Privacy / Proxy / Perfidy

what criminals (& others) put in domain Whois

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Normal Whois Data

- When a domain name is registered the registrant supplies their name and contact details (street address, perhaps phone & email)
- Other fields give admin/billing/technical/etc. contacts
  - one can often learn registrant phone numbers if the registrant is also admin/billing/etc.
- This data is public
  - and available on the port 43 whois service
  - also sometimes on the web as well
- Whois allows problems to be addressed promptly
  - but some people are shocked by the lack of privacy

Privacy and Proxy Services

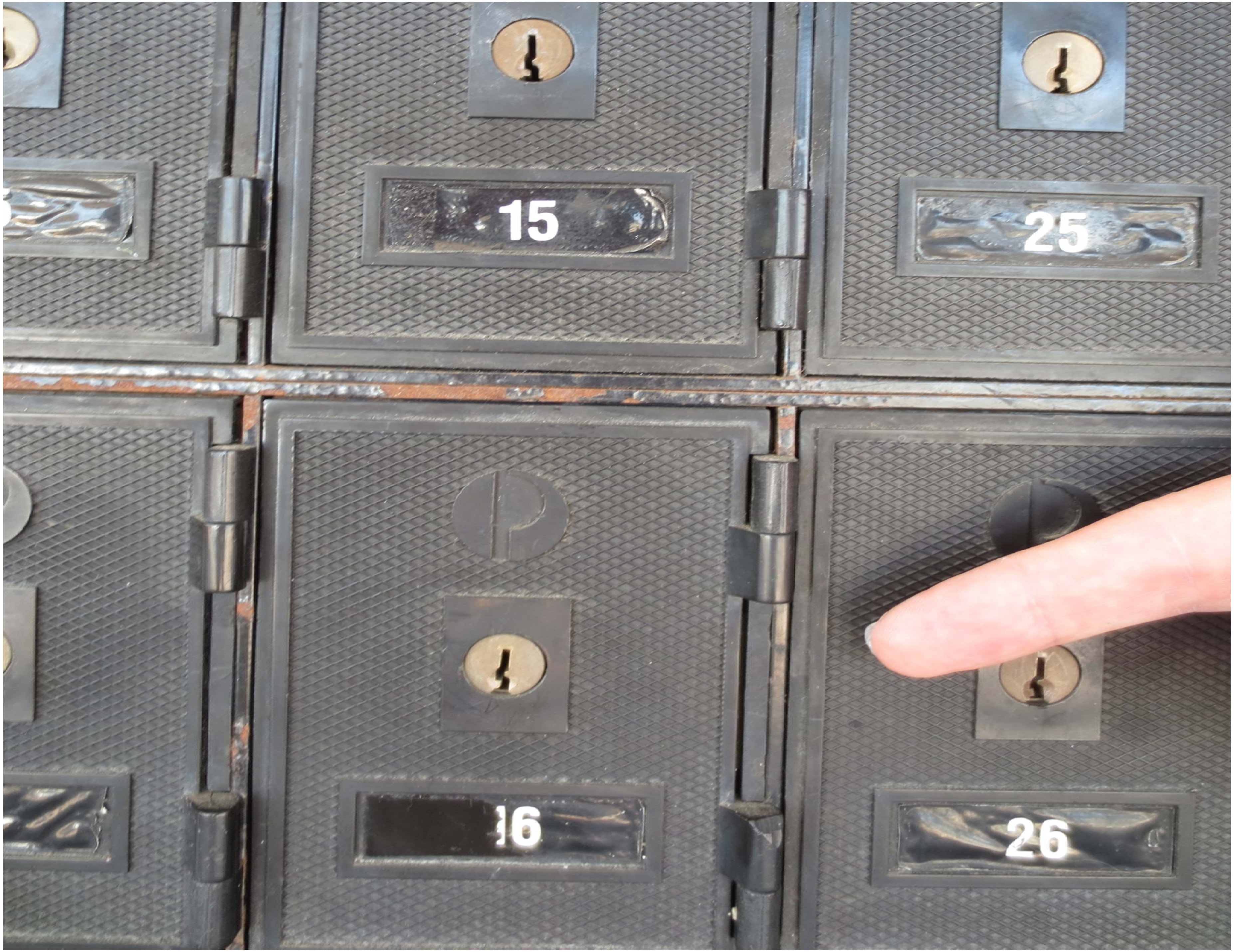
- Privacy Service
  - registrant name is provided, but contact details are generic (although sometimes the local part of the email address is specific to the registrant – to allow automated forwarding of email)
- Proxy Service
  - domain is registered in the name of the proxy service and all contact details are generic (although sometimes the local part of the email address is specific to the registrant – to allow automated forwarding of email)
- Note that for ".UK" Whois data may be hidden by individual choice (but not by traders or companies)
  - but .UK isn't one of the domains ICANN looks after

Example Proxy Registration

```
Domain Name: DOOMZONE.NET
Registrant:
    PrivacyProtect.org
    Domain Admin        (contact@privacyprotect.org)
    ID#10760, PO Box 16
    Note - All Postal Mails Rejected, visit Privacyprotect.org
    Nobby Beach
    null,QLD 4218
    AU
    Tel. +45.36946676

Creation Date: 07-Feb-2012
Expiration Date: 07-Feb-2013
```

POST
Nobby Beach 4218
LICK OBSERVATORY
MOUNT HAMILTON
CALIFORNIA
1888


15
25
16
26

ICANN Whois Studies

- ICANN doing a number of studies on the domain whois system:
  - NORC [in Chicago] has examined validity of whois details (most have some detail wrong!); the overall usage of privacy and proxy services (20%) and classifications of registrants
  - Carnegie Mellon University is investigating the extent to which Whois contact details are being misused
  - Interisle Consulting Group assessed feasibility of studying message relay and identity reveal by privacy/proxy services
  - Whois Service Requirements Survey by a GNSO Working Group
  - The present study by NPL into usage of privacy and proxy services when domains are maliciously registered
- Full (and more precise) details at
  - http://gnso.icann.org/en/group-activities/other/whois/studies

This Study

- National Physical Laboratory (NPL) in the UK commissioned to do a study into use of privacy and proxy services when domains are registered for harmful or illegal Internet activities
  - Main Author

Dr Richard Clayton	University of Cambridge

  - Project Team

Prof. Tyler Moore	SMU	typosquatting data
Dr Nicolas Christin	CMU	fake pharmacy data
Dr Tony Mansfield	NPL	experimental design
David Hindley	NPL	project management

Contract started:	April 2012
Draft report issued:	24 Sep 2013
Public comment period ended:	22 Oct 2013
Final version:	Real Soon Now

Summary of Methodology for Study

- Basic approach:
  - obtain various lists of criminal URLs
  - pick out domains being used
  - fetch Whois data for the biz/com/info/net/org domains
  - assess whether registrant is using privacy or proxy service
  - OR look for contact phone number of registrant
- Precise stats for privacy/proxy/no phone number
- Random sample of registrants with phone number
  - phone call made; if answered then one question survey (in registrant’s native language)
    - “did you register example.com”
  - if not answered then retried on different days/times

Phone Results

- Phone number had to be “apparently valid” (i.e. have enough digits, not be 9999999 or 0000000, or have an invalid North American area code)
  - BUT could turn out to be invalid when we dialled it
  - OR the number was valid but just rang and rang
  - OR we reached voicemail, or someone answered who could not help us reach the registrant, or registrant wasn’t ever available
  - OR phone answered and knowledge of domain denied
  - OR we spoke to the registrant (or someone speaking for a company) and they agreed they had registered the domain

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NOPHONE unless “apparently valid”

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Treated as failure

  - OR the number was valid but just rang and rang

Neither success nor failure

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Neither success nor failure

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Treated as success

Phishing (the report in a nutshell)

- Phishing (i.e. email enticing to web page...)
- Source data was 32 806 URLs (one week's worth), using 5 105 domains – 57% in biz/com/info/net/org/
- Used specialist knowledge to split these into three groups:
  - compromised machines (i.e. criminal added phishing pages)
    - 2121 domains
  - third parties (free webhosting domains, cloud services, etc.)
    - 263 domains (plus 1 had no Whois available, so ignored)
  - maliciously registered domain names
    - 449 domains (plus 5 had no Whois data available)

Phishing Analysis Results

- Privacy and proxy usage

third parties	14%	low
compromised machines	25%	average
maliciously registered domains	31%	high

- Able to reach registrant by phone

third parties	32%
compromised machines	24%
maliciously registered domains	2%

- No hope of reaching registrant by phone

third parties	50%
compromised machines	62%
maliciously registered domains	92%

Other Types of Malicious Registration

- WP2: Data from aa419.org (Advanced Fee Fraud &c)
  - 46% of registrants using privacy/proxy services
  - 89% impossible, a priori, to contact by phone
- WP3: Unlicensed pharmacies
  - 55% of registrants using privacy/proxy services
  - 92% impossible, a priori, to contact by phone
- WP5: Child sexual abuse image websites
  - 29% of registrants using privacy/proxy services
  - it is believed that 100% are impossible to contact by phone
- So a range of rates of usage of privacy/proxy services, but criminals seldom contactable by phone

Legal and Harmless Categories

Category	Privacy / proxy usage	impossible to reach by phone	Did reach by phone [*]
Legal pharmacies	9%	24%	24%
Law firms	13%	34%	25%
Executive search consultants	22%	37%	33%
Banks	28%	45%	15%
Alexa top 3500 (being typo-squatted)	19%	47%	29%
Adult websites	44%	55%	6%

* CAVEAT: small samples mean quite large error bounds for this column

The Story So Far...

- Average usage of privacy/proxy services:
  - 20% NORC measurement across all domains
  - 25% our measure of compromised websites
- Criminals use these services more than average
  - ranges from 29% to 55%
  - BUT some harmless activities also above average too
  - banks 28%, adult websites 44%
- Criminals don’t reveal contact phone numbers. So consider the *a priori* “impossible to contact” rates
  - ie usage privacy/proxy or bad/missing phone number rates
  - criminal activities: 88% – 92% (perhaps 100%)
  - legal and harmless: 24% – 62%

More Complex Datasets

- WP8: StopBadware (malware related domains)
  - Mainly compromised sites, but some malicious registrations
  - 20% of registrants use privacy/proxy services
  - But 51% not possible to reach by phone
- WP8: SURBL (domains indicating email is spammy)
  - Mainly maliciously registered, but by no means all
  - 44% of registrants use privacy/proxy services
  - but only 59% not possible to reach by phone
  - CAUTION: high error bounds with this dataset because many domains had the same contact phone number
  - ALSO: some evidence of report inflation, i.e. all possible domains listed when multiple domains can be resolved to same location

Typosquatting

- Already mentioned “typosquatted domains” : Alexa 3500 sites where small variants of domain name exist hoping to be visited by sloppy tpyers
- WP4: typoquatting domains
  - privacy/proxy services used by 48% of registrants
  - 11% reached by phone (c.f. adult websites 6%)
    - BUT very high error bounds (small number of people involved)
- Clearly some typosquatters are attempting to avoid being identified, whereas others are more laid back
  - NB this isn’t criminal – but civil action is more likely if the brand owner can identify “economies of scale”

UDRP

- Uniform Domain-name Dispute Resolution Policy
- Actions mainly related to typo-squatting
- WP9: domains subject to UDRP (many “similar” names occur)
  - privacy/proxy services used by 40% of registrants
  - no phone calls made because data was old (and many domains change hands in the process, so there was the possibility of a “difficult” conversation)

Statistical Significance

- Measurements of privacy/proxy services are exact and for many work packages the samples are large – so expectation is that the results are robust.
- Most variations >3% are statistically significant at 90% or better (see report for full details)
- Phone calls to registrants were done on a sampled basis
  - selection was random, but we avoided calling the same number more than once, so see report for (complex) statistical analysis
  - some small sample sizes and presence of large groups of domains with same contact number means that error bounds on the various categories of call outcome are sometimes quite large (>10%!)
- Figures for “it is impossible to consider making a phone call to this registrant” have low error bounds and are a clear indication of how criminals choose different methods to stay hidden

Summary of Numerical Results of Study

Work package	Privacy or proxy usage	Not possible to call registrant	Maliciously registered?
Legal pharmacies	8.8%	24.2%	no
Law firms	13.4%	33.6%	no
Executive search consultants	22.4%	36.7%	no
Banks	28.2%	44.6%	no
Typosquatted domains	19.2%	47.1%	no
Phishing: third parties	13.7%	49.6%	no
StopBadware domains	20.4%	51.4%	some
Adult websites	44.2%	55.1%	no
SURBL domains	44.1%	58.5%	mostly
Phishing: compromised sites	24.7%	61.7%	no
Typosquatting	48.2%	67.7%	yes
Advanced Fee Fraud	46.5%	88.9%	yes
Unlicensed pharmacies	54.8%	91.8%	yes
Phishing: malicious registration	31.2%	92.5%	yes

Summary of Findings

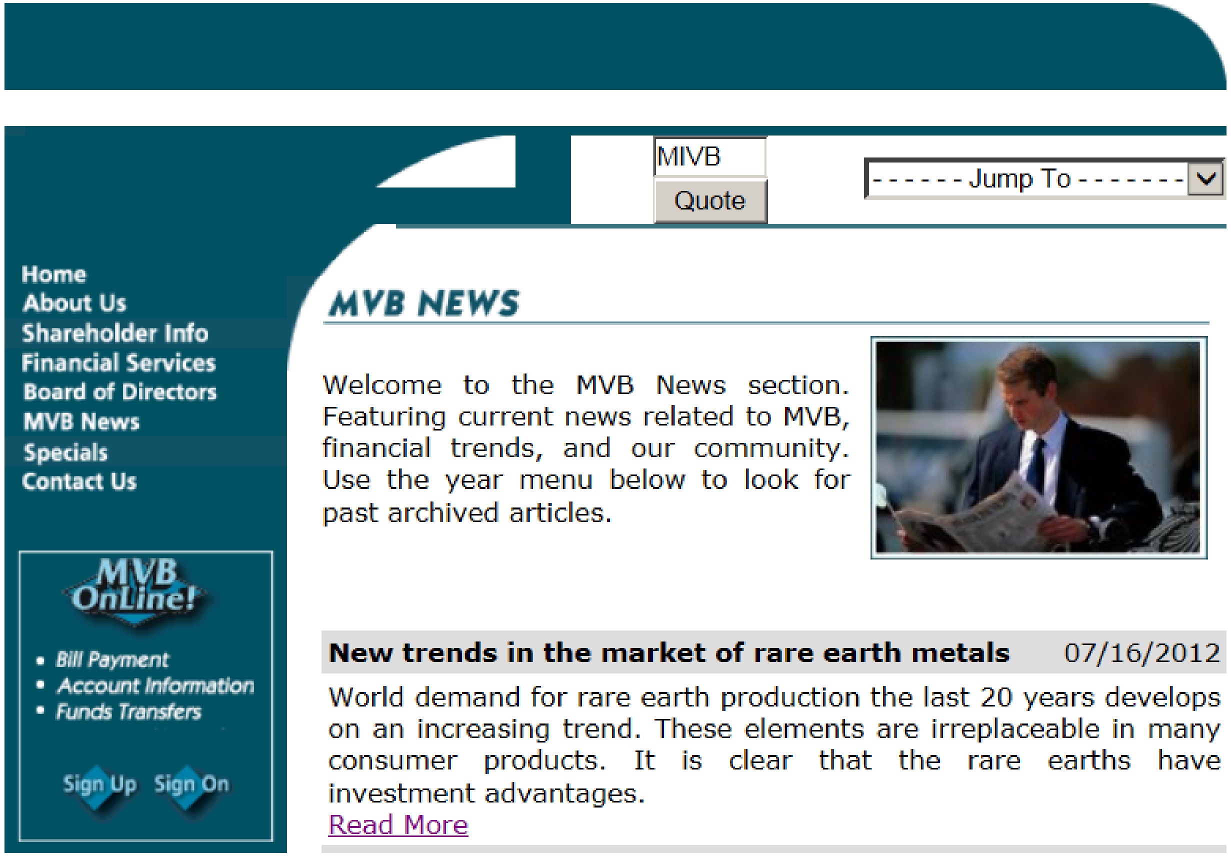
- Criminals DO use privacy/proxy services > average
- BUT so do some legal and harmless activities as well
- When criminals don’t use privacy/proxy services then they don’t provide valid contact numbers – so overall the effect is that at least 9/10 can’t be reached
- BUT many lawful and harmless activities fail to provide valid contact numbers either, with anything between a quarter and two third of them being inherently unreachable
- BUT the Whois phone number is not the only way to reach legitimate registrants…

Policy Conundrums

- Study shows (recall the typosquatting, the adult websites and the banks) that the reasons for using privacy and proxy services are many and various...
- Some people believe that privacy / proxy services are so abused that they should be forbidden
  - BUT many legitimate businesses & individuals are using them
  - clearly criminals will just fail to provide valid contact details
- Some people want compulsion to provide valid contact details (and these should be checked)
  - BUT between a quarter and two thirds of existing legitimate domain registrations don't provide valid contact details so hard to get there from here!

Dead Banks (joint work with Tyler Moore)

- Recall that WP6.x considered banks
- Whilst checking which banks were still “alive” came across some strange websites:



MVB NEWS

Welcome to the MVB News section. Featuring current news related to MVB, financial trends, and our community. Use the year menu below to look for past archived articles.

New trends in the market of rare earth metals 07/16/2012

World demand for rare earth production the last 20 years develops on an increasing trend. These elements are irreplaceable in many consumer products. It is clear that the rare earths have investment advantages.

Read More

Federal Deposit Insurance Corporation

- FDIC set up in the 1930s to oversee an insurance system for US consumer banking deposits
- Collects data every quarter and publishes its database online
- Has been recording website URLs for many years
  - albeit on an optional basis, so data not complete
- 3181 banks have closed or merged July 2003 – June 2013
- This gave us 2302 domains now surplus to requirements
  - this covers 75% of the closed/merged institutions
- We looked at current owner and current usage
  - Whois shows if current registrant is a bank or if no longer registered
  - site inspection tells us if operating as a bank, serving syndicated adverts, distributing malware, other re-use, or just inoperable

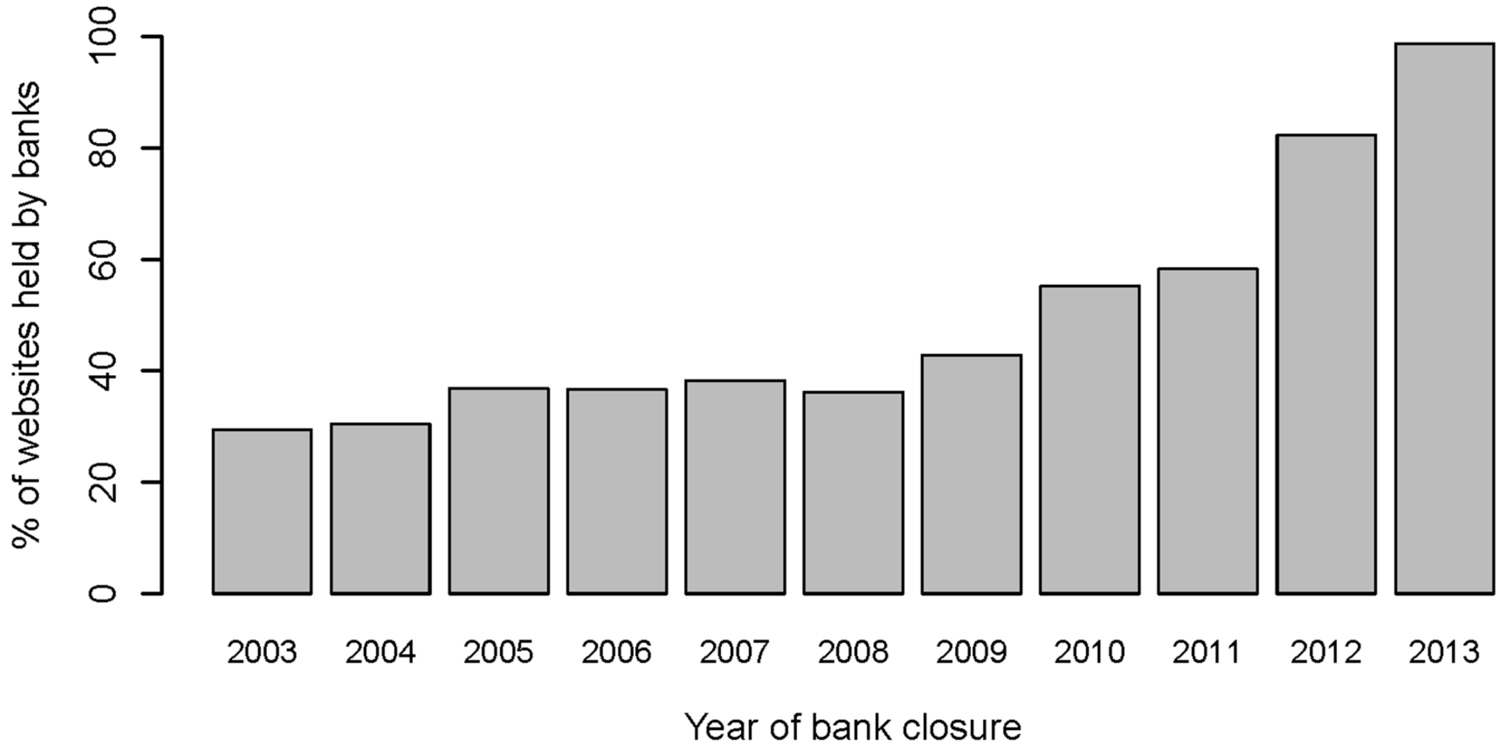
Basic Results

- 46% of domains still registered by a bank
  - but just 30% operable, rest inoperable
- 9% not registered, rest (45%) owned by third parties

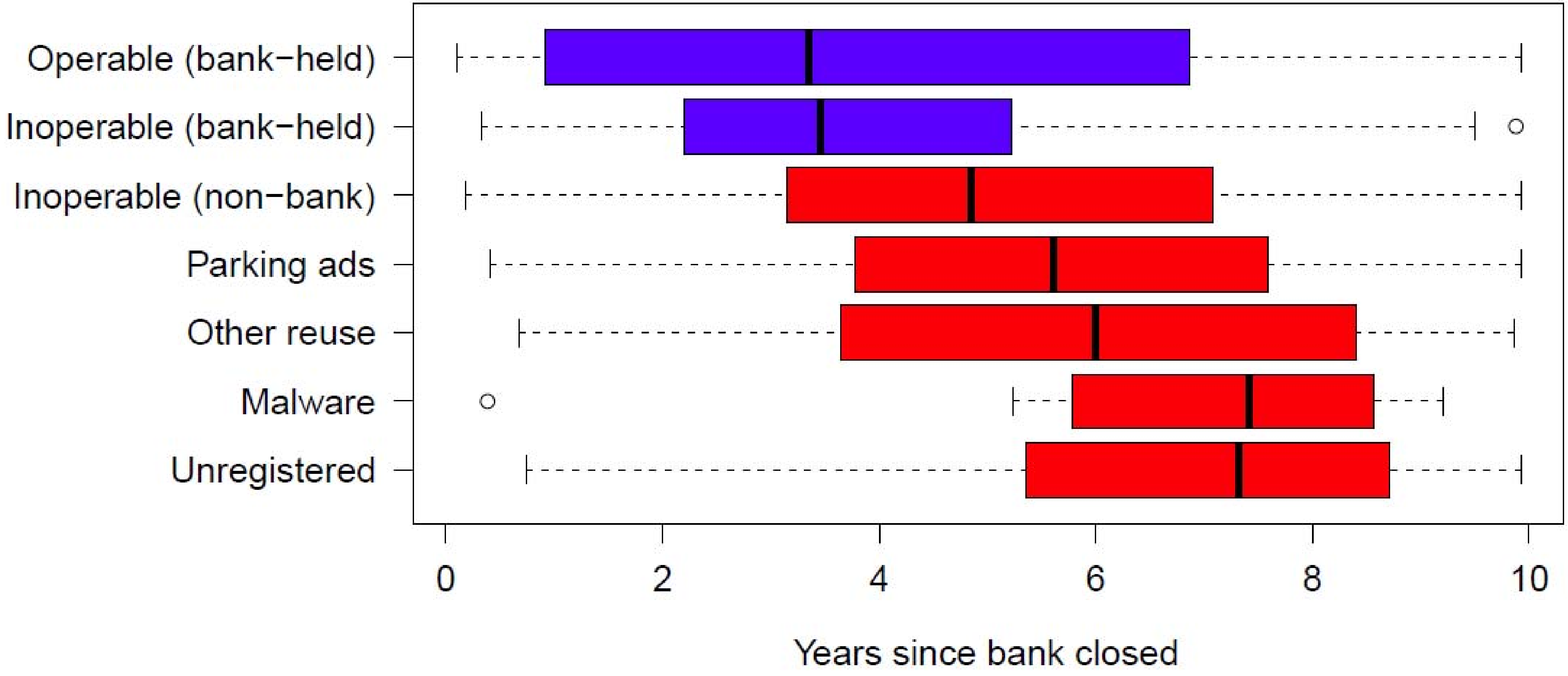
Of these third parties:

- 21% of domains inoperable
- 18% hosting pay per click adverts (domain parking)
- Remainder (4.6%) an assortment of uses
  - blogs, porn, a German film, etc., etc.
  - 11 hosting malware !
  - and 5 dubious examples (not owned by original bank but is a bank)
    - 2 more SEO examples (like midvalleybank)
    - 1 where another “Plaza Bank” has acquired the domain
    - and townecenterbank now redirecting to towncenterbank

Banks Keep Domains for a While



Evidence for Changing Use Over Time



See paper for statistical analysis – most differences highly significant

Some Logistic Regressions

- Size of bank matters
  - each doubling of size of deposits at the closed bank reduces the odds that domains will be abandoned by 16%
- Forcible closure matters (as opposed to merger)
  - “troubled” == forcibly closed OR merged with FDIC assistance
  - odds of abandonment increased by 138% for troubled banks
  - AND odds increase by 33% for each year after closure
- If domain has been abandoned by the bank
  - the larger the bank was, the more likely domain remains registered
  - each year, the chances that domain remains registered falls 21%
  - troubled banks less likely (factor 2.08) to remain registered

Policy Options

- Not just an issue for banking domains
  - malware C&C domains
  - iframe injection exploit hosting
  - and more...

1. Permanent cancellation
   - perhaps overkill ?
2. Trusted repository
   - which will return domain to the pool when no longer a threat
3. Warning lock
   - track important domains and hope someone steps up...
4. Prepaid escrow
   - OK for FDIC, tricky for other categories
   - we recommend FDIC deal with domain as part of closure process

Ongoing Reseach Activity

- Getting in contact with FDIC to apprise them of our results

- Currently doing an experiment to determine whether we can return the unregistered domains (they are now!) to the people who should be controlling them

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http://www.lightbluetouchpaper.org

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