications. Spatial econometric techniques are employed to ensure consistent inference.

We conclude that, consistently with the predictions of out theoretical analysis, credit conditions are a significant driver of non-life insurance development; and, according to the results of our empirical exercise, that they are also an important limiting factor in the particular case of Southern Italy.

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