Zombie Lending in the United States: Prevalence versus Relevance

Maximilian Göbel
ISEG - Universidade de Lisboa

Nuno Tavares
ISEG - Universidade de Lisboa

May 24, 2022

Current Policy Concerns

Laeven et al. (2020); Schivardi et al. (2020):

COVID-19 policy interventions as a lifeline for non-viable firms?

↓

If the answer is "YES":

What are the Economic Consequences?

The "Zombie"-Narrative

Zombification / Zombie-Lending

• Productivity	↓	Caballero et al. (2008), McGowan et al. (2018), Acharya et al. (2020)
• Misallocation of Resources	↑	Caballero et al. (2008), McGowan et al. (2018), Acharya et al. (2020)
• Investment	↓	Hallak et al. (2018), Acharya et al. (2020)
• Business Dynamism	↓	Hallak et al. (2018), Acharya et al. (2019), Acharya et al. (2020)
• Monetary Policy Efficacy	↓	Acharya et al. (2020)

Related Literature

- **Japan:** Caballero et al. (2008)
- **Europe:** McGowan et al. (2018), Andrews and Petroulakis (2019), Acharya et al. (2019), Acharya et al. (2020), Acharya et al. (2021)
- **Italy:** Schivardi et al. (2021)
- **World-wide:** Banerjee and Hofmann (2018), Banerjee and Hofmann (2020)
- **United States:** Favara et al. (2022)

Goal of the Paper

Zombification / Zombie-Lending in the U.S.

Prevalence	**Relevance**
↓	↓
On Aggregate: Not widespread (see: Favara et al. (2022))	? ? ?

Data

- **Balance Sheet**: Compustat
- **Debt Structure**: Standard & Poor's Capital IQ
  - Bank credit (BC)
  - Bonds & Notes (BN)
- **Time**: Annual; 2002 - 2019
- **Industries**: NAICS (2-digit)
  → Excluded: 11, 22, 52, 81, 92

Classifying Zombies (I)

No uniform Definition

Broad Definition

McGowan et al. (2018), Andrews and Petroulakis (2019), Banerjee and Hofmann (2018)

I) $ICR_{i,t-2:t} \equiv \frac{XINT_{i,t-2:t}}{EBITDA_{i,t-2:t}} > 1$

II) $Age_{i,t} \geq 10$

Narrow Definition

Banerjee and Hofmann (2018)

I) $ICR_{i,t-2:t} \equiv \frac{XINT_{i,t-2:t}}{EBITDA_{i,t-2:t}} > 1$

II) $Age_{i,t} \geq 10$

III) $tq_{i,s,t} < \widetilde{TQ}_{s,t}$

→ $\widetilde{TQ}_{s,t}$: median Tobin's Q in industry s

Bargagli Stoffi et al. (2020)

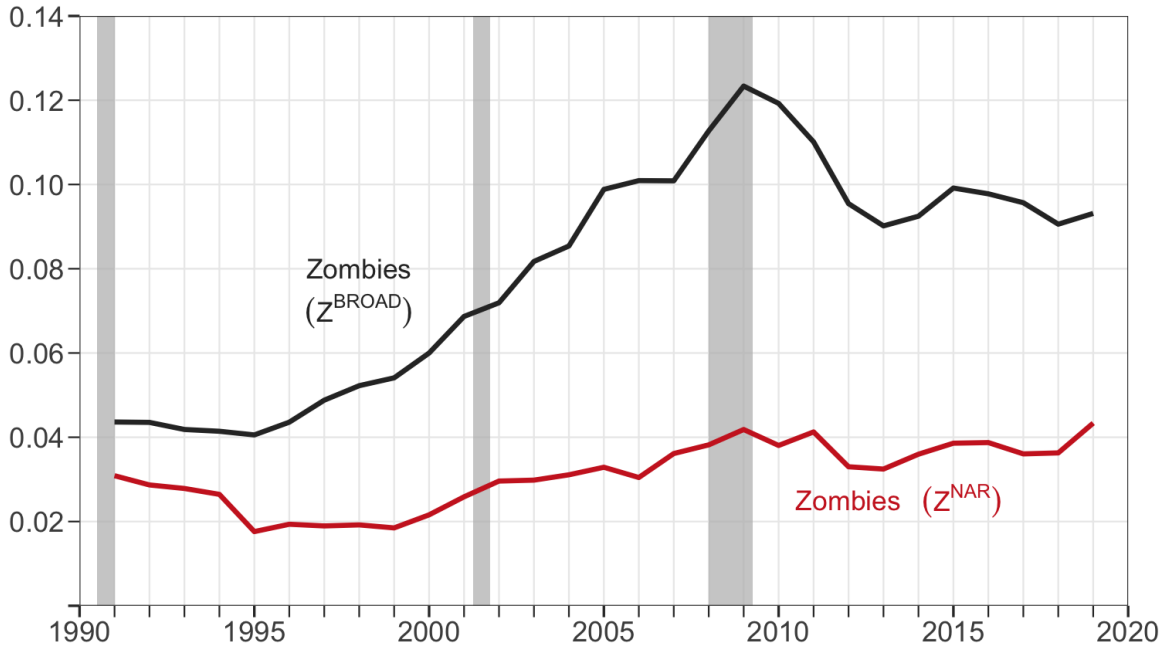
Positive correlation between firm default and non-reporting of financial information.

Classifying Zombies (III)

Extension of **Narrow Definition**:

III) $tq_{i,s,t} < \widetilde{TQ}_{s,t}$ OR $tq_{i,s,t} = NA$

Figure 1: Zombie Prevalence under Different Zombie-Definitions



Notes: Shaded areas mark NBER recessions.

Zombie-Lending (I)

Variables of Interest:

New / **fresh** bank-credit or bonds & notes

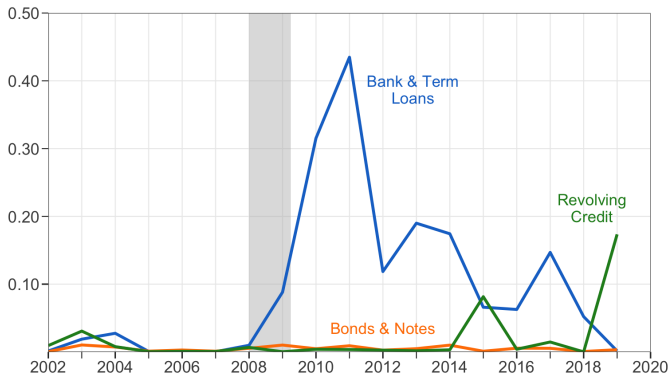
Table 1: Debt Obligations by Maturities – Full Sample: 2002-2019

	Bank/Term Loans	Revolving Credit Facility	Bonds and Notes
	Total Obs.	Total Obs.	Total Obs.
$1Q \leq m \leq 4Q$	13,687	16,665	31,751
$5Q \leq m \leq 8Q$	9,569	12,221	26,277
$9Q \leq m \leq 20Q$	28,035	32,255	68,250
$21Q \leq m \leq 40Q$	16,645	15,858	68,491
$41Q \leq m \leq 100Q$	3,881	2,212	31,603
$101Q \leq m \leq 120Q$	304	72	11,837
$121Q \leq m \leq 200Q$	179	13	2,464

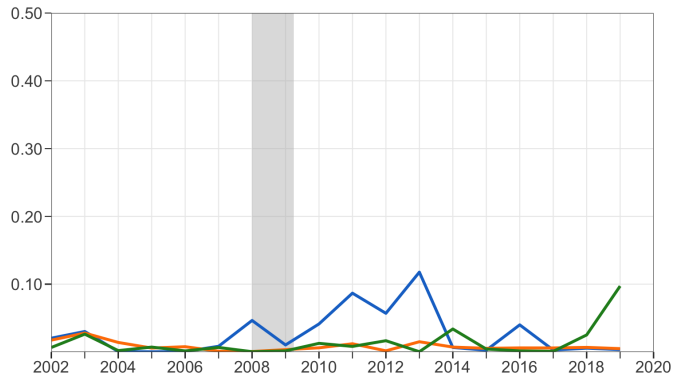
Notes: We show the number of newly reported debt obligations in company filings in Compustat's Capital-IQ database in the years 2002-2019 by their respective maturity upon origination.

Zombie-Lending (II)

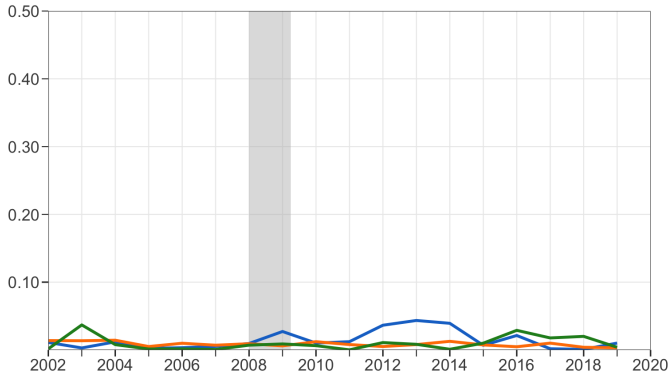
Figure 2: Share of Newly Granted Credit Sunk with Zombies



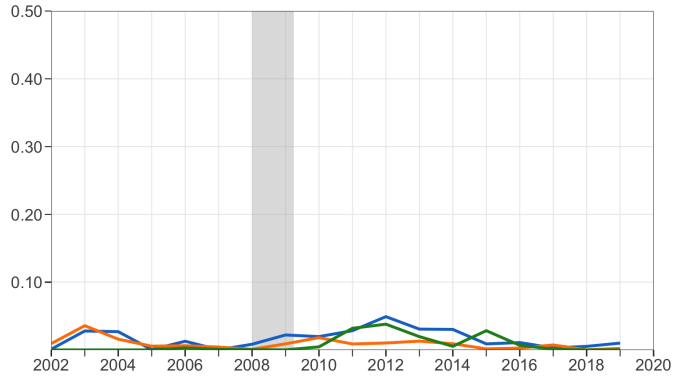
(a) $1Q \leq m \leq 4Q$



(b) $5Q \leq m \leq 8Q$



(c) $9Q \leq m \leq 20Q$



(d) $21Q \leq m \leq 40Q$

Summary - So Far (I)

Zombification / Zombie-Lending in the U.S.

Prevalence	**Relevance**
↓	↓
Figures 1 & 2: Not widespread ↓ In Agreement with Favara et al. (2022).	???

Industry-Share of Zombie-Credit

$Zombie - Credit - Share_{s,t}$:

Share of newly granted credit to industry s that sits with zombies

$$Zombie - Credit - Share_{s,t} = \frac{\sum_{i \in s} Credit^{Z}_{i,t}}{\sum_{i \in s} Credit^{Z}_{i,t} + Credit^{NZ}_{i,t}}$$

where

- $Credit^{Z}_{i,t}$: Amount of credit granted to zombie i in year t
- $Credit^{NZ}_{i,t}$: Amount of credit granted to non-zombie i in year t
- $Credit_{i,t}$: Bank-credit ($BC_{i,t}$) or Bonds & Notes ($BN_{i,t}$)

Zombie-Lending & Non-Zombie Performance (I)

Total-Factor-Productivity ($TFP_{i,t}$)

$$TFP_{i,t} = \mathbb{X} + \beta_{BC}\ NZ_{i,t-1} \times BC^{Z}_{s,t-1} + \beta_{BN}\ NZ_{i,t-1} \times BN^{Z}_{s,t-1} + \varepsilon_{i,t} \quad (1)$$

Capital Growth ($\Delta log\,(K_{i,t})$)

$$\Delta log\,(K_{i,t}) = \mathbb{X} + \beta_{BC}\ NZ_{i,t-1} \times BC^{Z}_{s,t-1} + \beta_{BN}\ NZ_{i,t-1} \times BN^{Z}_{s,t-1} + \varepsilon_{i,t} \quad (2)$$

Employment Growth ($\Delta EMP_{i,t}$)

$$\Delta EMP_{i,t} = \mathbb{X} + \beta_{BC}\ NZ_{i,t-1} \times \Delta log\left(BC^{Z}_{s,t}\right) + \beta_{BN}\ NZ_{i,t-1} \times \Delta log\left(BN^{Z}_{s,t}\right) + \varepsilon_{i,t} \quad (3)$$

Zombie-Lending & Non-Zombie Performance (II)

Figure 4: Zombie-Lending & Non-Zombie Performance

Maturity (m)	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$
	(1)	(2)	(3)
Variables	$TFP_{i,t}$	$\Delta log\left(K_{i,t}\right)$	$\Delta EMP_{i,t}$
$NZ_{i,t-1}$	-0.003	0.194***	7.768***
$NZ_{i,t-1} \times BC^{Z}_{s,t-1}$	-0.085	-0.251	
$NZ_{i,t-1} \times BN^{Z}_{s,t-1}$	0.177	0.107	
$NZ_{i,t-1} \times \Delta log\left(BC^{Z}_{s,t}\right)$			-0.293
$NZ_{i,t-1} \times \Delta log\left(BN^{Z}_{s,t}\right)$			-0.241
Years		2002 - 2019	
Observations	39,287	69,229	41,897
Firms	5,643	9,422	7,313
Fixed Effects	X	X	X
Controls	X	X	X
Within-R^2	0.03	0.12	0.06

Notes: For better visualization, coefficients of Model (3) are multiplied by a factor of 10^2.
Each estimation includes firm-, industry-, year- and -industry-year-fixed effects.
Standard errors are clustered at the firm-level.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Summary - So Far (II)

Zombification / Zombie-Lending in the U.S.

Prevalence	**Relevance**
↓	↓
Figures 1 & 2: Not widespread ↓ In Agreement with Favara et al. (2022).	Table 4: Not at all, BUT...

Fundamentals: Zombies vs Non-Zombies

Table 2: Summary Statistics – Full Sample: 2002-2019

	Median		Units
	Z^{NAR}	$Non-Zombies$	
TFP	0.10	0.10	
Assets	0.03	0.20	Bill. USD
(Book) Leverage	0.13	0.22	
ROA	-0.18	0.01	
Asset Tangibility	0.08	0.15	
CapX / Assets	0.01	0.03	
Value Added	-0.46	51.34	Mill. USD
Employees	0.10	0.82	($\times 10^3$)

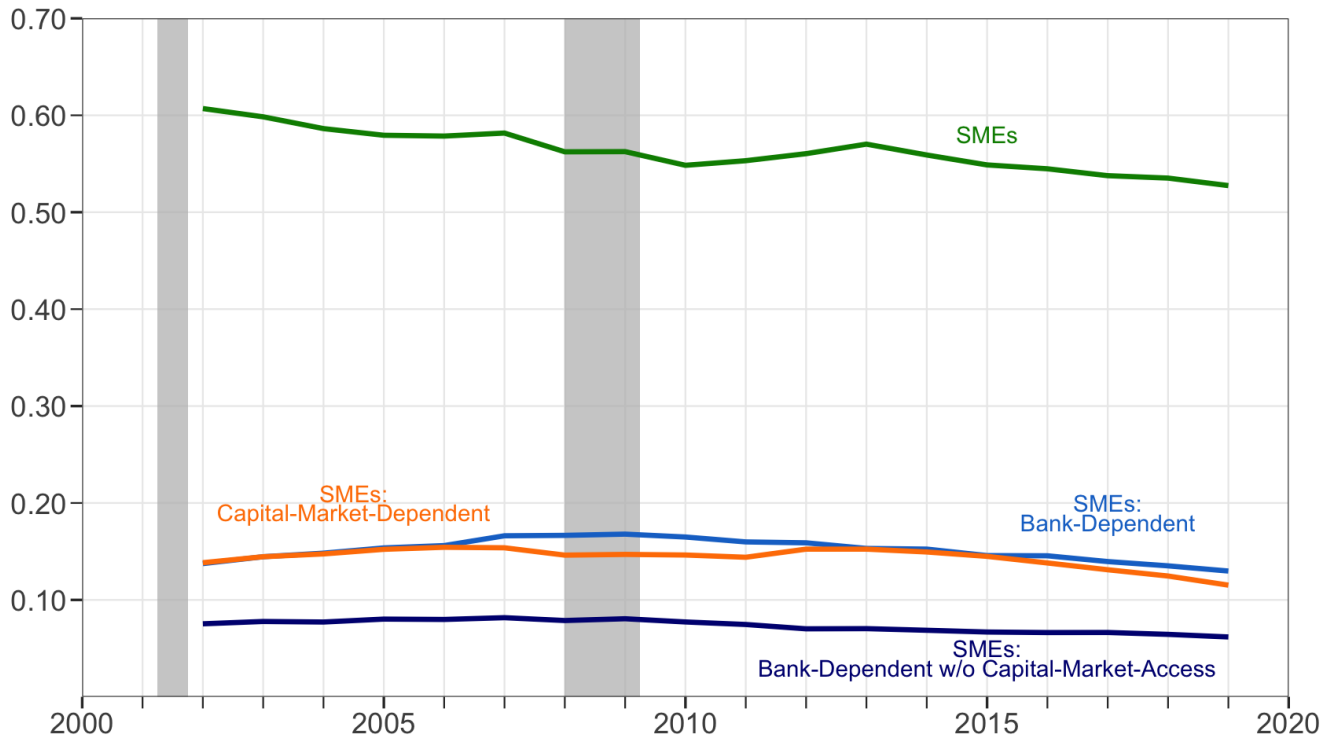
Notes: For each year in the sample, we first compute the cross-sectional median, and then compute the each time-series' average for each metric.

Focus: Small & Medium-Sized Companies

Small- & Medium-Sized (Chodorow-Reich, 2013):

Employees $<$ 1,000

Figure 5: Share of Small & Medium-Sized Companies



Zombie-Lending & Non-Zombie Performance (III)

Figure 6: Total Factor Productivity & Zombie-Lending

Maturity (m)	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$
	(1)	(2)	(3)
Variables	$TFP_{i,t}$	$TFP_{i,t}$	$TFP_{i,t}$
$NZ_{i,t-1}$	0.013	0.053	0.050
$NZ_{i,t-1} \times SM_{i,t-1}$	-0.14		
$NZ_{i,t-1} \times SM_{i,t-1} \times BC^{Z}_{s,t-1}$	0.075		
$NZ_{i,t-1} \times SM_{i,t-1} \times BN^{Z}_{s,t-1}$	-0.539***		
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i$		-0.023	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$		-0.019	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times BC^{Z}_{s,t-1}$		-0.510*	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times BN^{Z}_{s,t-1}$		-0.887*	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i$			-0.028
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$			-0.017
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i \times BC^{Z}_{s,t-1}$			-1.026**
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times BN^{Z}_{s,t-1}$			-0.926*
Years		2002 - 2019	
Observations	36,899	22,286	22,286
Firms	5,308	2,616	2,616
Within-R^2	0.03	0.04	0.04

Notes: Each estimation includes firm-, industry-, year- and -industry-year-fixed effects. Standard errors are clustered at the firm-level. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Zombie-Lending & Non-Zombie Performance (III)

Figure 6: Total Factor Productivity & Zombie-Lending

Maturity (m)	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$
	(1)	(2)	(3)
Variables	$TFP_{i,t}$	$TFP_{i,t}$	$TFP_{i,t}$
$NZ_{i,t-1}$	0.013	0.053	0.050
$NZ_{i,t-1} \times SM_{i,t-1}$	-0.14		
$NZ_{i,t-1} \times SM_{i,t-1} \times BC^{Z}_{s,t-1}$	0.075		
$NZ_{i,t-1} \times SM_{i,t-1} \times BN^{Z}_{s,t-1}$	-0.539***		
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i$		-0.023	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$		-0.019	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times BC^{Z}_{s,t-1}$		-0.510*	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times BN^{Z}_{s,t-1}$		-0.887*	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i$			-0.028
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$			-0.017
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i \times BC^{Z}_{s,t-1}$			-1.026**
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times BN^{Z}_{s,t-1}$			-0.926*
Years		2002 - 2019	
Observations	36,899	22,286	22,286
Firms	5,308	2,616	2,616
Within-R^2	0.03	0.04	0.04

Median TFP: -34%

Median TFP: -84.5%

Notes: Each estimation includes firm-, industry-, year- and -industry-year-fixed effects. Standard errors are clustered at the firm-level. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Zombie-Lending & Non-Zombie Performance (IV)

Figure 7: Capital Growth & Zombie-Lending

Maturity (m)	$5Q \leq m \leq 40Q$	$5Q \leq m \leq 40Q$	$5Q \leq m \leq 40Q$
	(4)	(5)	(6)
Variables	$\Delta log\,(K_{i,t})$	$\Delta log\,(K_{i,t})$	$\Delta log\,(K_{i,t})$
$NZ_{i,t-1}$	0.203***	0.180***	0.173***
$NZ_{i,t-1} \times SM_{i,t-1}$	-0.013		
$NZ_{i,t-1} \times SM_{i,t-1} \times BC^{Z}_{s,t-1}$	-0.178		
$NZ_{i,t-1} \times SM_{i,t-1} \times BN^{Z}_{s,t-1}$	0.153		
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i$		-0.028	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$		-0.000	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times BC^{Z}_{s,t-1}$		-0.213	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times BN^{Z}_{s,t-1}$		-0.815***	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i$			-0.047
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$			0.567*
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i \times BC^{Z}_{s,t-1}$			0.003
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times BN^{Z}_{s,t-1}$			-0.817**
Years		2002 - 2019	
Observations	63,498	53,092	53,092
Firms	8,642	6,360	6,360
Within-R^2	0.12	0.12	0.12

Capital Growth: -3.25%

Notes: Each estimation includes firm-, industry-, year- and -industry-year-fixed effects. Standard errors are clustered at the firm-level. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Zombie-Lending & Non-Zombie Performance (V)

Figure 8: Employment Growth & Zombie-Lending

Maturity (m)	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$	$1Q \leq m \leq 4Q$
	(1)	(2)	(3)
Variables	$\Delta EMP_{i,t}$	$\Delta EMP_{i,t}$	$\Delta EMP_{i,t}$
$NZ_{i,t-1}$	1.356	2.845	4.966***
$NZ_{i,t-1} \times SM_{i,t-1}$	7.418***		
$NZ_{i,t-1} \times SM_{i,t-1} \times \Delta log\left(BC^Z_{s,t}\right)$	-0.186*		
$NZ_{i,t-1} \times SM_{i,t-1} \times \Delta log\left(BN^Z_{s,t}\right)$	-0.033		
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i$		7.395***	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$		6.000***	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times \Delta log\left(BC^Z_{s,t}\right)$		-0.329*	
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times \Delta log\left(BN^Z_{s,t}\right)$		-0.078	
$NZ_{i,t-1} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i$			7.945***
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i$			4.714**
$NZ_{i,t} \times SM_{i,t-1} \times bank.dep_i \times no.bond_i \times \Delta log\left(BC^Z_{s,t}\right)$			-0.415*
$NZ_{i,t-1} \times SM_{i,t-1} \times CapM.dep_i \times \Delta log\left(BN^Z_{s,t}\right)$			-0.078
Years	2002-2019	2002-2019	2002-2019
Observations	41,897	25,357	25,357
Firms	7,313	3,725	3,725
Within-R^2	0.06	0.07	0.07

Employment Growth: -0.6% - -1.3%

Notes: For better visualization, coefficients are multiplied by a factor of 10^2.
Each estimation includes firm-, industry-, year- and -industry-year-fixed effects. Standard errors are clustered at the firm-level.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Zombie-Lending & Business Dynamism

Figure 9: Zombie-Lending & Business Dynamism

Maturity (m)	$1Q \leq m \leq 4Q$	$5Q \leq m \leq 40Q$
	(1)	(2)
Variables	$\frac{NB_{s,t}}{N_{s,t}}$	$\frac{NB_{s,t}}{N_{s,t}}$
$BC^Z_{s,t-1}$	0.005	-0.031**
$BN^Z_{s,t-1}$	-0.005	-0.021
$bank.dep_{s,t-1} \times BC^Z_{s,t-1}$	-0.023**	-0.013
$CapM.dep_{s,t-1} \times BN^Z_{s,t-1}$	0.022	0.030
Years	2002-2019	2002-2019
Observations	309	320
Industries	18	18

Notes: Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Conclusion

Zombification / Zombie-Lending in the U.S.

Prevalence	**Relevance**
↓	↓
Not widespread ↓ In Agreement with Favara et al. (2022).	**No one-size-fits all answer** Size Bank-Dependency Access to Capital-Markets

References I

Acharya, V., M. Crosignani, T. Eisert, and C. Eufinger (2020). Zombie Credit and (Dis-)Inflation: Evidence from Europe. *Federal Reserve Bank of New York Staff Reports* (955).

Acharya, V., T. Eisert, C. Eufinger, and C. Hirsch (2019). Whatever It Takes: The Real Effects of Unconventional Monetary Policy. *The Review of Financial Studies 32*(9), 3366–3411.

Acharya, V., S. Lenzu, and O. Wang (2021). Zombie Lending and Policy Traps. Working Paper 29606, National Bureau of Economic Research.

Andrews, D. and F. Petroulakis (2019). Breaking the Shackles: Zombie Firms, Weak Banks and Depressed Restructuring in Europe. Working Paper Series 2240, European Central Bank.

Banerjee, R. and B. Hofmann (2018). The Rise of Zombie Firms: Causes and Consequences. *BIS Quarterly Review Spetember*. Available at: `https://www.bis.org/publ/qtrpdf/r_qt1809g.htm`.

Banerjee, R. and B. Hofmann (2020). Corporate Zombies: Anatomy and Life Cycle. *BIS Working Papers* (882).

Bargagli Stoffi, F., M. Riccaboni, and A. Rungi (2020). Machine Learning for Zombie Hunting. Firms' Failures and Financial Constraints. *forthcoming*. Available at SSRN: `https://ssrn.com/abstract=3588410`.

References II

Caballero, R., T. Hoshi, and A. Kashyap (2008). Zombie Lending and Depressed Restructuring in Japan. *American Economic Review 98*(5), 1943–77.

Chodorow-Reich, G. (2013). The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008–9 Financial Crisis. *The Quarterly Journal of Economics 129*(1), 1–59.

Favara, G., M. Camelia, and A. Perez-Orive (2022). Zombie Lending to U.S. Firms. Available at SSRN: `https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4065886`.

Hallak, I., P. Harasztosi, and S. T. Schich (2018). *Fear the Walking Dead?: Incidence and Effects of Zombie Firms in Europe*. Publications Office of the European Union.

Laeven, L., G. Schepens, and G. Schnabel (2020). Zombification in Europe in Times of Pandemic. *ECONtribute Policy Brief* (011).

McGowan, M., D. Andrews, and V. Millot (2018). The Walking Dead? Zombie Firms and Productivity Performance in OECD Countries. *Economic Policy 33*(96), 685–736.

Schivardi, F., E. Sette, and G. Tabellini (2020). Identifying the Real Effects of Zombie Lending. *The Review of Corporate Finance Studies 9*(3), 569–592.

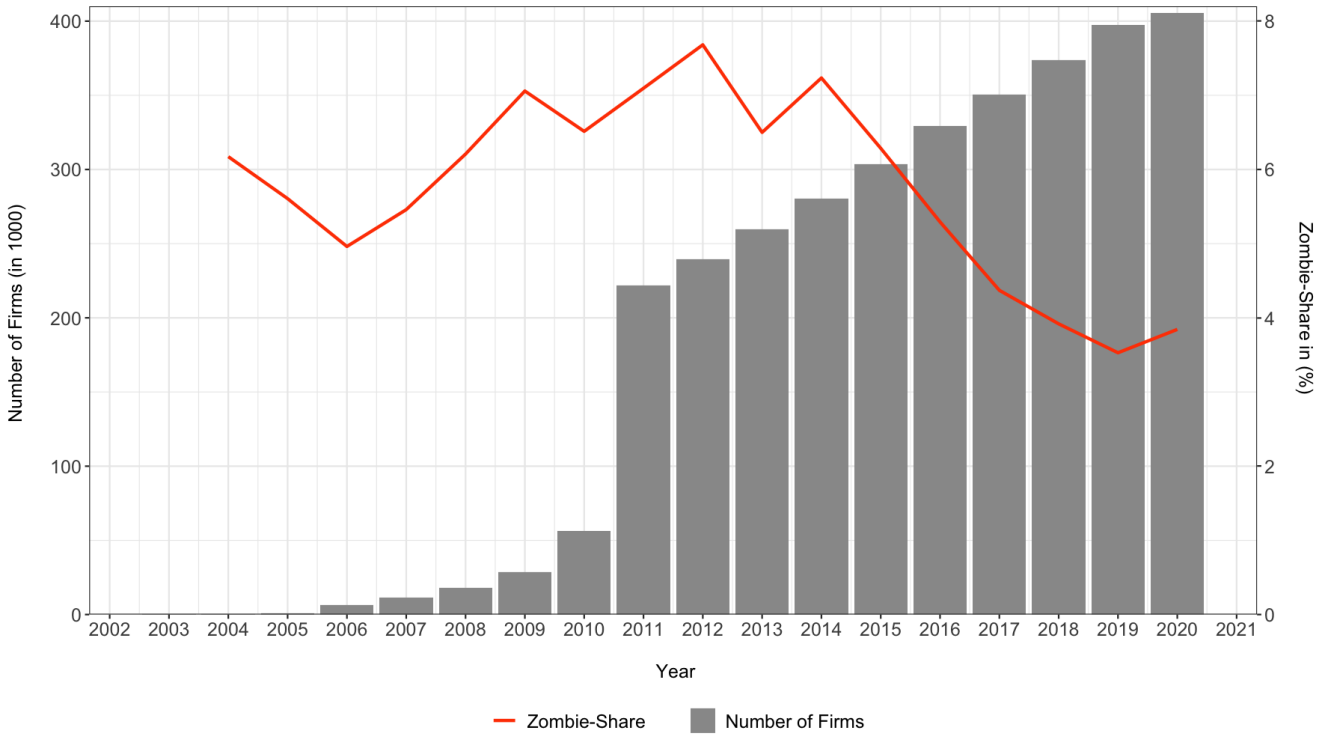
Schivardi, F., E. Sette, and G. Tabellini (2021). Credit Misallocation During the European Financial Crisis. *The Economic Journal 132*(641), 391–423.

Zombies in Portugal (I)

Bureau van Dijk - Amadeus

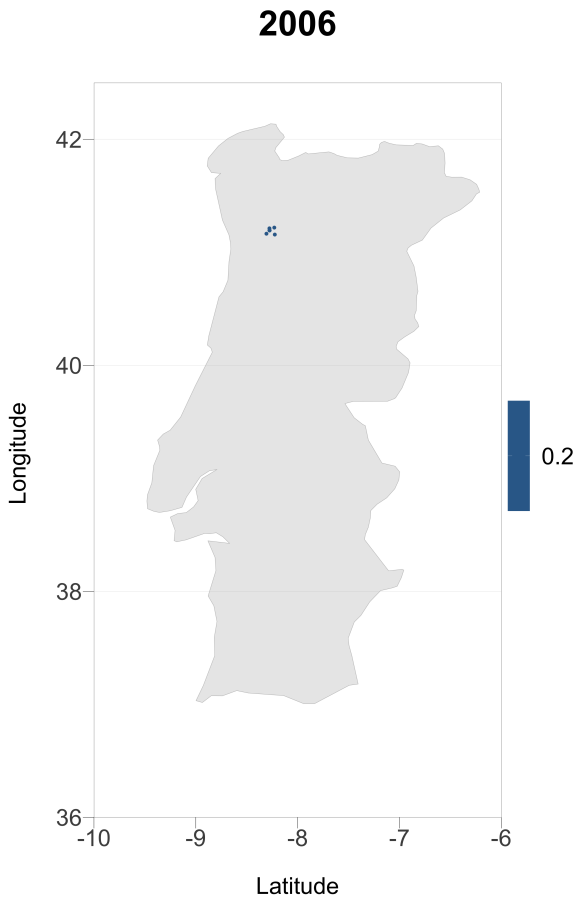
Zombie-Definition: McGowan et al. (2018)

Figure 10: Number of Firms & Zombie-Share



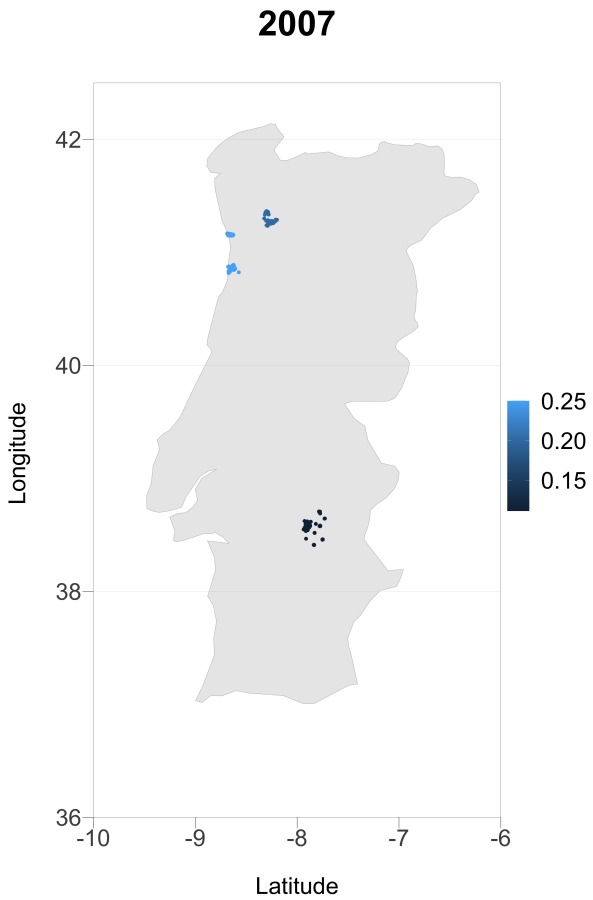
Zombies in Portugal (II)

Figure 11: Zombie-Share by 4-Digit Zip-Code



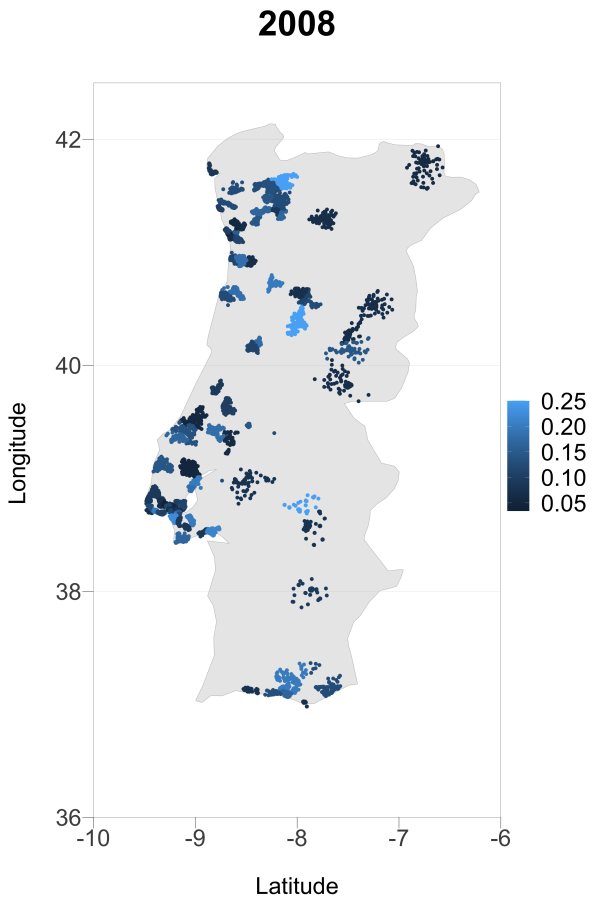
Zombies in Portugal (II)

Figure 12: Zombie-Share by 4-Digit Zip-Code



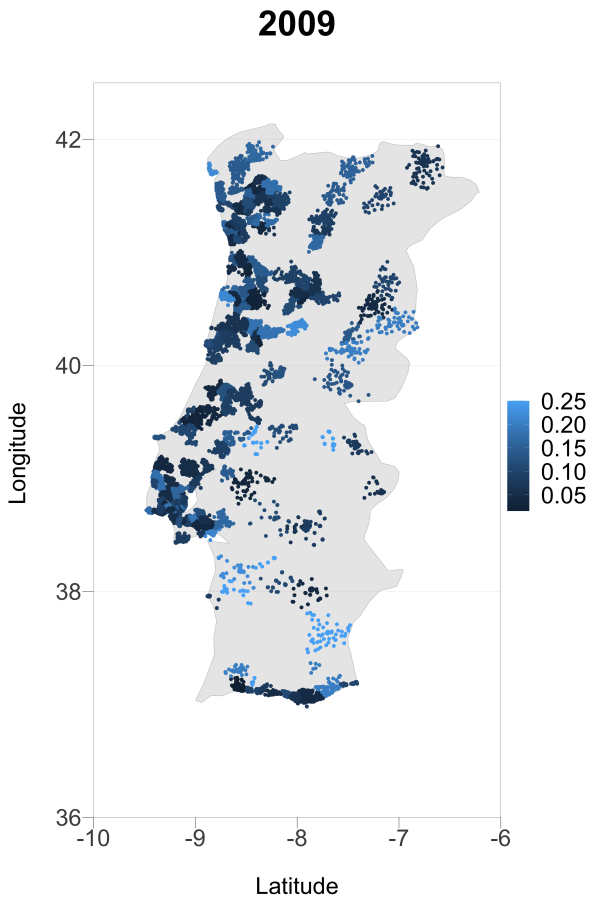
Zombies in Portugal (II)

Figure 13: Zombie-Share by 4-Digit Zip-Code



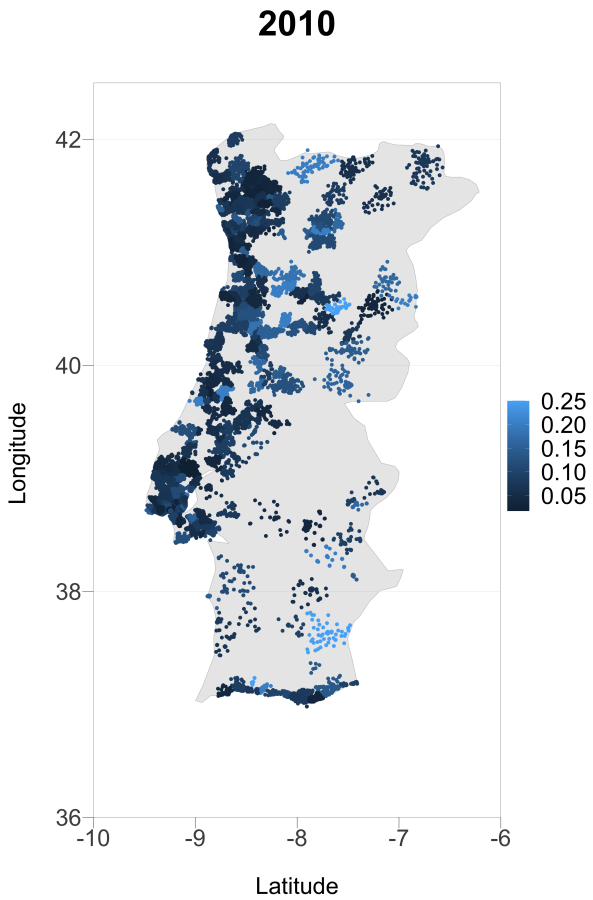
Zombies in Portugal (II)

Figure 14: Zombie-Share by 4-Digit Zip-Code



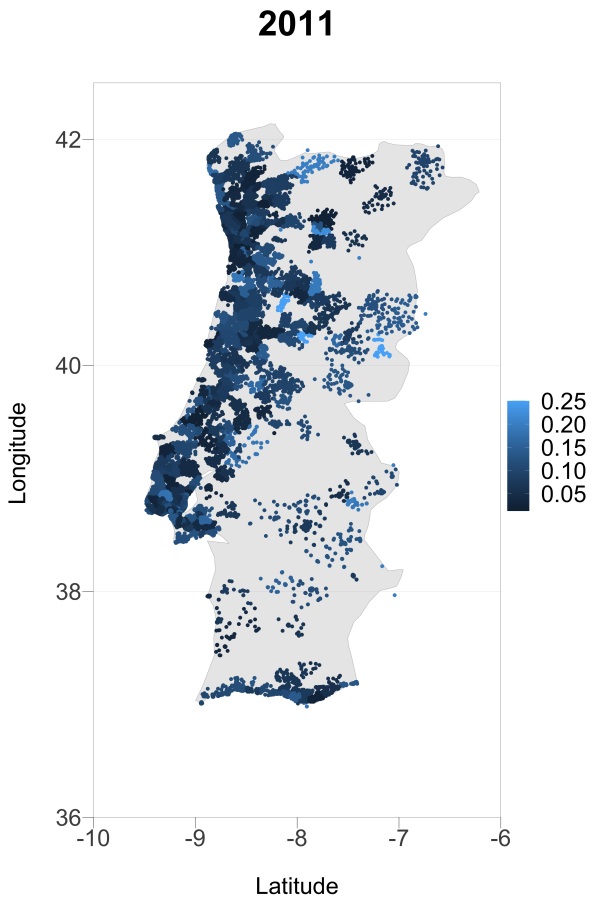
Zombies in Portugal (II)

Figure 15: Zombie-Share by 4-Digit Zip-Code



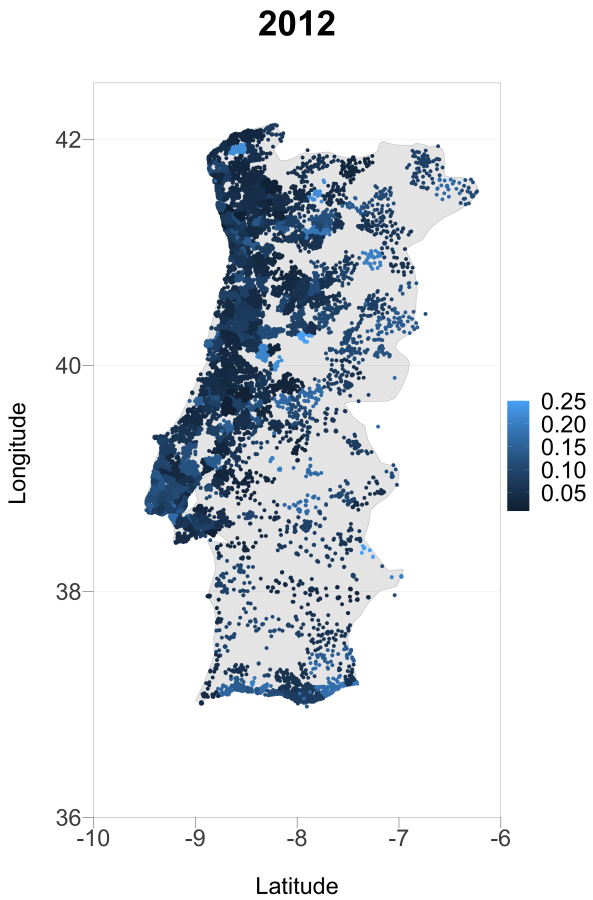
Zombies in Portugal (II)

Figure 16: Zombie-Share by 4-Digit Zip-Code



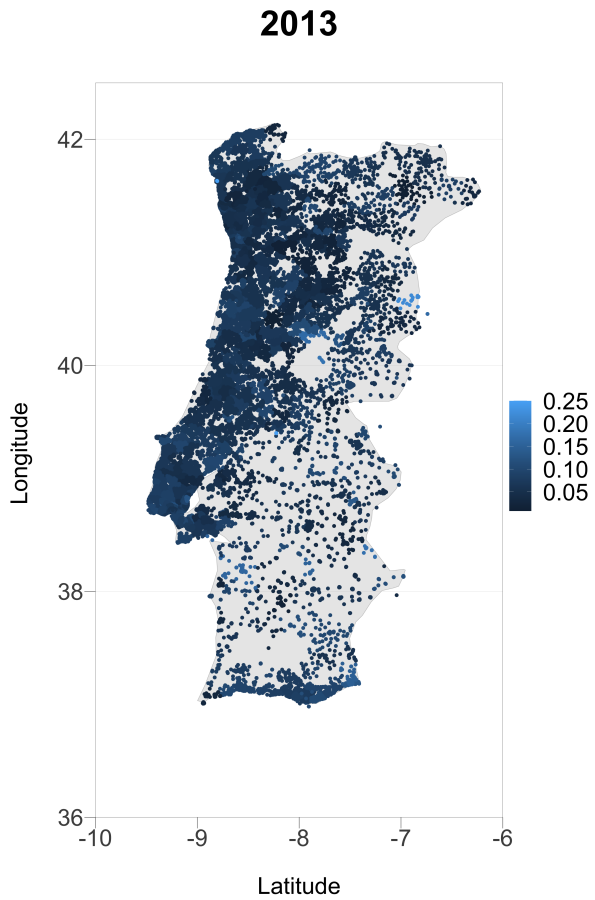
Zombies in Portugal (II)

Figure 17: Zombie-Share by 4-Digit Zip-Code



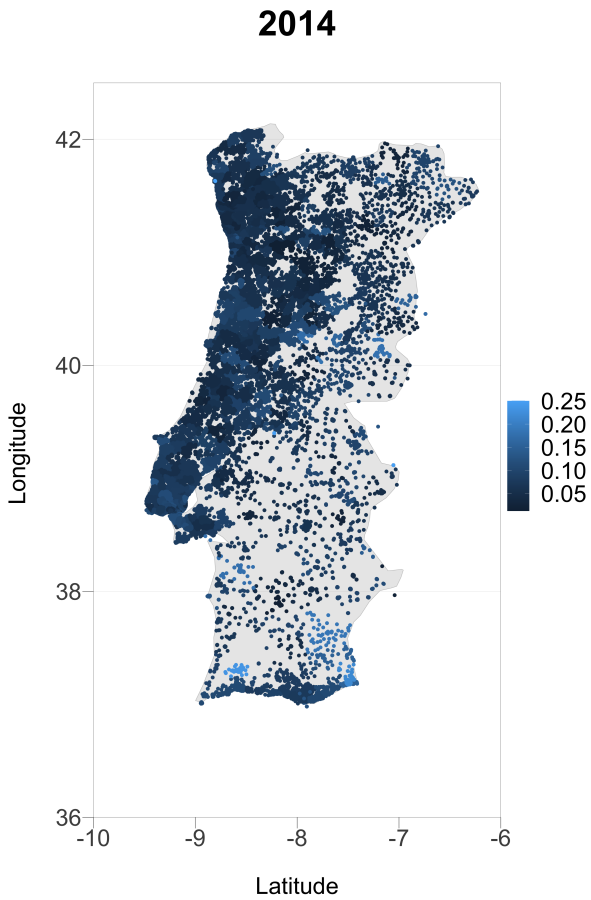
Zombies in Portugal (II)

Figure 18: Zombie-Share by 4-Digit Zip-Code



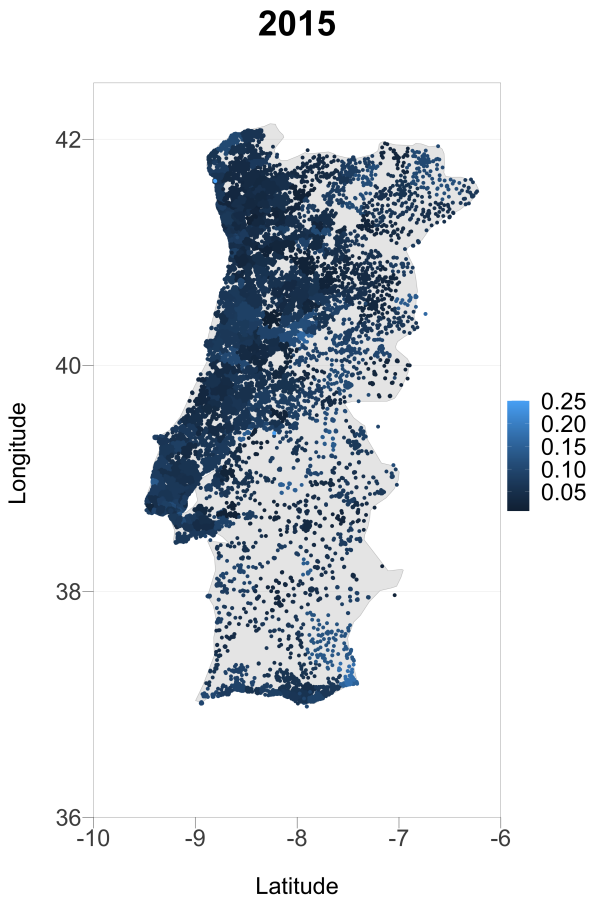
Zombies in Portugal (II)

Figure 19: Zombie-Share by 4-Digit Zip-Code



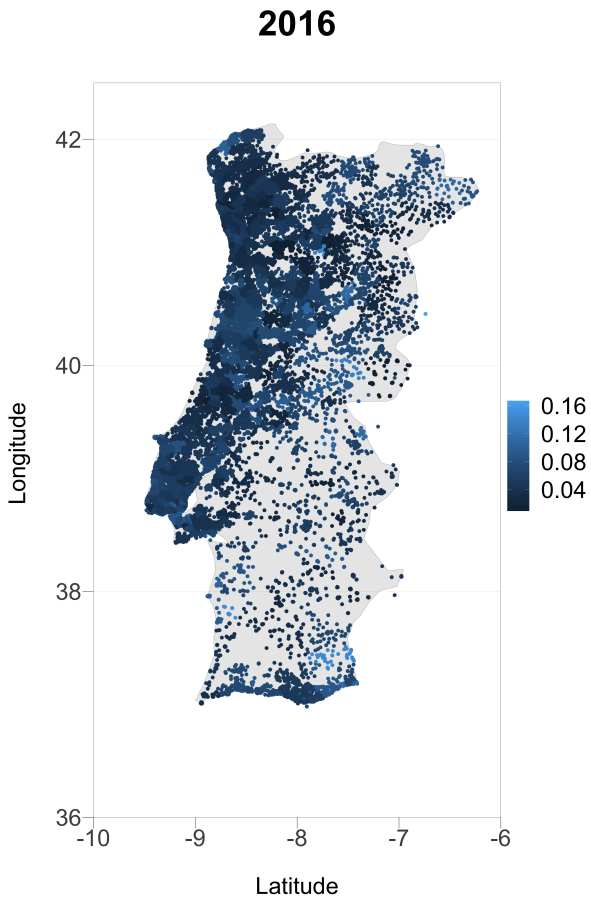
Zombies in Portugal (II)

Figure 20: Zombie-Share by 4-Digit Zip-Code



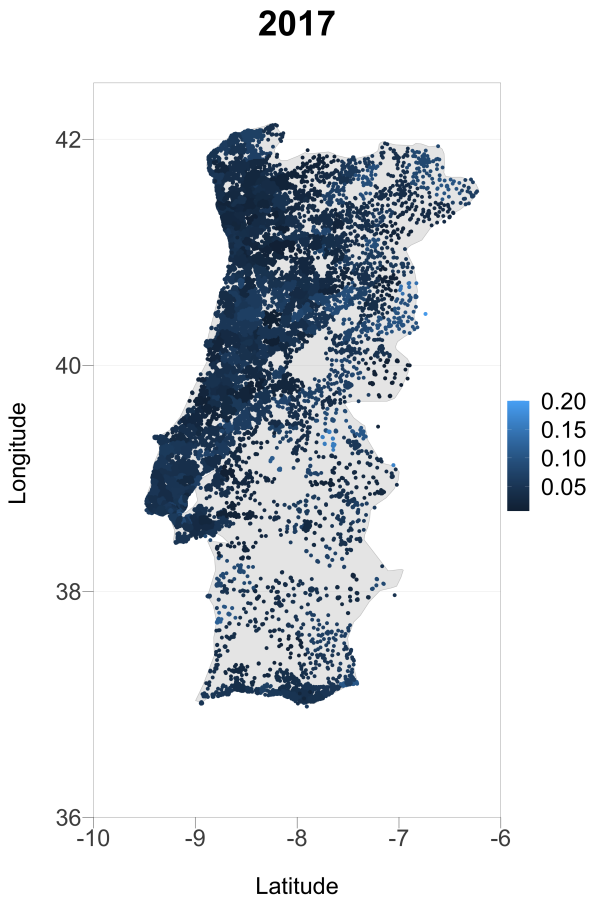
Zombies in Portugal (II)

Figure 21: Zombie-Share by 4-Digit Zip-Code



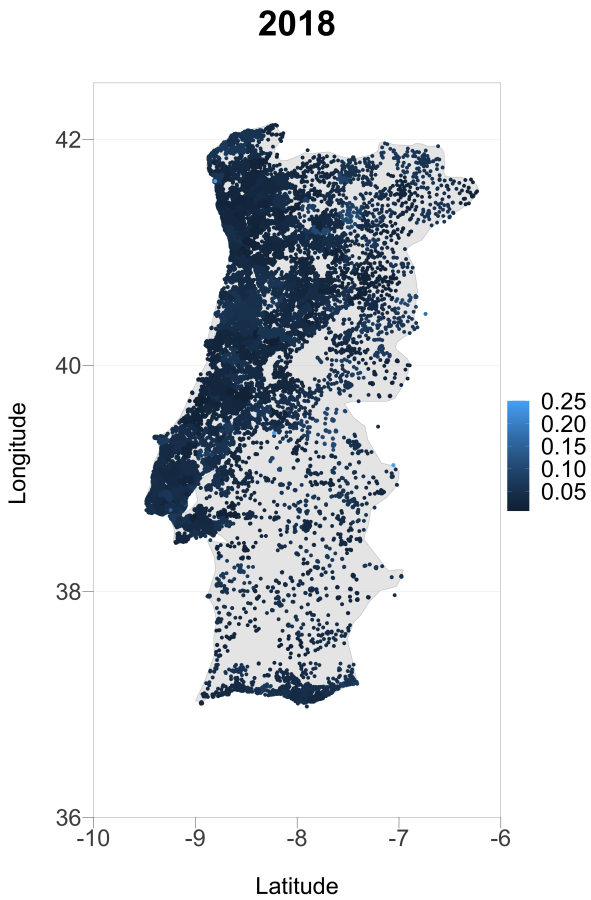
Zombies in Portugal (II)

Figure 22: Zombie-Share by 4-Digit Zip-Code



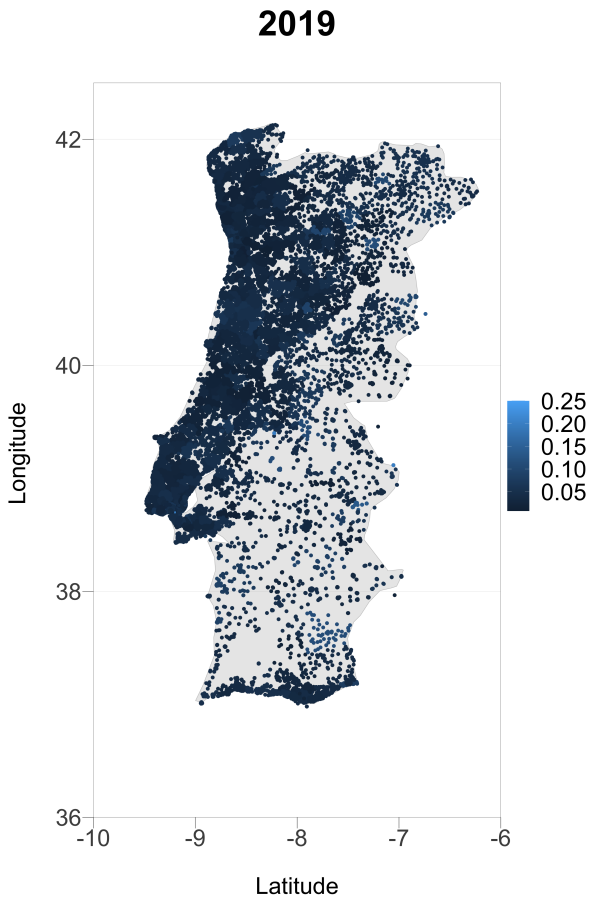
Zombies in Portugal (II)

Figure 23: Zombie-Share by 4-Digit Zip-Code



Zombies in Portugal (II)

Figure 24: Zombie-Share by 4-Digit Zip-Code



Zombies in Portugal (II)

Figure 25: Zombie-Share by 4-Digit Zip-Code