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FINANCIAL FLOWS TO TAX HAVENS: DETERMINANTS AND ANOMALIES

by Alessia Cassetta*, Claudio Pauselli*, Lucia Rizzica** and Marco Tonello**

Abstract

We study the Italian cross border bank transfers that took place between 2007 and 2010. The analysis moves from a gravity type of model to propose an empirical specification that allows us to describe the main determinants of cross border financial flows and to identify those flows that appear to be abnormally *above* the predicted value. We examine the economic determinants of the flows in a comparative perspective between destination countries which are considered "risky" by the Italian Financial Intelligence Unit (UIF) and other countries and find, as expected, that the variables that are most related to the real economy — such as the volume of trade, the immigrants' remittances and the tax rate applied to local businesses — matter *less* for flows to risky countries. We also find that, all things equal, financial flows to risky destinations are larger compared to other destinations. A second part of the paper focuses on the analysis of the abnormal flows which we define on the basis of a ranking of the residuals from the main empirical specification. We find positive and statistically significant correlations between our index of anomaly and some proxies of illegal activity in the province of origin and between our index and other measures of riskiness and opacity of legislation of destination countries.

Sommario

Il lavoro analizza i flussi finanziari dall'Italia verso l'estero effettuati tramite bonifico bancario nel periodo 2007-2010. Lo studio prende le mosse dal modello gravitazionale e ne propone una specificazione empirica che permette di identificare le principali determinanti dei flussi internazionali e di individuare quei flussi che risultano di gran lunga superiori al valore previsto dal modello. Il lavoro analizza le determinanti economiche dei flussi mettendo a confronto i paesi di destinazione considerati a rischio dall'UIF con gli altri paesi; i risultati mostrano, come previsto, che le variabili maggiormente legate all'economia reale - come il volume delle importazioni, le rimesse degli immigrati e l'imposizione fiscale nel paese di destinazione - rilevano meno per i flussi verso i paesi a rischio. Si mostra inoltre che, a parità di condizioni, i flussi verso i paesi a rischio sono più elevati rispetto a quelli verso altre destinazioni. La seconda parte dello studio si concentra sull'analisi dei flussi anomali, identificati sulla base del ranking dei residui ottenuti dalla stima del modello principale. Correlazioni positive e statisticamente significative emergono tra l'indice di anomalia proposto dal lavoro e alcuni indicatori di criminalità nelle province di origine dei flussi, nonché con misure di rischio e 'opacità' dei paesi di destinazione.

JEL Classification: F36, G15, K33.
Keywords: offshore financial flows; international money laundering; regulation.

* UIF (Italian Financial Intelligence Unit), Bank of Italy, Data Analysis Division.

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Contents

1 Introduction[1]

Following the recent G20 and G8 meetings and an initiative of some of the biggest European countries[2], the crackdown on international tax evasion and on countries facilitating it (the so called "tax havens" or "offshore financial centers") has rapidly climbed on top of advanced economies' political agenda.
The scrutiny which offshore financial centers and tax havens have come under lately can be explained in terms of the impact they are generally held to produce on the economy of other countries. Indeed, by allowing the presence of confidential accounts, they would reduce the transparency of financial transactions thus facilitating tax evasion and other criminal activities, including corruption, terrorism and drug trafficking.

The concern recently expressed by politicians worldwide is justified by the fact that offshore financial centers currently account for a sizable share of total international financial transactions: overall, they attract about a quarter of worldwide foreign portfolio investments (nearly 9.500 billions USD in 2011, according to UIF's own calculation based on IMF CPIS data)[3].
The official figures moreover tend to underestimate the actual amount of assets in foreign portfolio because offshore centers typically under report the amount of assets that they hold. According to Pellegrini and Tosti (2011) the extent of underreporting is such that 7.3% of the world's total GDP would be missing from the official statistics.

That flows to off-shore financial centers may reflect factors and motivations that go beyond standard economic and financial ones is confirmed also in figure 1. For instance, Italy's inward and outward foreign wire transfers with offshore centers or tax havens exhibited quite a different reaction to the global crisis that broke out in 2008: while flows to and from non-risky countries peaked in 2008 and then strongly contracted due to the crisis and the subsequent economic slump, flows to and from offshore centers and tax havens in the same period featured a less severe decrease and then started to grow again[4].

The existing economic literature on tax havens has mainly focused on the consequences of the existence of such centers on the economies of other countries. In this respect, the traditional view which depicts tax havens as "parasites" whose elimination would lead to an increase in tax

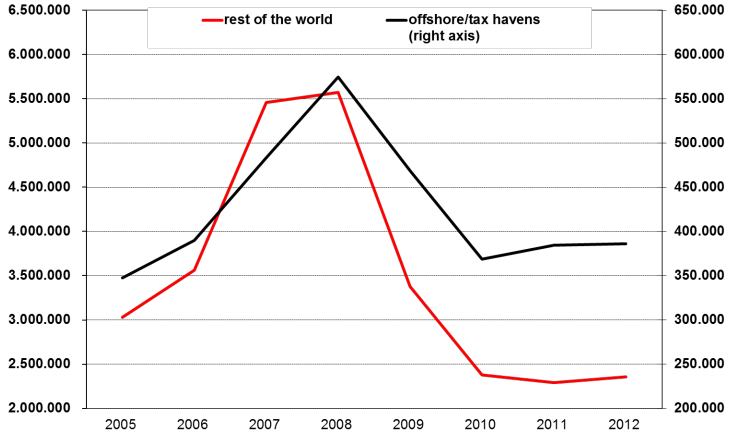
[1]The views and the opinions expressed in this paper are those of the authors and do not necessarily represent those of the institutions they are affiliated with. We are indebted for useful comments to Magda Bianco, Mario Gara, Silvia Giacomelli, Domenico Marchetti and participants at the 2013 Annual Conference of the Italian Society of Law and Economics (Lugano, 12-13 December 2013). All errors are ours.

[2]The reference is to the agreement reached in April 2013 by the governments of France, Germany, Italy, Spain and the UK to start a pilot multilateral exchange facility on tax matters.

[3]UIF is Italy's Financial Intelligence Unit and is established at the Bank of Italy. According to a standard international definition, a Financial Intelligence Unit (FIU) is a central, national agency responsible for receiving, (and as permitted, requesting), analyzing and disseminating to the competent authorities, disclosures of financial information (i) concerning suspected proceeds of crime and potential financing of terrorism, or (ii) required by national legislation or regulation, in order to combat money laundering and terrorism financing.

[4]In this regard, it needs to be stressed that in 2009-2010 Italy implemented a voluntary tax compliance program allowing Italian citizens to legalize unreported assets held abroad. This increased flows from those countries.

Figure 1: Italy's inward and outward foreign wire transfers (million euros)



revenues, savings of the resources spent on tracking financial activities to these countries, and finally enhance the welfare of non-haven countries (Slemrod and Wilson (2009) and Bucovetsky and Haufler (2008)), has more recently been challenged by a number of works which rather pointed at the existence of some desirable aspects of tax havens which may offset the negative ones typically mentioned. These effects would essentially be of three types (Hebous, 2011): (i) tax havens produce efficiency in the way firms use their capital in investing at home (Hong and Smart, 2007) or in other foreign countries (Desai et al. (2006a), Hines (2010)); (ii) tax havens may alleviate international tax rate competition (Johannesen (2010), Dharmapala (2008)); (iii) tax havens, or offshore financial centers, can generate positive externalities in neighboring countries by enhancing competition in the banking sector (Rose and Spiegel, 2007).

A more limited strand of literature, to which we aim to contribute, focuses instead on the determinants of flows to tax havens. Scholars argue for instance that countries can become tax havens when they exhibit a high quality of governance, being at least sufficiently politically stable (Dharmapala and Hines Jr., 2009). Another essential feature of tax havens would then be a small size: in a small enough country the tax system may be one of the few available instruments to attract foreign investment (Bucovetsky and Haufler (2008), Kanbur and Keen (1991)). Using firm level data, instead, Desai et al. (2006b) showed that firms which are larger, hold more foreign assets, have more intensive intra-firm trade and R&D expenses are most likely to use tax havens[5].

A number of studies have estimated the determinants of cross border financial flows using gravity models: Lane and Milesi-Ferretti (2008) for instance applied a gravity model to data on international equity holdings and found a strong correlation with bilateral imports but also a prominence of information costs in determining financial flows. Information costs are a key variable also in Portes and Rey (2005), who estimate a gravity model on a long panel dataset

[5]The rationale for this finding is that these are the firms which benefit the most from the possibility of reallocating taxable income away from high tax jurisdictions and from reducing the burden of home country taxation from foreign countries.

of bilateral gross cross border equity flows between fourteen countries in the period 1989-1996. Finally Rose and Spiegel (2007) estimate a similar model on a much larger sample including 69 source and 222 host countries. Their empirical analysis delivers two main findings: (i) geography matters, as distance has a significant negative impact on cross border flows; (ii) tax havens attract more flows than other countries even controlling for all the available economic and institutional variables.

Our paper takes the moves from these contributions to apply a gravity model to the flows of capital between Italian provinces and foreign countries to assess the relevance of the main economic and socio-demographic variables and evaluate the differences between offshore and non offshore countries.
Secondly, we take a normative step and provide evidence that the analysis of the residuals from the estimated gravity model can reveal patterns of anomaly which well correlate with measures of tax evasion and money laundering activities.

The paper is structured as follows: next section presents the conceptual framework of the study; section 3 describes the data used and provides some descriptive statistics; section 4 shows the econometric model and the empirical evidence on the determinants of cross border wire transfers; section 5 introduces the anomaly indicator built to analyze the residuals of the model; conclusions follow.

2 Conceptual Framework

The model on which we develop our analysis is based on the so called "gravity models" (Tinbergen, 1962), which are mainly used in the field of international trade to predict the flows of goods from a country i to a country j. In this model it is assumed that the flows of goods between countries are regulated by a law similar to Newton's gravity, so that:

$$F_{ijt} = G \times \frac{M_{it} M_{jt}}{D_{ij}} \tag{1}$$

where F_{ijt} are the flows from a country i to a country j in the specified unit of time t; G is then a constant, similar to Newton's gravity constant, M_{it} and M_{jt} represent the economic "mass" of respectively country i and country j, and D_{ij} is the physical distance between the two countries.

The econometric translation of this model is very simple and thus appealing; indeed, if we take the natural logarithms of equation 1, we obtain a simple linear specification of the type:

$$\log F_{ijt} = g + \beta_1 \log M_{it} + \beta_2 \log M_{jt} - \beta_3 \log D_{ij} + \epsilon_{ijt} \tag{2}$$

Following Lane and Milesi-Ferretti (2008), Portes and Rey (2005), Rose and Spiegel (2007),

in this paper we propose to apply a similar model to the flows of capital (rather than goods) between Italian provinces and foreign countries between 2007 and 2011. Estimating a regression like that in (2) allows us to assess the relevance of the main economic variables on the amount of capital that outflows from Italy to foreign countries and provides an estimate of the share of the observed flows which can be explained by standard economic variables. It is of special interest to us, indeed, to understand how much of the observed flows of capital from Italy is *not* explained by the main economic and socio-demographic characteristics of the two countries involved, and what other factors are instead relevant, in order to derive some implications for an effective financial control policy.

3 Data and Descriptive Statistics

The Italian anti-money laundering law (Legislative Decree 231/2007) requires banks and other intermediaries to record all transactions amounting to over 15,000 euros in a specific archive (Single Electronic Archive). Each month intermediaries file these data to the UIF in the Aggregate Anti-Money-Laundering Reports (S.AR.A. from the Italian acronym) by aggregating individual records according to several criteria determined by the law[6].
During 2012, UIF received almost 100 million aggregate records, corresponding to 300 million transactions worth more than 24 trillion euro. Reporting entities are mainly banks, which accounted for more than 96% of the total number of reported transactions in 2012, but also include fiduciary and asset management companies, securities firms and insurers.

For the purpose of this study, we considered only cross border wire transfers made by private customers of Italian banks between 2007 and 2011. On a yearly basis cross-border wire transfers reported to UIF account for about 5.9% of records (corresponding to 3.4% of transactions and to 9.5% of amounts) and are equally partitioned between inward and outward transfers.
Over 5 million records related to outgoing cross border wire transfers were aggregated to exploit the largest available set of explanatory variables in the estimation. The resulting dataset contains more than 55,000 observations aggregated according to the year, the province of origin and the destination country (which identifies respectively the province where the bank branch of the sender's account is located and the country where the bank of beneficiary is based): that is, each record refers to flows from a given Italian province to a given foreign country in a given year[7]. The transactions considered are only those originated from domestic households and firms, while wires sent by financial intermediaries and public administration on their own behalf

[6]The reported information has been enlarged since January 2012; it currently includes the client's residence and economic sector, the intermediary's branch where the transaction took place, the type of the transaction, the total amount transacted and the corresponding cash component, plus the number of transactions that have been aggregated in a single record.

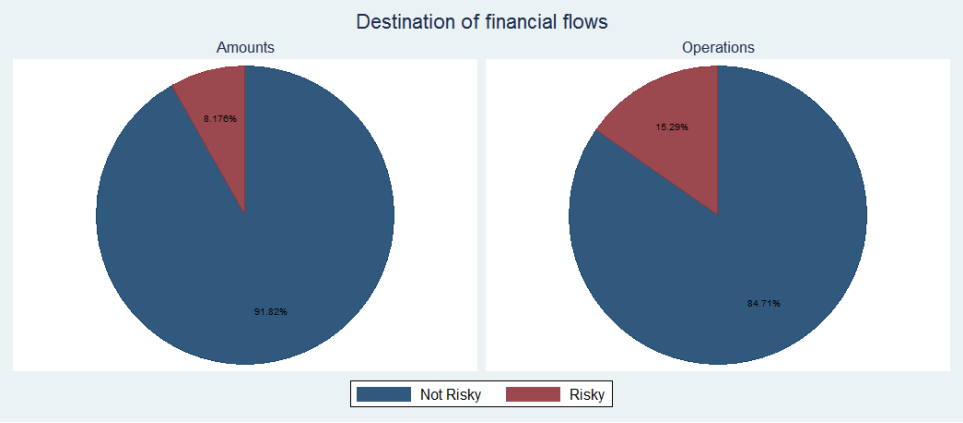
[7]The dataset included a large number of transactions towards non independent territories. While the analysis of these flows would have been very interesting for this study, we had to drop these observations because no data about the economic and socio-demographic characteristics of these territories is available. A list of the territories dropped is included in the appendix.

and by foreign customers are not included. Since not all explanatory variables are available for all countries and provinces of origin, the final sample considered for the analysis contains slightly more than 50,000 records in the most parsimonious econometric specification and shrinks to almost 25,000 records when we consider all the available control variables.

The first step of our work was to classify destination countries into risky and not risky. Though the phenomenon of international harmful tax practices is generally well understood, in current practice the terms used to identify opaque jurisdictions are arbitrarily applied to a highly heterogeneous group of states and territories offering privileged tax treatment, diversified 'secrecy' services either in the financial or corporate sector and providing typically inadequate tax and judicial cooperation at international level. Lacking a universal definition of risky destinations, we define as "risky" the group of countries that appear in the official list issued by the Ministry of Economy and Finance according to the Revenue Taxation Law[8] and add to these a group of countries that UIF specially monitors because of opaque features of their financial, corporate or tax regulations.

Considering this classification of the destination countries, it turns out that: 15% of the transactions of the outward cross border wire transfers sample refer to flows to risky countries; these account for about 8% of the overall amount of outward flows (Figure 2). Aggregate flows to risky destinations are smaller on average and consist of fewer operations (Table 1). It is also easy to notice, from the figures in table 1, that the average size of each operation to risky countries is considerably smaller than that of operations to non risky countries (about 110,00 euro versus 223,000 euro for non risky countries). Finally, if one looks at the partition of flows to risky countries by their final destination, it appears that the vast majority of them is sent to European countries, thus indicating a preference for doing business in nearest locations even for risky activities.

Figure 2: Destinations of cross-border financial flows



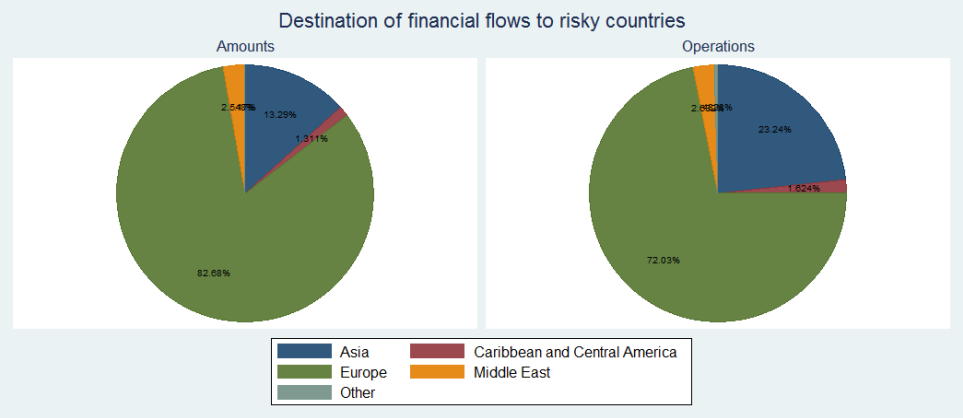
[8]See Law 917/1986, art.167, indent 1.

Table 1: Financial flows from Italian provinces to foreign countries, 2007-2011

	(1)		
	Not Risky	Risky	Total
Operations$_{ijt}$	385.0	212.6	342.6
	(2996.9)	(1223.0)	(2672.7)
Flows$_{ijt}$, million	86.16	23.48	70.72
	(2052.0)	(257.0)	(1786.3)
log Flows$_{ijt}$	13.53	13.16	13.44
	(2.756)	(2.647)	(2.734)
Observations	55382		

mean coefficients; sd in parentheses

Figure 3: Destinations of cross-border financial flows to "risky" countries



We added to the UIF dataset a set of socio-economic and demographic variables related to the province of origin and to the country of destination of the wire transfer (a list of the variables and their source is reported in the appendix). For the destination countries, we consider the country per capita GDP, the average firm level taxation, and per capita foreign direct investment. As a proxy of the distance between province and country, we add a dummy variable which takes value 1 if the foreign country j shares a border with the Italian province i. For the province, economic characteristics are proxied by the employment rate[9], the personal taxable income per tax-payer and the value of import from each country. Socio-demographic characteristics include resident population and the stock of immigrant resident population from each country. We also employ, in a second stage of the analysis, some indicators of criminal activity to proxy for the relevance of the market for profitable illegal activities such as drug trafficking, smuggling and prostitution ("enterprise syndicate crimes") and to signal how deeply-rooted criminal organizations are in a certain province ("power syndicate crimes")(Block, 1980). An index of mafia penetration in

[9]We would have preferred to use province level Value Added, but this is not yet available from ISTAT statistics for the years covered by the empirical exercise.

each province computed by Transcrime, an academic research center, is also used as a measure of criminal activity. Finally, we consider the number of Suspicious Transaction Reports (STR) received by UIF as a proxy for the actual amount of money-laundering or tax evasion activity. The Suspicious Transaction reports are mandatorily filed by financial intermediaries, professionals and non-financial enterprises "whenever they know, suspect or have reason to suspect that money laundering or terrorist financing is being or has been carried out or attempted[10]".

Tables 2 and 3 show the descriptive statistics of these two sets of variables for the flows included in the main econometric specification of section 4. Table 2 contains the characteristics that are specific to each province/country/year cell in the upper panel and those specific to the destination country j and year t in the lower panel. All statistics are split between flows to risky countries (as defined above) and other flows, the last column reports the statistics for the full sample.

The figures reported in the first three lines of table 2 are coherent with those of table 1: the average number of operations in each record of flows to risky countries is smaller than that of flows to non risky countries and so is the average amount; with respect to the full sample of table 1, the regression sample is made of smaller but more numerous operations to risky countries, so that the average amount of money per operation is essentially unchanged (129,000 euro for risky countries, 241,000 euro for non risky ones[11]).

We also have information about the number of immigrants from each country j residing in province i in each year t: clearly the number of migrants coming from risky countries is considerably smaller than that of those from other countries because risky countries are on average smaller than non risky ones, at least in terms of population.

It also appears that the value of the commercial flows between Italian provinces and risky countries is smaller on average than that with non risky countries. Looking at country specific indicators, we observe that risky countries are on average richer than non risky ones while receiving less FDIs, and that they generally apply lower tax rates to firms. Finally, the table shows that risky countries are on average farther away than non risky ones.

[10] According to the Legislative Decree 231/2007, art. 41(1): "the suspicion must arise from the characteristics, size or nature of the transaction or from any other circumstance ascertained in connection with the functions carried out and taking account of the economic capacity and the activity engaged in by the person in question, on the basis of information available to the reporters, acquired in the course of their work or following the acceptance of an assignment".

[11] These figures are simply obtained from those in table 1 by dividing the value of the flows by the number of operations.

Table 2: Descriptive Statistics of regression sample, 2007-2010. Characteristics of flows destination countries.

	(1)		
	Not Risky	Risky	Total
Operations$_{ijt}$	541.7	393.9	521.6
	(3570.8)	(1852.7)	(3389.6)
Flows$_{ijt}$, million	130.8	50.78	119.9
	(2661.4)	(399.3)	(2478.8)
log Flows$_{ijt}$	14.27	14.16	14.25
	(2.668)	(2.695)	(2.672)
log migrants$_{ijt}$	4.042	2.684	3.858
	(2.160)	(2.091)	(2.201)
log import$_{ijt}$	14.72	13.51	14.55
	(2.884)	(2.846)	(2.908)
log GDP$_{jt}$, pc	9.078	9.522	9.138
	(1.396)	(1.202)	(1.380)
Shared Border$_{ij}$	0.00228	0.00890	0.00318
	(0.0477)	(0.0939)	(0.0563)
log population$_{jt}$	17.00	15.44	16.79
	(1.537)	(1.473)	(1.618)
tax rate$_{jt}$	45.50	36.95	44.34
	(16.25)	(10.21)	(15.84)
log FDI$_{jt}$	22.60	21.84	22.49
	(1.945)	(1.719)	(1.934)
Observations	24844		

mean coefficients; sd in parentheses

With respect to the province of origin of the financial flows, we observe, in table 3, that flows to risky countries usually come from bigger and richer provinces. When looking at the differences in terms of crime indicators, moreover, provinces of origin of financial flows to risky countries show a higher level of property crime rates while other crimes seem to have the same intensity irrespectively of the destination of the transfers. Considering the indicators built by Transcrime and the number of STRs to UIF, instead, it appears that flows to risky countries tend to originate from provinces with higher crime rates or number of STRs.

Table 3: Descriptive Statistics of regression sample, 2007-2010. Characteristics of flows source provinces.

	(1)		
	Not Risky	Risky	Total
Employment Rate$_{it}$	60.14	61.03	60.26
	(8.951)	(8.682)	(8.920)
log population$_{it}$	13.01	13.15	13.03
	(0.800)	(0.797)	(0.801)
log taxable income$_{it}$, pc	9.996	10.01	9.997
	(0.0919)	(0.0928)	(0.0922)
log property crimes$_{it}$	28.18	29.62	28.37
	(10.65)	(10.99)	(10.71)
log violent crimes$_{it}$	3.358	3.286	3.348
	(2.199)	(2.206)	(2.200)
log organized crime$_{it}$	0.0120	0.0119	0.0120
	(0.0152)	(0.0148)	(0.0151)
log extortions$_{it}$	0.0700	0.0672	0.0696
	(0.0568)	(0.0549)	(0.0565)
log white collar crimes$_{it}$	0.0389	0.0353	0.0384
	(0.0423)	(0.0376)	(0.0417)
log enterprise syndicate crimes$_{it}$	2.074	2.055	2.072
	(1.437)	(1.467)	(1.441)
log power syndicate crimes$_{it}$	8.394	8.383	8.392
	(5.830)	(6.009)	(5.855)
Transcrime Index of Mafia Penetration$_i$	7.572	7.947	7.623
	(16.44)	(17.51)	(16.59)
Firms confiscated for mafia$_i$, per 10,000 firms	7.346	7.904	7.426
	(8.347)	(9.372)	(8.504)
UIF STR$_i$	148.3	175.1	151.9
	(288.9)	(323.6)	(294.0)
Observations	24844		

mean coefficients; sd in parentheses

4 Empirical Analysis

In this section we bring the model presented in section 2 to the data. The dependent variable is the natural logarithm of the financial flows from province i to country j in year t. The first set of control variables includes the observable characteristics of each Italian province. In principle, we want to add as many observable characteristics as possible, so to describe the (time variant) economic features of each province that could explain the financial flows from province i to each foreign country j. We thus use the available socio-demographic characteristics of the source provinces and a set of relevant economic characteristics of each destination country j (as detailed in section 3) which could explain financial and economic flows from Italian provinces. Finally, in some specifications we also include a dummy which takes value 1 if the foreign country is a risky one (risky_j) according to the classification described in section 3.

We estimate several versions of the model using OLS regressions with robust standard errors clustered at the province level. We progressively add the complete set of control variables. In some specifications we also include provincial and year fixed effects to control, respectively, for time invariant unobserved heterogeneity in each province and time trends. The estimated coefficients can be interpreted as elasticities, as the control and dependent variables are expressed in logarithms.

Our baseline results are presented in table 4. We include flows from *all* Italian provinces to *all* foreign destination countries. In column (1) we include the set of control variables that are available for all countries and provinces, while in columns (2) through (6) we add the complete set of control variables, year and province fixed effects. The sample considerably shrinks passing from the first regression to the second set of specifications. To make sure that our results are not driven by sample selection, we repeat the regression of column (1) on the smaller sample. These results are reported in column (7) and show no significant differences with respect to those in column (1). The explicative power of the model also increases. Thus, we focus our comments on columns (2)-(6), which are the specifications that will be used in the analysis of the residuals (see section 5). Finally, in column (8) we introduce a fully interacted specification to account for the differences between risky and non risky destinations.

Focusing on column (2), all the correlations with the characteristics of the foreign country have the expected sign. Financial flows are positively correlated with the foreign GDP and population, with FDI and with the proximity to the Italian provinces. Conversely, they are negatively correlated with the firm level tax rate. The characteristics of the local economies (i.e. the set of control variables at the provincial level) are also significantly correlated with cross-border financial flows. Cross-border flows are positively correlated with the provincial average personal taxable income, with the stock of immigrants (of the receiving foreign country), with the amount of goods imported from each foreign country, and with the general economic conditions of the province (as proxied by the employment rate).

In column (3) we add the dummy *risky* which shows a positive and statistically significant coefficient. This means that, all things equal, financial flows to a risky destination are substantially larger compared to those to other countries. Including year and province fixed effects - columns (4)-(6) - does not change substantially the sign and the magnitude of the correlations, unless for the provincial employment rate and population which are no longer statistically different from 0.

In column (8) we repeat the baseline OLS regression of column (2) by also interacting all the variables with the dummy *risky*[12]. In this case, we want to test whether there are statistical differences in the coefficients estimated for flows to risky countries with respect to the other flows. This exercise reveals some remarkable results: flows to tax havens depart more frequently from the richest provinces and are directed to the largest and richest countries among the risky ones; secondly, variables that are most related to the real economy (the presence of immigrants, the tax rate applied to local businesses, the bilateral flows of import) matter less in explaining the flows to risky countries; finally, flows to risky countries follow FDIs. This last finding is in line with the most recent literature which has stressed the growing relevance worldwide of tax havens and offshore financial centres as countries of both destination and origin of FDI (Haberly and Wójcik, 2014), our results would thus confirm that Italy is part of this trend[13].

[12]Results are substantially similar if fixed effects are included in the regression (unreported regressions).

[13]Indeed, the (positive) sign and statistical significance of the coefficient of FDI in columns (2)-(6) appear to be driven by the evidence on flows to risky destinations, since the coefficient of FDI alone in column (8) is negative and not significant.

Table 4: OLS Estimates on full sample.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employment Rate$_{it}$	0.080***	0.041***	0.041***	0.040***	0.000	-0.000	0.089***	0.041***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.009)	(0.009)	(0.001)	(0.002)
Employment Rate$_{it}$× risky$_j$								0.007
								(0.004)
log GDP$_{jt}$, pc	1.193***	0.838***	0.833***	0.852***	0.872***	0.866***	1.318***	0.827***
	(0.007)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.009)	(0.013)
log GDP$_{jt}$ pc, × risky$_j$								0.812***
								(0.044)
Shared Border$_{ij}$	3.680***	1.308***	1.207***	1.303***	1.202***	1.095***	3.240***	1.299***
	(0.188)	(0.165)	(0.165)	(0.165)	(0.162)	(0.161)	(0.208)	(0.203)
Shared Border$_{ij}$× risky$_j$								-0.319
								(0.335)
log population$_{it}$	1.252***	0.571***	0.559***	0.561***	0.336	0.329	1.333***	0.527***
	(0.011)	(0.017)	(0.017)	(0.017)	(0.610)	(0.608)	(0.015)	(0.017)
log population$_{it}$× risky$_j$								0.375***
								(0.051)
log population$_{jt}$	0.630***	0.087***	0.104***	0.096***	0.101***	0.118***	0.591***	0.166***
	(0.005)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.008)	(0.010)
log population$_{jt}$× risky$_j$								0.036
								(0.029)
log taxable income$_{it}$, pc		1.781***	1.789***	1.954***	5.217***	5.285***		1.470***
		(0.171)	(0.171)	(0.177)	(2.009)	(2.002)		(0.179)
log taxable income$_{it}$, pc × risky$_j$								2.187***
								(0.483)
log migrants$_{ijt}$		0.253***	0.259***	0.255***	0.264***	0.270***		0.276***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)		(0.005)
log migrants$_{ijt}$× risky$_j$								-0.093***
								(0.015)
tax rate$_{jt}$		-0.007***	-0.006***	-0.007***	-0.007***	-0.007***		-0.007***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.001)
tax rate$_{jt}$× risky$_j$								0.016***
								(0.003)
log import$_{ijt}$		0.400***	0.403***	0.399***	0.394***	0.397***		0.425***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)		(0.005)
log import$_{ijt}$× risky$_j$								-0.256***
								(0.013)
log FDI$_{jt}$		0.057***	0.057***	0.046***	0.047***	0.047***		-0.007
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)		(0.009)
log FDI$_{jt}$× risky$_j$								0.079***
								(0.024)
risky$_j$	-0.032		0.365***			0.361***	-0.053	-33.679***
	(0.025)		(0.029)			(0.028)	(0.036)	(4.362)
Observations	50510	24844	24844	24844	24844	24844	24844	24844
R^2	0.485	0.704	0.706	0.704	0.723	0.725	0.524	0.721
Year FE				yes	yes	yes		
Province FE					yes	yes		

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5 The Anomaly Index: Construction and Predictions

The empirical analysis carried out to this point allowed us to highlight the role played by the major economic variables in explaining the flows of capital from Italian provinces to foreign countries. A crucial point though remains that of understanding what other non economic variables determine the variation in the amount of flows that we observe. We thus focus our attention on the residuals of the regression model which has the highest predictive power among those estimated in the previous section; the model considered will thus be that of column 5 of table 4, the R^2 of this regression reveals that there is about 28% of the observed variation in the amount of log flows from Italy to foreign countries which is not explained by the most important economic variables that we included in the regression.

In order to understand what other forces drive the financial flows, we take the studentized residuals[14] of the regression and normalize them on a 0-1 scale. This allows us to identify and rank the most unpredicted flows and to build an index of anomaly which will be highest for those flows which are most largely *above* the amount predicted by the estimation of equation 2, and will be lowest for those flows which are most largely *below* the predicted amount. Table 5 reports the top 20 flows according to our index together with the corresponding amount of capital transferred and the number of operations entailed[15].

Table 5: Top 20 outliers flows

Year	*From*	*To*	*million €*	*Operations*	*Index*
2010	Umbria 1	Cyprus	194.5	104	1
2007	Emilia Romagna 1	Mozambique	5.8	26	.9779373
2007	Sardegna 1	Switzerland	44.7	26	.9566107
2007	Emilia Romagna 2	Panama	14.6	36	.9463907
2008	Piemonte 1	Algeria	220.2	18	.927729
2008	Lazio 1	Malta	0.5	16	.9102542
2007	Emilia Romagna 3	Luxembourg	5594.5	3274	.907112
2010	Veneto 1	Cyprus	253.4	253	.8934924
2010	Umbria 1	Honduras	5.0	27	.893119
2008	Piemonte 2	Kenya	1.9	57	.8860027
2009	Toscana 1	Zimbabwe	6.8	27	.8740342
2010	Toscana 1	Zimbabwe	6.9	35	.8723251
2008	Umbria 1	Malta	1.4	21	.8695132
2007	Liguria 1	Malta	121.5	554	.8687478
2007	Liguria 2	Nigeria	4.8	2	.8566697
2007	Toscana 1	Zimbabwe	7.2	31	.8542836
2010	Liguria 3	Panama	8.5	48	.851546
2010	Lazio 2	Latvia	5.4	37	.8458577
2008	Lazio 3	Sierra Leone	4.9	42	.8452809
2010	Campania 1	Malta	3.6	61	.8452042

The index of anomaly is, by definition, a measure of all that is not explained by the variables

[14] These are the regression residuals divided by their standard deviation, this normalization makes the residuals of a regression comparable and thus is needed for the detection of outliers.

[15] The names of the provinces are concealed for confidentiality reasons.

included in the empirical specification: this is likely to include money laundering activities but will also synthesize other aspects such as the presence, in some foreign countries, of NGOs and humanitarian organizations that receive financial aid from Italy. Yet, table 6 shows that our index of anomaly is strongly and positively correlated with the UIF definition of risky country, especially for those flows which are *above* the predicted ones (index>0.5)[16].

Table 6: Correlation between Anomaly Index and Definitions of "risky country".

	All values			Index> .5		
	Index	Risky_j	FATF_j	Index	Risky_j	FATF_j
Index	1			1		
Risky_j	0.0760***	1		0.130***	1	
FATF_j	-0.0359***	-0.0451***	1	0.0103	-0.128***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

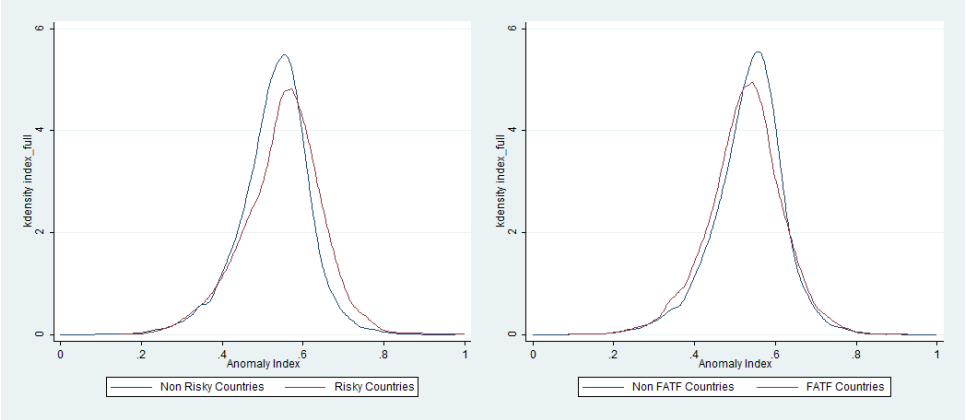
Further evidence on this is provided by figure 4 which shows that the distribution of our index for the risky countries is shifted to the right, i.e. risky countries have larger values of our anomaly index. On the other hand, a similar correlation is not observable for the countries belonging to the list created by the Financial Action Task Force (FATF)[17]; this result was somehow predictable because the FATF list currently contains only 14 countries[18] which are monitored because they still present deficiencies in their degree of compliance with the standards set for anti-money laundering (AML) and combating the financing of terrorism (CFT) purposes. As shown in table 6 and in figure 4 the flows towards the FATF countries are generally *below* the amounts predicted by our econometric model. Such finding suggests that the list of "risky" countries employed by UIF allows for a more effective detection of anomalous financial flows.

[16]We also tested whether the probability of having an anomalous residual is higher for observations related to risky countries. We define as "anomalous" the residuals with studentized values above 2 (Iglewicz and Hoaglin, 1993; Velleman and Welsch, 1981). We find that the percentage of anomalous observations for risky countries (3.62) is more than double that for non risky countries (1.59), the difference being significant at 1% level.

[17]The FATF is an inter-governmental body established in 1989 within the Organization of Economic Development and Cooperation. The objectives of the FATF are to set standards and promote effective implementation of legal, regulatory and operational measures for combating money laundering, terrorist financing and other related threats to the integrity of the international financial system.

[18]At the time of writing this paper, these are: Democratic People's Republic of Korea (DPRK), Ecuador, Ethiopia, Indonesia, Iran, Kenya, Myanmar, Pakistan, Sao Tomé and Principe, Syria, Tanzania, Turkey, Vietnam, Yemen.

Figure 4: Distribution of Anomaly Index by country grouping

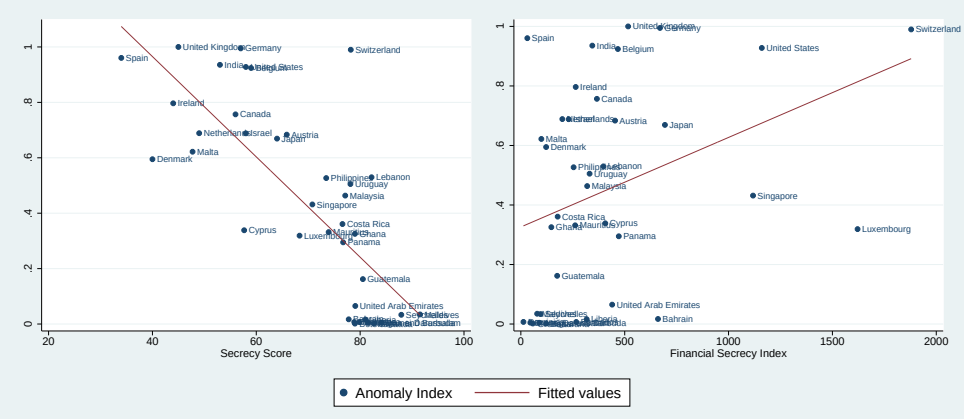


A second step of this analysis consists in comparing the degree of riskiness measured by our constructed index with the characteristics of the country of destination and of the province of origin of the financial flows.

We begin with the countries of destination and assign a single value of the index to each country by collapsing it at the country level; in doing so we use the *sum* of the values rather than the mean to maintain the variation generated by the regression and assign a larger weight to those countries that have more unexplained variability in the financial flows received from Italy; the sum of the index values is then normalized between 0-1. Having assigned a level of riskiness to each single country, we compare this ranking with that generated by the *Financial Secrecy Index*. This is a measure elaborated by the Tax Justice Network, a UK based think tank of researchers whose main interest is the study of the impacts of tax avoidance, tax competition and tax havens. The Financial Secrecy Index is based on a *Secrecy Score*, which is a *qualitative* measure that tries to assess how secretive a jurisdiction is in terms of laws, regulations, adherence to international treaties and so on; the Secrecy Score is then *weighted* by the jurisdiction's size and overall importance to the global financial markets so as to create a final measure of "Financial Secrecy" that takes into account not only the degree of opacity of the country's regulations but also its relevance on the financial markets: while Maldives rank first in the sample in terms of Secrecy Score, they just rank 60th in terms of Financial Secrecy Index where instead Switzerland is first. Figure 5 compares our index with the Secrecy Score (left panel) and the Financial Secrecy Index (right panel): as the scatter plots highlight our index is negatively related to the Secrecy Score (the correlation coefficient in this case is -0.761, significant at 1% level) while it positively and significantly correlates with the Financial Secrecy Index (the correlation coefficient is 0.357, significant at 5% level)[19]. The reason of such divergent paths is that our index, as the Financial Secrecy one, takes into account the volume of transactions involved so as to give a larger weight to countries which receive the largest amounts of flows from Italy.

[19]We also computed the mean of the Financial Secrecy Index and of the Secrecy Score for the anomalous observations (i.e., those with studentized residuals above 2) and found that for both indexes, the mean is higher with respect to that computed for the other observations, at the 5% significance level.

Figure 5: Correlation between Anomaly Index and Financial Secrecy Indicators.



We proceed our analysis of the anomaly index constructed by comparing it with some characteristics of the province of origin: as for the countries of destination, we collapse our original index by province of origin by summing up its values and then normalizing them on a 0-1 scale. We obtain a ranking of the Italian provinces based on the share of the flows that they send abroad which is not explained by our econometric specification. The geographical distribution of these flows reveals that the provinces with the highest value of our anomaly index include some of the biggest and richest districts (for example Rome and Parma), but also some areas known for featuring high levels of penetration of organized crime (for example Naples, but also some provinces in Emilia Romagna, Liguria and Piedmont). There are also some more "unexpected" results which may provide valuable indications for further operational work.
We move on to compare the distribution of the index among Italian provinces to that of some indicators of local criminal activity and to that of the UIF Suspicious Transaction Reports (STR) described in section 3. Table 7 reports the correlation coefficients.

As shown in the first panel of the table, our anomaly index correlates positively and significantly to the UIF STRs, thus providing evidence that anomalous financial flows towards risky countries tend to originate from provinces which most feature anomalous financial conducts as reported to the UIF. The second panel of the table then contains the coefficients of correlation between our index and the crime rates derived from the data provided by the Ministry of the Interior: it turns out that our index depicts the same patterns of the crime indicators exhibiting a positive correlation with most of them. As further confirmed by figure 6 this positive correlations are particularly strong for property and drugs related crimes, which generally generate significant flows of (illegal) money[20]. Indeed, if we aggregate the crime types contained

[20]For each variable listed in table 7, we computed the mean among anomalous observations (studentized residuals >2) and tested whether this was higher than the corresponding mean computed among all other observations. The results are consistent with those reported in table 7, as we found that the mean among anomalous observations is significantly higher for all variables that table 7 shows to be correlated with the anomaly index (and also for the number of firms confiscated for mafia). Moreover, by using the residuals of the model estimated without

Table 7: Correlation between Anomaly Index and Province Level Crime Indicators

	Risk Index$_i$
UIF STR per 100,000 people	0.660**
Property crimes$_i$	0.705**
Violent crimes$_i$	0.451
Organized crime$_i$	-0.315
Money laundering crimes$_i$	0.112
Drugs crimes$_i$	0.644**
White collar crime$_i$	-0.545*
Power syndicate crimes$_i$	0.455
Enterprise syndicate crimes$_i$	0.575*
Firms confiscated for mafia$_i$, per 10,000 firms	-0.126
Transcrime Index of Mafia Penetration$_i$	0.0493

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in the archives of the Ministry of the Interior according to the definitions of Block (1980) described in section 3, we obtain a stronger correlation with the enterprise syndicate crimes, i.e. those types of crime which are more likely to generate illicit flows of capital and goods (Figure 7).

Finally the last panel of table 7 reports the correlation between our index and two further measures of the penetration of organized crime: the first is the number of firms confiscated for alleged criminal connections in the province, while the second is the Index of Mafia penetration built by Transcrime. These measures show a poor correlation with our index mainly because they tend to over weigh the provinces located in the Southern regions where the Mafia presence has traditionally been highest; our index, instead, tends to put more weight on those provinces which are financially and commercially more prominent, i.e. those in the Northern regions.

province fixed effects, we find that the mean of money laundering crimes and that of the Transcrime Index of Mafia Penetration, computed among anomalous observations, are significantly higher, too.

Figure 6: Correlation between Anomaly Index and Province Level Crime Indicators.

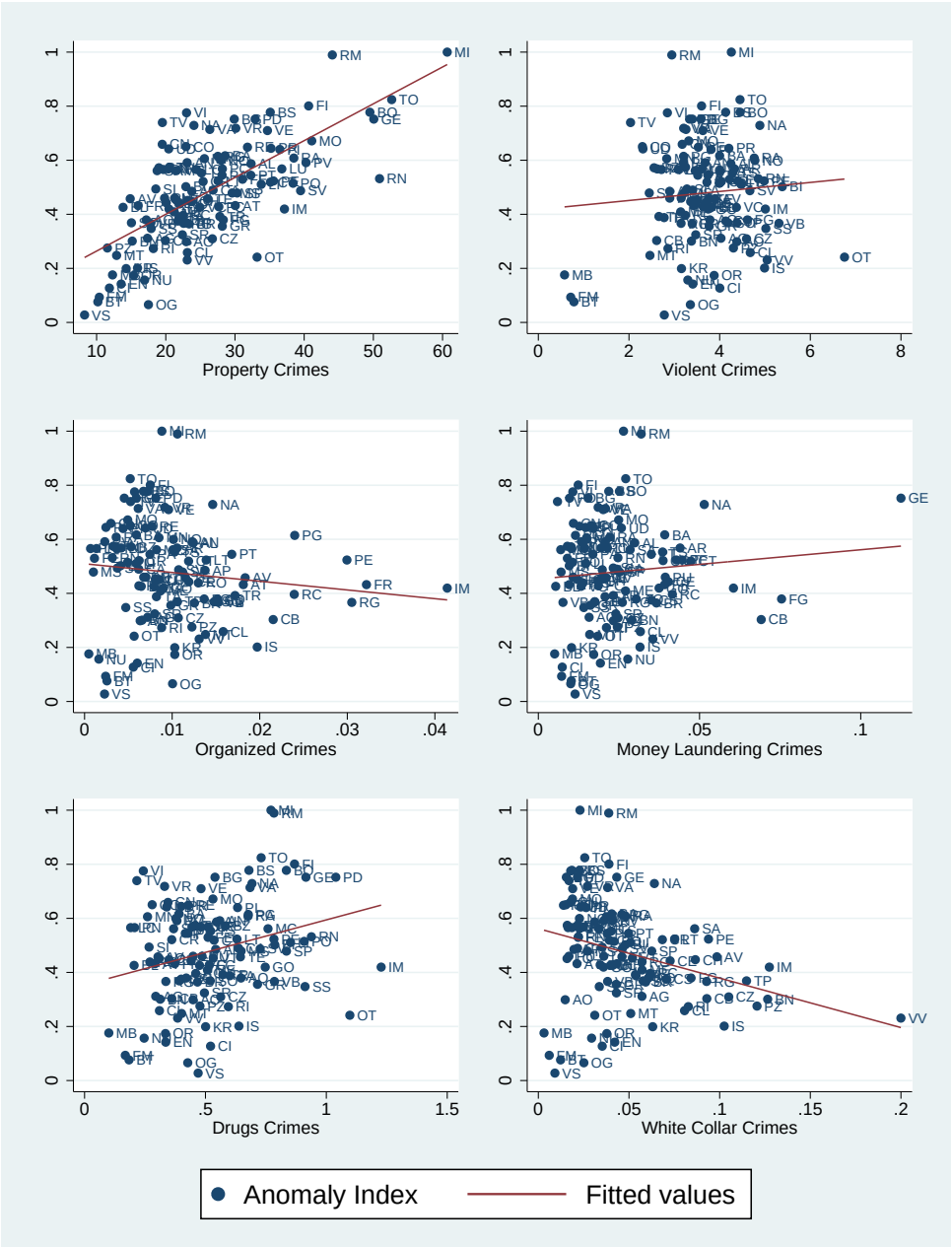
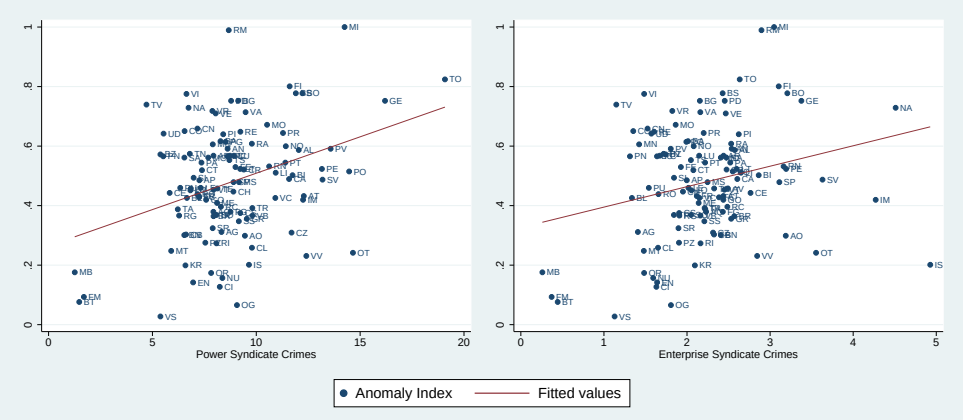


Figure 7: Correlation between Anomaly Index and Province Level Crime Indicators - Block (1980) definitions



6 Concluding Remarks

Offshore financial centers and tax havens are currently at the heart of an intense policy debate because they are held to originate undesirable spillovers by decreasing tax intakes in other countries and reducing the transparency of financial transactions, thus facilitating criminal activities, including tax evasion, corruption, terrorism and drug trafficking. Concerns are further justified by the great amount of financial transactions that involve these centers and by the share of global investments that they attract. These facts are particularly relevant for the Italian case, where the underground economy is vast and connections between flows to financial havens and organized crime enterprise activities have been often discovered by law enforcement and judicial authorities. For example consider that between 2007 and 2011, our period of observation, almost 15% of the cross-border transfers from Italy refer to risky countries, accounting for almost 8% of the overall amount of outward flows. The existing economic literature has not yet found a clear consensus on the effects of financial havens on global markets. Recent contributions have prevalently focused on the effects of tax havens on the economies of other countries and little has been done on the study of the determinants of financial flows to and from tax havens.

Our work aims to contribute to this latter strand of the literature. We apply a gravity model to study the determinants of the flows of capital between Italian provinces and foreign countries to assess the relevance of the main economic and socio-demographic variables and evaluate in which ways flows to offshore and non offshore countries are different. To this purpose, we construct a rich dataset which combines information on bank wire transfers to and from all Italian provinces with several data sources containing information on the economic and socio-demographic characteristics of Italian provinces and destination countries. From the empirical point of view, we estimate a gravity model using OLS regressions and test the sensitivity of our findings across several specifications that account for unobserved (time invariant) territorial

characteristics and yearly time trends.

We find that financial flows are positively correlated with foreign GDP and population, with FDI and with the proximity to the Italian provinces. Conversely, they are negatively correlated with the firm level tax rate. The characteristics of the local economies are also significantly correlated with cross-border financial flows: these are positively correlated with the provincial average personal taxable income, with the stock of immigrants, with the amount of goods imported from each foreign country, and with the employment rate. We also find that, all things equal, financial flows to a risky destination are substantially larger compared to those to other countries and that this is not explained by the socio-economic characteristics of the province where the financial flow starts nor by those of the destination (risky) country.

As a second step of our analysis, we exploit the studentized residuals from the gravity model OLS regressions to construct an Anomaly Index. This allows to identify and rank the most unpredicted flows and to build an Index of Anomaly which is higher for those flows which are most largely *above* the amount predicted by the estimation of the baseline equation, and lower for those which are most largely *below* the predicted amount. We find that our Anomaly Index is positively and statistically significantly correlated with property and drug related crimes at the provincial level and with indexes of opacity and riskiness of the legislation of the destination countries.

Our findings are also interesting from a policy perspective. Investigations on the part of national and international FIUs and law enforcement authorities could be greatly enhanced by the knowledge of the characteristics and the dynamics of suspect flows to offshore countries. For instance, we find that flows to risky destinations are not fully explained by the volume of commercial flows and financial investments between Italian provinces and risky countries. Our Anomaly Index also highlights important correlations with some observable characteristics at the provincial level which could guide efforts by anti-money laundering and law enforcement authorities.

Finally, from an operational anti-money laundering perspective, interesting insights could be drawn by further investigating the outliers emerging from the model. Moreover, our analysis could be improved by estimating a gravity model at the municipality or even bank branch level. Such development goes beyond the scope of this paper and is left to future research.

7 Appendices

Table 8: Data sources.

Variable	Source
Operations_{ijt}, Flows_{ijt}	UIF S.Ar.A.
Migrants_{ijt},	Demo Istat
Imports_{ijt}, $\text{Employment Rate}_{it}$	Istat
GDP_{jt}, Population_{jt}, FDI_{jt}	World Bank
Tax Rate_{jt}	Doing Business
Population_{it}, $\text{Taxable Income}_{it}$	FINLOC
Crime rates_{it}	SDI, Ministry of Interior
Transcrime Index of $\text{Mafia Penetration}_i$, $\text{Firms confiscated for mafia}_i$	Transcrime
UIF STR_i	UIF
Secrecy Score_j, $\text{Financial Secrecy Index}_j$	Tax Justice Network

Table 9: Countries and territories not included in the analysis.

Country	Total Amount	Operations
Aland Islands	115,851	4
Anguilla	4,053,335	134
Antarctica	2,284,375	84
Dutch Antilles	157,784,112	1564
Azores Islands	3,120,129	78
Bouvet Island	272,276	22
Canary Islands	32,108,492	472
Chafarinas Islands	7,360,128	115
Chagos Islands	4,310,352	57
Christmas Island	156,936	8
Vatican City	12,168,469	176
Clipperton	674,148	26
Cook Islands	174,737	18
Falkland Islands	291,945	8
Gibraltar	206,564,000	1614
Gough	14,166	1
Guadalupa	99,631,304	820
French Guyana	27,247,860	346
Guernsey	173,168,240	1429
Heard and McDonald Island	586,732	8
American Pacific Islands	233,924	7
Jersey	1,974,071,680	3791
Madeira	56,123,092	787
Martinica	6,001,378	112
Mayotte	2,007,821	32
Melilla	13,203	1
Midway Islands	246,436	4
Montserrat	3,210,584	100
Nauru	3,653,265	3
Norfolk Island	20,000	1
Penon de Alhucemas	10,531,626	372
Pitcairn	279,482	7
Reunion	13,089,096	418
Saint Helena	127,654	7
South Georgia and South Sadwich	36,170	4
Taiwan	8,337,577,472	168737
British Indian Ocean Territory	11,305	1
Tokelau	4,939,763	89
Tristan da Cunha	1,909,411	31
British Virgin Islands	21,095,060	170
Wallis and Futuna	96,339	2

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