

Unemployment and volunteering: Does unemployment affect content generation on Wikipedia?

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Michael Kummer, Olga Slivko, Michael Zhang
Georgia Tech, ZEW and HKUST

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Today's menu

■ Research question:

- Do contributions to online public goods raise due to the economic crisis via unemployment?

■ Data:

- Country-level data for European countries
 - unemployment rates, hours worked + contributions (edits, edits) to Wikipedia
- District-level (“Kreise”) data for Germany:
 - unemployment rates, “Kurzarbeit”+contributions (edits, bytes)

■ Method: Difference-in-difference approach.

- affected vs. unaffected countries
- before vs. after the shock

■ Findings: with shocks to unemployment, more edits takes place on Wikipedia

Why care?

- 1 Time spent online can be **wasteful** (Wallsten, 2013) or **beneficial** for society, e.g. online knowledge
- 2 What happens to Wikipedia?
 - + **opportunity cost of leisure time** lower: poorer people increase their time online (Goldfarb and Prince (2008)).
 - Employed might have less spare time for public goods giving.
- 3 Wikipedia is an increasingly important knowledge repository.
 - Is it even becoming a productive input?
 - Slowdowns (or accelerations) in content generation have a lasting effect on the stock of content.
- **Why care?:** What are the side effects of economic crises?
→ Public goods

State of Research - A quick glance

■ Contribution to public goods

- Charity (Vesterlund, 2006)
- Spillovers from articles (Kummer, 2014; Gorbatai, 2014; Aaltonen and Seiler, 2015),
- Spillovers from editors (Zhang and Zhu, 2011; Algan et al., 2013; Slivko, 2014)

■ Unemployment and time use

- Leisure activities decrease at the time of *reemployment*
- Leisure time absorbs app.50% of foregone market work hours (TV)
- Knabe, 2010, Krueger and Mueller, 2012, Aguiar et al., 2012, 2013
- Goldfarb and Prince (2008): having Internet access, *poorer people* spend more time online than wealthy people as they have a *lower opportunity cost of time*.

- **Our contribution:** with an economic crisis, more online public good provision.

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Data - Basics

- World's largest platform for encyclopedic knowledge.
- Millions of Articles and 100s of volunteers;
- In more than 100 languages.
- Collected country level data for Europe.



Find Wikipedia in a language:

[Deutsch](#) • [English](#) • [Español](#) • [Français](#) • [Italiano](#) • [Nederlands](#) • [Polski](#) • [Русский](#) • [Svenska](#)

Data - Country Level

- *Variables on the country level:*
 - Wikipedia monthly stats: active Wikipedians, views, edits per article, words added
 - Unemployment rates, hours worked (monthly by country)

- *Affected countries, Crisis start:*
 - A significant decrease in hours worked + media events and EU reports

At the country level: unemployment

Table: Crisis Indicators: unemployment rates and the difference between them (%)

	Affected by crisis	Crisis start	Unemp.rate, %	Change in Unempl., %
Bulgarian	yes	Oct 2008	6	3
Catalan	yes	Sept 2008	11	10
Czech	yes	Oct 2008	5	4
Danish	no	.	4	4
Dutch	no	.	3	1
Finnish	no	.	7	6
German	no	.	8	2
Greek	yes	June 2009	9	5
Hungarian	yes	March 2009	9	4
Icelandic	yes	Oct 2008	5	10
Italian	yes	May 2009	8	4
Japanese	no	.	4	2
Norwegian	no	.	3	1
Polish	no	.	8	2
Romanian	yes	Oct 2008	6	2
Russian	yes	Oct 2008	7	4
Slovene	yes	Oct 2008	5	2
Swedish	no	.	7	5
Turkish	yes	Oct 2008	11	6

At the country level: Wikipedia

	Language speakers (m)	In main country, %	Views per speaker	Wikipedians, %	Active 5-100 edits, %	Active > 100 edits, %
Bulgarian	8.16	86.05	2	0.02	10.7	3.5
Catalan	4.08	.	3	0.06	13.3	3.9
Czech	10.62	97.93	4	0.04	12.3	2.8
Danish	5.52	97.42	3	0.06	9.9	2.3
Dutch	21.94	71.54	6	0.06	9.6	2.2
Finnish	5.39	94.58	10	0.13	9.7	2.3
German	78.25	89.21	12	0.10	9.0	1.4
Greek	13.43	79.65	1	0.02	6.0	1.8
Hungarian	12.61	78.06	2	0.04	12.8	3.3
Icelandic	0.24	94.32	9	0.16	11.8	5.4
Italian	63.66	90.64	5	0.04	10.2	2.2
Japanese	122.06	99.13	8	0.03	12.7	1.5
Norwegian	4.74	97.85	6	0.13	9.7	2.1
Polish	38.66	94.66	8	0.04	10.8	2.3
Romanian	23.78	83.67	1	0.01	12.1	2.9
Russian	167.33	81.87	1	0.01	17.0	3.4
Slovene	2.09	91.60	4	0.07	12.6	2.8
Swedish	9.20	96.12	7	0.09	11.0	2.4
Turkish	70.81	93.92	1	0.01	10.6	1.9
Total	34.87	89.90	5	0.06	11.2	2.7

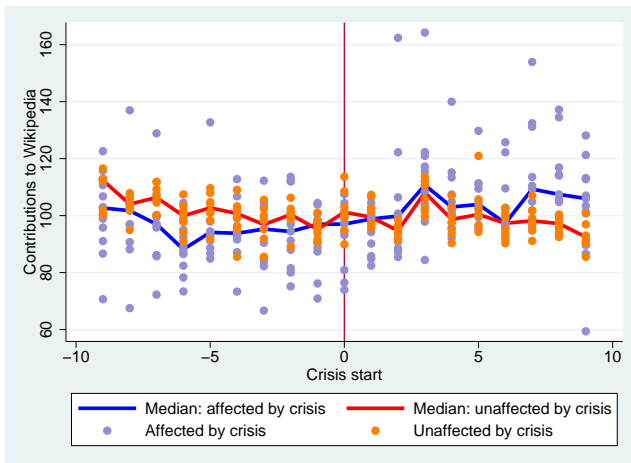
Columns (3)-(6) are means of the interval 12 months before to 12 months after crisis

Sources: stats.wikimedia.org

- English, Spanish and Portuguese Speakers mostly live outside the European Countries.

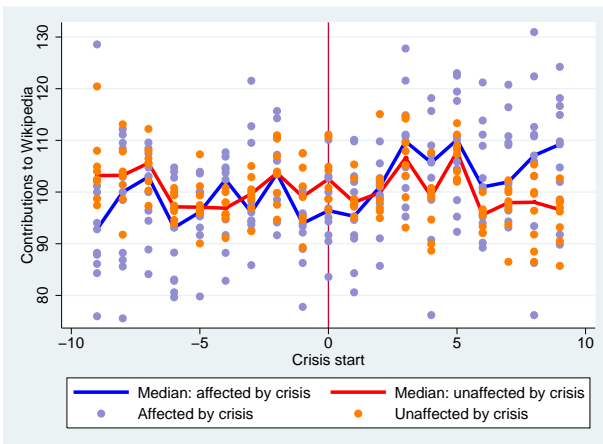
Trends: Active Wikipedians (5-100 monthly edits)

(Median values of the dependent variable for the groups of affected and unaffected countries 9 months before and after the crisis)



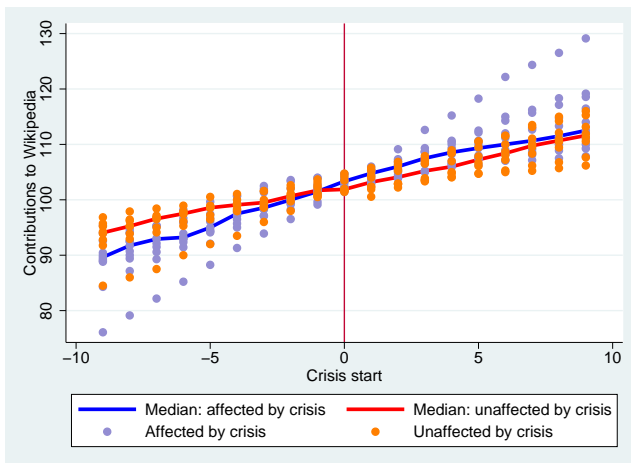
Trends: Active Wikipedians (>100 monthly edits)

(Median values of the dependent variable for the groups of affected and unaffected countries 9 months before and after the crisis)



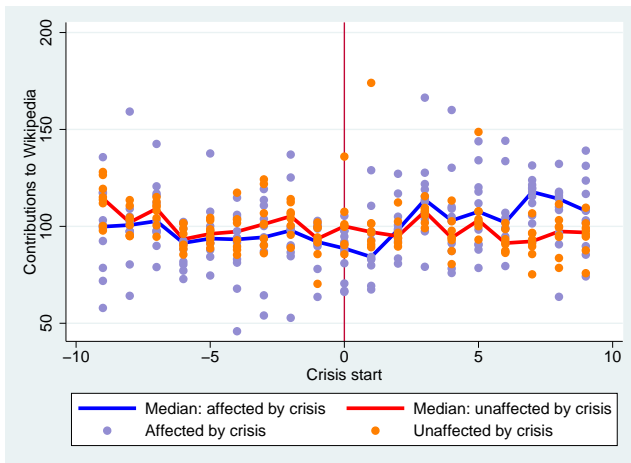
Trends: Edits per article monthly

(Median values of the dependent variable for the groups of affected and unaffected countries 9 months before and after the crisis)



Trends: Words growth monthly

(Median values of the dependent variable for the groups of affected and unaffected countries 9 months before and after the crisis)



Econometric specifications

Dif-in-Dif: comparing countries affected and unaffected by crisis before and after the crisis

$$Contributions_{it} = \beta \text{ After}_t + \gamma (\text{After}_t \times \text{Affected}_i) + \mu_i + \nu_t + \epsilon_{it}$$

Results - DiD

Time period - for each country +/- 6 months from the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
After crisis	-11.05 (9.390)	-8.134 (4.801)	0.206 (3.592)	-3.399* (1.686)	2.090 (6.944)
Affected after crisis	14.49** (6.448)	10.87* (5.280)	2.059 (4.074)	3.665** (1.582)	5.275 (8.870)
Time trend	1.191 (0.850)	0.790* (0.393)	0.490 (0.382)	1.348*** (0.166)	0.453 (0.580)
Constant	109.8*** (2.415)	107.1*** (4.420)	102.0*** (1.904)	94.61*** (0.773)	104.8*** (4.865)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	247	247	247	247	247

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the countries that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies, and a common time trend. Standard errors, clustered by countries, are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Results - DiD

Time period - for each country +/- 12 months from the crisis

Table: DiD Regression for the period of 12 months before and 12 months after the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
After crisis	-7.942 (5.705)	-6.634 (4.036)	-3.525 (2.870)	-3.458* (1.822)	-5.758 (5.127)
Affected after crisis	13.15* (7.006)	14.70*** (4.571)	11.42** (4.386)	6.181** (2.688)	13.43** (5.706)
Time trend	0.207 (0.424)	0.159 (0.186)	0.130 (0.174)	1.129*** (0.0872)	0.287 (0.422)
Constant	108.3*** (3.972)	88.25*** (3.326)	96.81*** (2.956)	84.70*** (1.652)	101.0*** (4.728)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	429	475	475	475	475

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the countries that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies, and a common time trend. Standard errors, clustered by countries, are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness check - OLS: Unemployment

OLS Regression: unemployment and contributions (−12, 0) months

Table: OLS Regression for the period of 12 months before the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
Unemployment rate (norm.)	-0.208*** (0.0687)	-0.0910 (0.167)	-0.0249 (0.0877)	0.0103 (0.0221)	-0.178 (0.204)
Time trend	0.130 (0.339)	0.300 (0.422)	0.345 (0.289)	1.420*** (0.117)	0.0133 (0.484)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	182	228	228	228	228

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedia users (with at least 5 edits), (3) the number of very active Wikipedia users (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The independent variable of interest, *Unemployment*, is the normalized monthly unemployment rate. All specifications include month, quarter and year dummies, and a common time trend. Standard errors, clustered by countries are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

- No evidence of correlation between unemployment and contributions to Wikipedia before the shock

Robustness check - OLS: Views and activity on Wikipedia

Views and activity on Wikipedia (-12,12)

Table: OLS Regression for the effect of views during the period of 12 months before and 12 months after the crisis

	(1)	(2)	(3)	(4)
	Active 5-100e.	Active more 100e.	Edits p.article	Words growth
Views	0.305** (0.136)	0.257** (0.0909)	0.0307 (0.0308)	0.237*** (0.0612)
Time trend	0.0185 (0.0638)	0.275*** (0.0566)	0.926*** (0.0580)	0.392 (0.295)
Year dummies	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes
Observations	429	429	429	429

NOTES: The table shows the relationship between views of Wikipedia and different measures of contributions to Wikipedia in each column: (1) the number of active Wikipedians (with at least 5 edits), (2) the number of very active Wikipedians (with more than 100 edits), (3) the average number of edits per article, (4) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The independent variable of interest, *Views*, is the normalized monthly youth unemployment rate. All specifications include month, quarter and year dummies, and a common time trend. Standard errors, clustered by countries in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

■ Views channel edits

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Data - Basics

- In German: 1,716,000 Articles; 1000s of volunteers.
- Public metatext-dump (1M pages) augmented with clicks (Dec. 2007 - Dec 2010.) and articles-links. (Size 1TB)
- Extracted IP level data matched to German districts.
- Combined it with district-level macro unemployment data.

Benutzerkonto erstellen Anmelden

Lesen Bearbeiten Versionsgeschichte Suchen

Koordinaten: 36° S, 58° W

[iki Loves Monuments: Fotografiere Denkmale, hilf der Wikipedia und gewinne!](#)

st eine Republik im Süden [Südamerikas](#), dem [Südkegel](#). Es ist der größte des Kontinents; im Hinblick auf die Einwohnerzahl nimmt es dort en Nord-Süd-Ausdehnung hat das Land Anteil an zahlreichen Klimavom lateinischen Wort für [Silber](#) – *argentum* – und liefert einen Hinweis seinem Territorium zu finden glaubten. Bis zu seiner Unabhängigkeit [reiches](#).

s, ist Zentrum eines der größten Ballungsräume auf dem nes seiner größten Kulturzentren angesehen, in dem unter anderem 1 sind weite Teile des Landes, insbesondere der trockene Süden, nur sich bei Argentinien um eine [präsidiale Bundesrepublik](#), in der die

República Argentina
Argentinische Republik



Data - Basics

- In German: 1,716,000 Articles; 1000s of volunteers.
- Public meta-text dump (1M pages) augmented with clicks (Dec. 2007 - Dec 2010.) and articles-links. (Size 1TB).
- Extracted IP level data matched to German districts.
- Combined it with district-level macro unemployment data.

- (Aktuell | Vorherige) 20:23, 15. Mär. 2013 CroMagnon (Diskussion | Beiträge) K .. (146.015 Bytes) (0) .. (→Str
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- (Aktuell | Vorherige) 00:41, 14. Mär. 2013 Steak (Diskussion | Beiträge) .. (144.708 Bytes) (-4.705) .. (207 Inte
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- (Aktuell | Vorherige) 15:59, 11. Mär. 2013 2003:74:8f04:a600:59cf:2b61:5922:25ce (Diskussion) .. (149.414 Byt
- (Aktuell | Vorherige) 15:58, 11. Mär. 2013 2003:74:8f04:a600:59cf:2b61:5922:25ce (Diskussion) .. (149.414 Byt
- (Aktuell | Vorherige) 15:44, 10. Mär. 2013 79.252.190.161 (Diskussion) .. (149.414 Bytes) (-4) .. (→Kulinari)

German Districts - Data

The dataset contains:

- Anonymous contributions with IP-addresses (in 2008-2009, 15% of all edits in German Wikipedia)
- matched to German districts
 - Dependent variables: Total monthly bytes of contributions and number of revisions
- Unemployment rates and Part-time jobs (monthly by districts)
- *Crisis start*: Jan 2009
- *Affected and unaffected districts*: by changes in the unemployment rates

Descriptive statistics at the level of districts (UR)

District-level averages by German states:

Table: Crisis Indicators: unemployment rates and the difference between them (%)

	share of affected districts	Unemp.rate,%	Change in Unempl.,%
Baden-Wuerttemberg	0.63	4.69	1.13
Bavaria	0.69	4.46	1.25
Brandenburg	0.58	13.21	1.12
Bremen	0.50	13.23	0.40
Hamburg	.	8.33	0.83
Hessen	0.17	6.71	0.64
Lower Saxony	0.10	7.85	0.68
Mecklenburg-Western Pomerania	0.77	14.15	1.65
North Rhine-Westphalia	0.29	8.50	0.76
Rhineland-Palatinate	0.40	6.18	0.99
Saarland	0.00	6.62	0.86
Saxony	0.85	12.78	1.86
Saxony-Anhalt	0.80	13.72	1.34
Schleswig-Holstein	0.18	8.10	0.75
Thuringia	0.76	11.35	1.86

- Unemployment rates increase less than in Europe

Econometric specifications

Dif-in-Dif: comparing German districts before and after the raise in unemployment

$$Contributions_{it} = \beta \text{ After}_t + \gamma (\text{After}_t \times \text{Affected}_i) + \mu_i + \nu_t + \epsilon_{it}$$

Two remarks

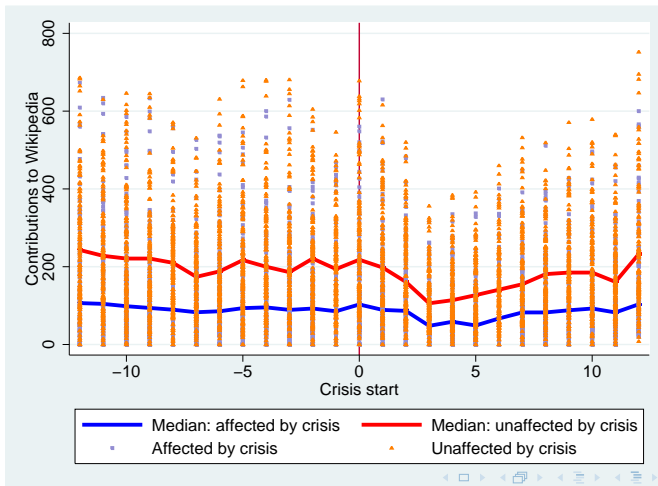
Using IP-addresses of anonymous contributions implies:

- Restricted set of contributions.
 - New users
 - Occasional users

- Restricted set of available dependent variables
 - We can only determine average properties of these edits:
 - number of edits and avg. length of edits in bytes.

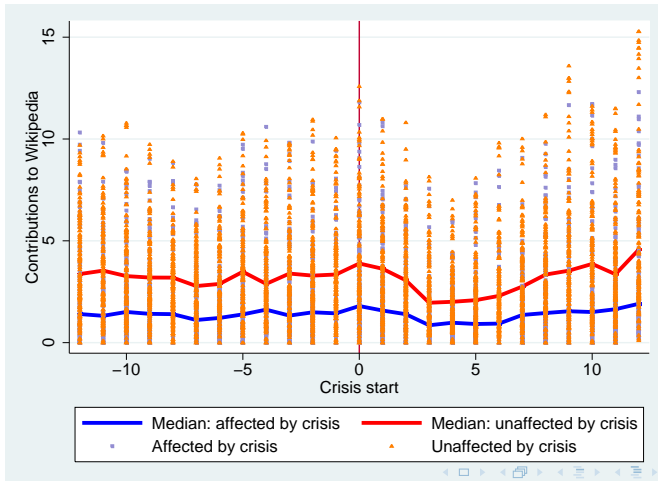
Trends: Edits

(Median values of the dependent variable for the groups of affected and unaffected districts 6 months before and after the crisis)



Trends: Bytes

(Median values of the dependent variable for the groups of affected and unaffected districts 6 months before and after the crisis)



DiD results for Unemployment as treatment (+/- 6 months)

Contributions made all day long

Table: DiD Regression with robust estimator of variance (before and after 6 months, crisis: at t)

	(1) # Edits (norm.)	(2) Contribution (KB) (norm.)
After	-32.62*** (2.954)	-16.53*** (4.286)
Affected after crisis	6.188** (2.515)	5.327 (3.913)
Constant	104.4*** (1.600)	110.2*** (2.886)
Observations	3341	3341

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Correlation results for Unemployment (- 6, 0 months)

Table: OLS Regression (range: before and after 6 months)

	(1)	(2)
	# Edits (norm.)	Contribution (KB) (norm.)
Unemployment	-5.680 (4.318)	-3.503 (5.979)
Constant	150.3*** (29.81)	133.7*** (41.40)
Observations	1541	1541

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The independent variable of interest is *Unemployment rate* for each district. All specifications include month and year dummies. Standard errors, clustered by districts in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

- **Before the shock**, there is no evidence on correlation between economic situation and contributions to Wikipedia

Correlation results for Unemployment (0, 6 months)

Table: OLS Regression (range: before and after 6 months)

	(1)	(2)
	# Edits (norm.)	Contribution (KB) (norm.)
Unemployment	4.059* (2.254)	5.645 (3.928)
Constant	49.62*** (18.52)	38.01 (32.14)
Observations	1554	1554

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The independent variable of interest is *Unemployment rate* for each district. All specifications include month and year dummies. Standard errors, clustered by districts in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

- **After the shock**, there is correlation between economic situation and contributions to Wikipedia

DiD results for Youth Unemployment as treatment (+/- 6 months)

Contributions made all day long

Table: DiD Regression with robust estimator of variance (before and after 6 months)

	(1) # Edits (norm.)	(2) Contribution (KB) (norm.)
After	-34.12*** (2.867)	-22.45*** (4.277)
Affected after crisis	6.116** (2.553)	5.936 (3.991)
Constant	102.9*** (1.508)	109.0*** (2.969)
Observations	3315	3315

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

DiD results for Youth Unemployment as treatment (+/- 12 months)

Contributions made all day long

Table: DiD Regression with robust estimator of variance (before and after 12 months)

	(1) # Edits (norm.)	(2) Contribution (KB) (norm.)
After	-6.882** (3.210)	21.67*** (5.786)
Affected after crisis	5.663** (2.529)	6.692* (3.598)
Constant	110.2*** (1.300)	107.1*** (2.343)
Observations	6400	6400

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

DiD results for Unemployment as treatment (+/- 6 months)

Contributions made in leisure time of the day (6pm-9am and weekends)

Table: DiD Regression with robust estimator of variance (before and after 6 months, crisis: at t)

	(1)	(2)	(3)
	# Edits (norm.)	Contribution (KB) (norm.)	Unemployment (norm.)
After	-35.08*** (3.281)	-19.45*** (5.068)	4.189*** (0.789)
Affected after crisis	7.939*** (2.707)	6.378 (4.381)	15.50*** (1.101)
Constant	109.4*** (2.111)	105.8*** (3.048)	86.98*** (0.378)
Observations	3377	3377	3365

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Summary of Results

- After crisis, we see additional Wikipedia contributions...
 - in countries where unemployment rose during the European Economic Crisis.
 - in German districts where unemployment rate increased.
- Country-level evidence:
 - Insight: due to exogenous shocks to unemployment, more contributions to online public goods
- Districts level evidence:
 - Similar pattern on German districts, though weaker patterns, because unemployment was less strongly felt.
 - Effects are driven by leisure-time activity

State of Research - Contextualization

■ Contribution to public goods

- Charity (Vesterlund, 2006)
- Spillovers from articles (Kummer, 2014; Gorbatai, 2014; Aaltonen and Seiler, 2015),
- Spillovers from editors (Zhang and Zhu, 2011; Algan et al., 2013; Slivko, 2014)

■ Unemployment and time use

- Leisure activities decrease at the time of *reemployment*
- Leisure time absorbs app.50% of foregone market work hours (TV)
- Knabe, 2010, Krueger and Mueller, 2012, Aguiar et al., 2012, 2013
- Goldfarb and Prince (2008): having Internet access, *poorer people* spend more time online than wealthy people as they have a *lower opportunity cost of time*.

- **Our contribution:** with an economic crisis (increase in unemployment), more online public good provision.

Research question and contribution:

How unemployed spend their time?

- Knabe, 2010, Krueger and Mueller, 2012, Aguiar et al., 2012, 2013
- Unemployed are less satisfied but compensate this by *using their time in more enjoyable ways*
- Leisure activities decrease at the time of *reemployment*
- Once unemployed, the leisure time absorbs app.50% of foregone market work hours (TV)
- Wallsten, 2013: *Online leisure time is a substitute for work* since **most of the time spent online is spent on social networks, online games, emails and portals.**
- Goldfarb and Prince (2008): having Internet access, *poorer people* spend more time online than wealthy people as they have *a lower opportunity cost of time.*

Research question and contribution:

Do ICT affect individual learning or labour market perspective?

- Xu, L., Nian, T., Cabral, L. (2014) Stackoverflow
- Acquisti and Fong (2013) used an experimental approach to study the impact of Facebook on discrimination in hiring

Some Limitations

- **Are the German IP-contributions representative?**
 - Not average contributions.
 - But relevant contributions?
 - → Attempt to match users with their location
- **What are the crisis driven contributions?**
 - Are they crisis-specific?
 - Are they about general topics?
 - → Study the precise contributions in Germany

Open Questions for Discussion

- **So, what really is the mechanism?**
 - Who contributes more content?
 - What type of content?
 - → Attempt to match users with their location
- **What else do browsers do when they have more time?**
 - Microlevel browsing data?
 - → Compare Wiki-use to other things (gaming, jobsearch etc.)

THANK YOU FOR YOUR ATTENTION ;)

M. Kummer: kummer@zew.de

Olga Slivko: slivko@zew.de

M. X. Zhang: zhang@hkust.hk

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BACKUP

At the country level: Descriptive statistics for +/- 6 months

	(1)
UR	-2.024*** (-6.29)
YouthUR	-7.223*** (-7.11)
Internetusage	0.288*** (14.30)
HoursWorked	-2.717*** (-9.36)
m_speakers	1.466 (0.25)
popshare	4.791*** (4.89)
<i>N</i>	247

t statistics in parentheses

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

At the country level: Descriptive statistics for +/- 12 months

Table: Descriptive statistics for the period 12 months before and 12 months after the crisis

	(1)		(2)	
	Countries less affected by crises		Countries more affected by crises	
Unemployment	5.636	(2.085)	7.120	(2.493)
Youth unemployment	13.08	(5.512)	18.36	(6.427)
Working hours in the economy	37.95	(2.219)	41.06	(2.805)
Language speakers (m)	36.43	(40.39)	19.93	(22.10)
Share of language speakers in country (%)	92.51	(8.397)	87.80	(6.647)
Views (m)	324.6	(389.8)	58.29	(99.62)
Words added (m)	3.279	(2.640)	1.502	(1.986)
New wikipedians	452.4	(453.4)	147.4	(174.5)
Editors with >5 monthly edits	2483.0	(2563.3)	713.7	(895.7)
Editors with >100 monthly edits	358.9	(328.9)	133.6	(153.4)
Edits per article	25.62	(8.437)	22.70	(5.647)

Columns (1) and (2) are means of the interval 12 months before to 12 months after the economic crisis

Results - DID hours worked

Time period - for each country +/- 6 months from the crisis

	(1)	(2)	(3)	(4)	(5)
	Views	Active 5-100e.	Active more 100e.	Edits p.article	Words growth
After crisis	-11.05 (9.390)	-8.134 (4.801)	0.206 (3.592)	-3.399* (1.686)	2.090 (6.944)
Affected after crisis	14.49** (6.448)	10.87* (5.280)	2.059 (4.074)	3.665** (1.582)	5.275 (8.870)
Time trend	1.191 (0.850)	0.790* (0.393)	0.490 (0.382)	1.348*** (0.166)	0.453 (0.580)
Constant	109.8*** (2.415)	107.1*** (4.420)	102.0*** (1.904)	94.61*** (0.773)	104.8*** (4.865)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	247	247	247	247	247

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the countries that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies, and a common time trend. Standard errors, clustered by countries, are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Results - DID hours worked

Time period - for each country +/- 12 months from the crisis

Table: DID Regression for the period of 12 months before and 12 months after the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
After crisis	-7.942 (5.705)	-6.634 (4.036)	-3.525 (2.870)	-3.458* (1.822)	-5.758 (5.127)
Affected after crisis	13.15* (7.006)	14.70*** (4.571)	11.42** (4.386)	6.181** (2.688)	13.43** (5.706)
Time trend	0.207 (0.424)	0.159 (0.186)	0.130 (0.174)	1.129*** (0.0872)	0.287 (0.422)
Constant	108.3*** (3.972)	88.25*** (3.326)	96.81*** (2.956)	84.70*** (1.652)	101.0*** (4.728)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	429	475	475	475	475

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the countries that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies, and a common time trend. Standard errors, clustered by countries, are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness check - OLS: Unemployment

OLS Regression: unemployment and contributions (−6, 0) months

Table: OLS Regression for the period of 6 months before the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
Unemployment rate (norm.)	-0.178 (0.115)	-0.140 (0.106)	-0.108* (0.0582)	0.0201 (0.0202)	-0.159 (0.146)
Time trend	1.045 (0.678)	2.183*** (0.527)	0.175 (0.403)	1.284*** (0.0622)	1.427*** (0.464)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	114	114	114	114	114

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The independent variable of interest, *Unemployment*, is the normalized monthly unemployment rate. All specifications include month, quarter and year dummies, and a common time trend. Standard errors, clustered by countries are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

■ 6 months before and 6 months after the crisis

Robustness check - OLS: Unemployment

OLS Regression: unemployment and contributions (−9, 0) months

Table: OLS Regression for the period of 9 months before the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
Unemployment rate (norm.)	-0.192** (0.0754)	-0.0797 (0.167)	-0.0901 (0.0677)	0.00966 (0.0149)	-0.247 (0.205)
Time trend	1.159** (0.490)	-1.068* (0.562)	-0.131 (0.331)	1.284*** (0.0921)	-0.00314 (0.675)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	170	171	171	171	171

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The independent variable of interest, *Unemployment*, is the normalized monthly unemployment rate. All specifications include month, quarter and year dummies, and a common time trend. Standard errors, clustered by countries are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

■ 9 months before and 9 months after the crisis

Robustness check - OLS: Unemployment

OLS Regression: unemployment and contributions (0, 12) months

Table: OLS Regression for the period of 12 months after the crisis

	(1) Views	(2) Active 5-100e.	(3) Active more 100e.	(4) Edits p.article	(5) Words growth
Unemployment rate (norm.)	-0.0788 (0.0619)	-0.112 (0.110)	-0.0671 (0.0507)	-0.0294 (0.0272)	-0.0469 (0.134)
Time trend	1.007 (0.695)	0.272 (0.317)	-0.103 (0.286)	1.002*** (0.146)	0.431 (0.746)
Year dummies	Yes	Yes	Yes	Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	228	228	228	228	228

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) views of Wikipedia, (2) the number of active Wikipedians (with at least 5 edits), (3) the number of very active Wikipedians (with more than 100 edits), (4) the average number of edits per article, (5) the new words added. All indicators of contributions to Wikipedia are normalized such that the mean value of the variable across all periods is considered 100%. The rest of the monthly values are computed as a percentage of this value. The independent variable of interest, *Unemployment*, is the normalized monthly unemployment rate. All specifications include month, quarter and year dummies, and a common time trend. Standard errors, clustered by countries are in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

- Contributions to Wikipedia are uncorrelated with the raise in unemployment after the shock

more on districts

DiD results for Unemployment as treatment (+/- 12 months)

Contributions made in leisure time of the day (6pm-9am and weekends)

Table: DiD Regression with robust estimator of variance (before and after 12 months, crisis: at t)

	(1) # Edits (norm.)	(2) Contribution (KB) (norm.)	(3) Unemployment (norm.)
After	0 (.)	0 (.)	2.322*** (0.618)
Affected after crisis	3.876 (2.659)	1.082 (3.842)	11.12*** (1.185)
Constant	109.9*** (3.946)	132.5*** (7.022)	105.5*** (0.783)
Observations	6470	6470	6127

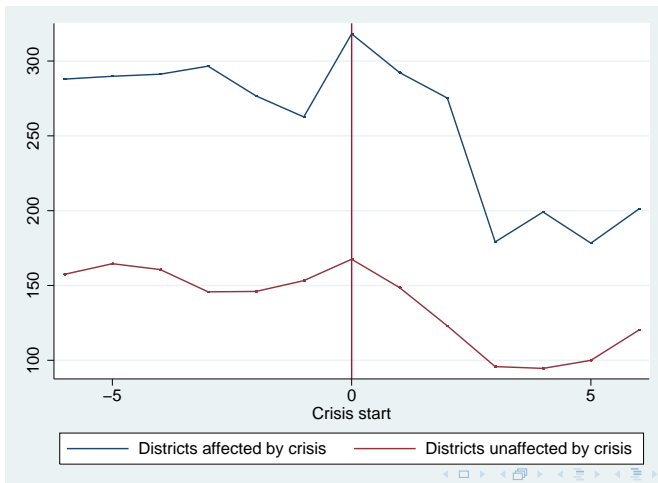
Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

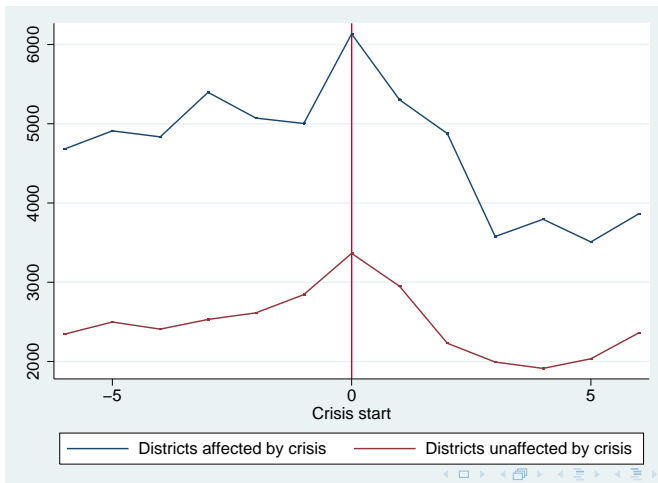
Part-time employment. Trends: Edits

(Median values of the dependent variable for the groups of affected and unaffected districts 6 months before and after the crisis)



Part-time employment. Trends: Bytes

(Median values of the dependent variable for the groups of affected and unaffected districts 6 months before and after the crisis)



DiD results for Part-time employment as treatment (+/- 6 months)

Contributions made all day long

Table: DiD Regression with robust estimator of variance (before and after 6 months, crisis: at t)

	(1) # Edits (norm.)	(2) Contribution (KB) (norm.)	(3) Unemployment (norm.)
after	4.785 (4.567)	13.03** (6.437)	-1.175 (1.189)
affected_after	-1.162 (2.708)	-11.28*** (4.268)	2.677* (1.516)
Constant	102.4*** (4.796)	102.3*** (6.647)	110.5*** (1.100)
Observations	2574	2574	2560

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable of interest, which represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the period after the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

- Now the moment of crisis is defined when part-time employment grows (for 80% of the sample, again, Jan 2009)
- Affected are considered regions with higher relative part-time employment growth

German districts: Did results for Part-time work as treatment (+/- 6 months)

Table: DID Regression with robust estimator of variance (before and after 6 months, crisis: at t)

	(1) # Edits (norm.)	(2) Contribution (KB) (norm.)	(3) Unemployment (norm.)
after	4.785 (4.567)	13.03** (6.437)	-1.175 (1.189)
affected_after	-1.162 (2.708)	-11.28*** (4.268)	2.677* (1.516)
Constant	102.4*** (4.796)	102.3*** (6.647)	110.5*** (1.100)
Observations	2574	2574	2560

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable represents the treatment effect, *Affected after crisis*, is an interaction term between dummies for the districts that are affected by the crisis with the time dummy indicating the crisis. All specifications include month and year dummies. Standard errors, clustered by districts, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Kreise: Results - DID (UR) manual

Time period - for each country +/- 12 months from the crisis

Table: DID Regression with robust estimator of variance (before and after 12 months, crisis: at t)

	(1)	(2)	(3)
	Log # revisions	Log length of contrib.(KB)	u_all_index
after	-0.186*** (0.0251)	-0.109*** (0.0305)	-0.829 (0.525)
affected_after	0.0563* (0.0333)	0.112** (0.0454)	18.59*** (1.023)
month== 1.0000	0.488*** (0.0276)	0.582*** (0.0425)	11.47*** (0.684)
month== 2.0000	0.453*** (0.0302)	0.470*** (0.0441)	11.41*** (0.686)
month== 3.0000	0.398*** (0.0288)	0.397*** (0.0458)	9.808*** (0.573)
month== 4.0000	0.0922*** (0.0303)	0.171*** (0.0475)	7.576*** (0.333)
month== 5.0000	0.00315	0.0233	2.738***

Kreise: Results - DID (UR)

Time period - for each country +/- 18 months from the crisis

Table: DID Regression with robust estimator of variance (before and after 18 months, crisis: at t)

	(1) Log # revisions	(2) Log length of contrib.(KB)	(3) u_all_index
after	-0.199*** (0.0262)	-0.0587 (0.0386)	-7.280*** (0.597)
affected_after	0.0752** (0.0292)	0.0917** (0.0428)	15.30*** (0.805)
Constant	3.721*** (0.00596)	6.455*** (0.00857)	97.27*** (0.234)
Observations	14581	14581	14577

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

NOTES: The table contains different measures of contributions to Wikipedia in each column: (1) the number of revisions, (2) the total contribution length in kb. The variable represents the treatment effect, *affected_after*, is an interaction term between dummies for the kreise that are affected by the crisis with the time dummy indicating the period specifications include month and year dummies. Standard errors, clustered by countries, in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.