

One size does not fit all: A field experiment on the drivers of tax compliance and delivery methods in Rwanda

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Maputo, 6th July 2017

Outline

- 1 Background
- 2 Empirical framework
- 3 Results
- 4 Concluding remarks

Background

Motivation

- Administrative data still under-utilised in LIC
- Few rigorous evaluations of tax policies and initiatives in LIC
- Very large literature on tax compliance, including field TE
- No large scale field tax experiment in Africa or in any LIC

Many questions remain unanswered:

- Do the standard results of this literature hold in low-income countries?
- Can simple nudges work to increase tax compliance in these contexts?
- How effective is deterrence when enforcement is severely limited?
- What is the best way to reach out to taxpayers?

Main experiment: two research questions

1. Is deterrence as effective in LIC as in HIC and MIC?

⇒ HP1: *Friendly approaches are generally more effective than deterrence in nudging taxpayers to comply more*

⇒ HP1b: *Small taxpayers are more responsive to deterrence than large TP*

2. What is the most effective way to reach taxpayers?

⇒ HP2: *Physical letters are more effective than SMS and emails to increase compliance*

What this paper does

- Implement a large scale field experiment (Feb-March 2016)
- Intervention: messages sent to TP by the RRA
- Outcome: tax liability as declared by TP
- Data: administrative data from taxpayer records
- Close collaboration with RRA

What this paper does

- Implement a large scale field experiment (Feb-March 2016)
- Intervention: messages sent to TP by the RRA
- Outcome: tax liability as declared by TP
- Data: administrative data from taxpayer records
- Close collaboration with RRA

Part of a set of papers, also including:

- 1 Review of TE literature (ICTD WP 46)
- 2 Descriptive paper (ICTD WP 56)
- 3 Pilot experiment (ICTD WP 57)
- 4 This paper (ICTD WP 58)
- 5 Feedback paper on taxpayer reactions (ICTD WP 59)

Preview of key results

- Simple nudges increase tax compliance by about 20%
- Friendly approaches work better than deterrence
- Non-traditional methods of communication are highly effective
- One size does not fit all!
 - Small taxpayers react more to deterrence
 - Public service SMS is particularly effective

Empirical framework

Research design

- Context: 15% tax ratio, public services, self-reliance
- 9 treatments interact contents and delivery methods
 - 3 contents: deterrence, public services, reminder
 - 3 delivery methods: letter, email, SMS
 - 1 no message control group
- All messages personalised, simple and translated in two languages
- Confidentiality of research project
- Letters and emails are identical
 - Sent through RRA official channels
 - Picture to make message clearer and more salient
 - Treatment changes two sentences in otherwise identical messages
- SMS
 - More concise, but same message
 - No picture
 - Sent twice during the filing period



RWANDA REVENUE AUTHORITY
OFFICE RWANDAIS DES RECETTES

TAXES FOR GROWTH AND DEVELOPMENT

Our Ref: 003/PR/DCG/15

Your Ref:

Kigali, on 8 January 2016

RE: Tax filing period open until 31st March 2016

To: ~~XXXXXXXXXXXXXXXXXXXX~~

RRA would like to inform you that your CIT tax return is due by 31st March 2016. For more information about the filing process and payment methods, contact the call centre (3004) or visit the RRA website (<http://www.ra.gov.rw>).

We would like to thank you for your collaboration and wish you a prosperous year 2016.

IMPAMVU: Itariki ntarengwa yo kumenyekanisha umusoro kunyungu ari 31 Werurwe 2016

Kuri: ~~XXXXXXXXXXXXXXXXXXXX~~

Ikigo cy' Imisiro n' Amahoro kirifuza kubamenyesha ko kumenyekanisha umusoro ku nyungu bikorwa bitaranzwe itariki ya 31 Werurwe 2016. Ku bisobanuro birambuye byerekeye uburyo bwo kumenyekanisha no kwishyura umusoro ku nyungu, mwahamagaza umurongo utishyurwa 3004 cyangwa mugasura urubuga rw' Ikigo cy' Imisiro n' Amahoro (RRA) (www.ra.gov.rw).

Tubashimiye ubufatanye mudashwema kutugaragariza, tuboneyeho no kubifuriza umwaka mushya muhire wa 2016, uzababere uw' uburumbuke.

Kind Regards/Murakoze

BIZIMANA ROZANINWALI Pascal

The Deputy Commissioner General & Commissioner for Corporate Services
 Komiseri mukuru muri ibyo akaba na Komiseri w'imirimo rusange



Komishiyari, Avenue du 1er Miliard,
 P.O Box 3087 Kigali, Rwanda
 HOTLINES 3004/3005

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 Fax: +250 595 750, 518 535
 Website: www.ra.gov.rw



RWANDA REVENUE AUTHORITY

OFFICE RWANDAIS DES RECETTES

TAXES FOR GROWTH AND DEVELOPMENT

Our Ref: 001/PR/DCG/15

Your Ref:

Kigali, on 8 January 2016

RE: Pay taxes. Build Rwanda. Be proud

To: [REDACTED]

RRA would like to inform you that your CIT tax return is due by 31st March 2016. For more information about the filing process and payment methods, contact the call centre (3004) or visit the RRA website (<http://www.rra.gov.rw>).

By paying your taxes you make it possible to educate our children, fund our healthcare, and keep us safe.

Pay taxes. Build Rwanda. Be proud.

We would like to thank you for your collaboration and wish you a prosperous year 2016.

IMPAMVU: Ishyura imisoro. Ubaka u Rwanda. Gira ishema

Kuri [REDACTED]

Ikigo cy' Imisoro n' Amahoro kirifuza kubamenyesha ko kumenyekanisha umusoro ku nyungu bikorwa bitarenze itariki ya 31 Werurwe 2016. Ku bisobanuro birambuye byanywe uburyo bwo kumenyekanisha no kwishyura umusoro ku ryanga, nibabamagaza umurungu utishyurwa 3004 cyangwa mugashuri umubura rw' Ikigo cy' Imisoro n' Amahoro (RRA) (www.rra.gov.rw).

Iyo wishyuye imisoro yawe, uhobozza abana kwiga, uba ushyigikiye ubuvuzi n'umutekano byacu.

Ishyura imisoro. Ubaka u Rwanda. Gira ishema.

Tubashimiye ubufatanye mudahwema kutagaragariza, tubonyeho no kubifuriza umwaka mushya muhire wa 2016, uzahabere uw'ubumubake.

Kind Regards/Murakoze



BIZIMANA PASCAL

The Deputy Commissioner General & Commissioner for Corporate Services
Komiseri mukuru wungirije akaba na Komiseri w'imirimo rusange

Spending of tax of RWF 100
Uko Leta ikoresha amafaranga 100 y'amusoro



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RWANDA REVENUE AUTHORITY
OFFICE RWANDAIS DES RECETTES

TAXES FOR GROWTH AND DEVELOPMENT

Our Ref: 002/PR/DCG/15

Your Ref:

Kigali, on 8 January 2016



RE: Pay your taxes on time and avoid fines and penalties

To: ~~XXXXXXXXXX~~

RRA would like to inform you that your CIT tax return is due by 31st March 2016. For more information about the filing process and payment methods, contact the call centre (3004) or visit the RRA website (<http://www.ra.gov.rw>).

Do you know that if you do not declare and pay your taxes on time, RRA can fine and possibly prosecute you?

Pay your taxes on time and avoid fines and penalties.

We would like to thank you for your collaboration and wish you a prosperous year 2016.

IMPAMVU: Ishyura imisoro ku gihe, wirinde ibihano by'ubukererwe

Kuri: ~~XXXXXXXXXX~~

Ikigo cy'Imisoro n'Amahoro kirifuza kubamenyesha ko kumenyekanisha umusoro ku nyungu bikoresha bitarenze itariki ya 31 Werurwe 2016. Ku bisobanuro birambuye byerekeye uburyo bwo kumenyekanisha no kwishyura umusoro ku nyungu, mvuhamagara umurogo utishyurwa 3004 cyangwa magasura urubuga rw'Ikigo cy'Imisoro n'Amahoro (RRA) (www.ra.gov.rw).

Wari uzi ko icyo utamenyekanishije ngo unishyure imisoro yawe ku gihe, RRA iguca ibihano by'ubukererwe ikaba yagukurikirana mu nkiko?

Ishyura imisoro yawe ku gihe, wirinde ibihano by'ubukererwe.

Tubashimiye ubufatanye mudahwema kutagaragariza, tubonyeho no kubifuriza umwaka mushya muhire wa 2016, uzababere uw'uburumbuke.

Kind Revenue Mutegeze



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Data and sample

Taxpayer-level administrative data from tax returns

- Unbalanced panel 2012-2015
- Focus on business taxes: CIT and PIT
- Financial variables: turnover, gross profits, **tax liability**
- Some firm characteristics: location, sector

Sample randomly allocated to 9 treatment groups:

- Registered in one of Kigali's tax centres
- Recently registered or using e-tax
- Contact information available

⇒ Final sample: 3,000 PIT and 10,800 CIT taxpayers

Randomisation

Stratified randomisation based on:

- Zero-tax taxpayers
- Regime
- No stratification on size, but balance OK for sub-group analysis

Balance on all variables: randomisation successful!

balance checks

Implementation: [more details](#)

- Reduced sample due to early or late filers
- Delivery reports (LATE)

Empirical strategy

$$Tax_i = \alpha + \sum_{j=1}^9 \beta_j Treatment_{ji} + \gamma X_i + \mu_i$$

- i = individual TP; j = treatment
- X = controls for Large (LTO), geographical location, zero-tax taxpayers in the previous year, lagged gross profit, interaction variable between the latter two
- Censoring of tax due at zero, many zero-tax TP \rightarrow two solutions:
 - 1 Tobit on full sample
 - 2 OLS on restricted sample, excluding zero-tax TP
- Estimates of both ITT and LATE
- Spillovers

Results

ITT

ITT all 9 treatments

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
SMS public service	1,407,199.26*** (153,442)	-0.04*** (0)	3,544,368.63** (1,292,235)	4,550,480.08*** (1,036,797)
SMS deterrence	379,518.08 (500,337)	-0.03 (0)	-245,033.48 (1,860,993)	324,137.34 (1,781,739)
SMS reminder	-15,902.13 (240,477)	0.00 (0)	1,241,134.24 (2,763,019)	2,331,515.56 (2,840,454)
Letter public service	707,583.03 (1,266,081)	0.00 (0)	3,796,213.90 (3,355,908)	4,388,817.55 (3,113,822)
Letter deterrence	634,482.54 (739,065)	-0.03* (0)	1,231,126.13 (1,959,400)	903,638.99 (2,053,014)
Letter reminder	1,119,430.64*** (426,378)	-0.02 (0)	5,809,435.63* (2,817,386)	5,602,792.51* (3,089,071)
Email public service	345,458.48 (1,126,076)	-0.01 (0)	1,967,733.51 (1,723,669)	-783,095.80 (2,332,100)
Email deterrence	430,401.07 (485,345)	-0.00 (0)	2,993,798.13** (1,339,807)	3,697,592.20*** (1,208,896)
Email reminder	2,664,015.28*** (898,269)	-0.04*** (0)	10,639,216.85** (4,964,584)	9,308,465.76 (5,432,401)
Observations	9096	9096	4053	4002

ITT Pooled treatments by content

	(1)	(2)	(3)	(4)
	Tobit	Part 1: probit	Part 2: OLS	Baseline tax > 0
Public service	823,187.26 (625,114)	-0.02 (0)	3,096,329.43 (1,810,455)	2,714,466.70 (1,962,408)
Deterrence	481,613.28 (529,090)	-0.02 (0)	1,300,026.49 (843,973)	1,643,254.83* (928,069)
Reminder	1,273,011.31*** (457,644)	-0.02** (0)	5,967,428.97** (2,234,761)	5,726,421.86** (2,101,499)
Observations	9096	9096	4053	4002

ITT Pooled treatments by method

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
Email	1,166,352.28* (676,493)	-0.02* (0)	5,288,674.58* (2,623,881)	4,072,925.37 (2,855,417)
SMS	594,526.72*** (176,020)	-0.02*** (0)	1,521,214.71 (1,341,336)	2,400,533.44* (1,324,915)
Letter	823,157.22 (681,655)	-0.02 (0)	3,608,689.17* (1,997,274)	3,645,078.22** (1,662,965)
Observations	9096	9096	4053	4002

LATE

LATE all 9 treatments

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
SMS public service	5,363,942.83*** (322,324)	-0.10*** (0)	3,569,631.66*** (858,448)	4,623,205.09*** (970,625)
SMS deterrence	1,461,515.06 (1,299,268)	-0.07 (0)	-248,942.20 (2,653,145)	316,401.84 (2,114,499)
SMS reminder	-94,180.98 (1,092,264)	0.00 (0)	1,228,229.79 (1,764,621)	2,319,468.48 (2,400,879)
Letter public service	3,466,679.15 (10,212,368)	0.01 (0)	5,724,642.38 (4,958,903)	6,929,320.36 (4,939,256)
Letter deterrence	4,834,456.11 (5,730,935)	-0.16 (0)	2,276,954.08 (3,449,282)	1,675,666.59 (3,436,177)
Letter reminder	7,421,150.33*** (453,880)	-0.06 (0)	9,371,466.70*** (1,937,233)	9,326,503.16*** (2,284,360)
Email public service	1,449,387.58 (2,484,610)	-0.04 (0)	2,218,042.05 (1,820,440)	-961,520.75 (2,670,881)
Email deterrence	1,648,146.34 (2,113,767)	-0.00 (0)	3,027,511.72* (1,642,372)	3,727,109.56*** (1,198,950)
Email reminder	12,183,058.93*** (4,278,392)	-0.13*** (0)	12,695,332.35* (6,954,886)	11,088,858.82* (6,303,194)
Observations	9096	9096	4053	4002

LATE Pooled treatments by content

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
Public service	3,592,740.45 (3,019,863)	-0.05 (0)	3,649,319.31 (2,116,150)	3,249,755.25 (2,562,327)
Deterrence	2,231,539.12 (2,504,690)	-0.06 (0)	1,553,364.09** (552,263)	1,954,857.40*** (672,286)
Reminder	6,060,000.12*** (2,131,204)	-0.06*** (0)	7,306,421.44** (2,825,984)	7,046,330.51** (2,619,055)
Observations	9096	9096	4053	4002

LATE Pooled treatments by method

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax>0
SMS	2,267,910.69*** (670,466)	-0.06*** (0)	1,527,920.10*** (300,191)	2,414,571.87*** (583,228)
Letter	5,376,106.00 (5,409,949)	-0.07 (0)	5,941,759.64** (2,245,117)	6,173,069.90** (2,267,034)
Email	4,937,561.22 (2,892,354)	-0.06* (0)	5,868,725.26* (3,353,987)	4,488,731.19 (3,197,734)
Observations	9096	9096	4053	4002

Recap of results so far

- ① Nudges work to increase compliance in Rwanda
 - Overall revenue gain: about 9 million USD extra revenue
 - About 20% increase in compliance
- ② Friendly approaches seem to be more effective than deterrence (HP1)
 - Simple reminders are highly effective
 - Public service SMS highly effective ...
 - ...but public service letters and emails are not. Why?
- ③ Less traditional delivery methods are a cost-effective and efficient way to reach out to a large number of TP (HP2)

Sub-group analysis

By size (CIT):

- Smaller taxpayers react more to deterrence **ITT** **LATE**
- SMS and emails are particularly effective for small taxpayers

By taxpayer type:

- PIT: deterrence effective in some specifications (but = reminder)
- Increase in compliance: CIT vs PIT
 - Proportionally more for PIT (25% vs 20%)
 - Larger revenue gains for CIT

By zero-tax status (CIT):

- Zero-tax: messages not particularly effective
- Non-zero-tax: effect both on probability of $\text{tax} > 0$ and amount

Robustness

- Include late filers, up to 15th April
- Include lagged tax due as a control
⇒ Results are qualitatively the same
- ...

Concluding remarks

Conclusions

- ✓ HP1: Friendly messages are generally more effective than deterrence in nudging taxpayers to comply more
- ✓ HP1b: Small taxpayers are more responsive to deterrence than large TP
- ✗ HP2: Physical letters are more effective than SMS and emails to increase compliance

Policy implications

- Illustrate the importance of rigorous evaluation in tax administration
- Effectiveness of 'modern' approach of customer orientation . . .
. . . while a mix of strategies is still needed (STO vs LTO)
- Cheap delivery methods are highly effective and scaleable
- Not 'only' research
 - Collaboration and capacity building
 - Behavioural insights: personalisation of messages → new SMS platform
 - Recommendations on taxpayer registry, zero-tax TP, streamline communications

Open questions and next steps

- Learning or nudging? Long-term vs short-term effects
- Why are there so many nil filers? Avoidance vs de-registration
- Fiscal exchange or self-reliance? 'Public service' only works via SMS
- Would these results be replicable in other countries?

Thank you

Comments welcome!

Appendix

Balance tests: CIT

Variable:	(1) Real regime	(2) Zero tax due lagged	(3) Large and top-medium	(4) Gross profit lagged (in RWF)	(5) Tax due lagged (in RWF)
Public service SMS, <i>n</i> =1059	582 (0.80)	554 (0.51)	50 (0.35)	107,068,598 (0.43)	3,103,129 (0.40)
Deterrence SMS, <i>n</i> =1060	584 (0.77)	569 (1.00)	60 (1.00)	81,875,720 (0.93)	1,123,349 (0.48)
Control SMS, <i>n</i> =1060	579 (0.93)	561 (0.74)	52 (0.46)	119,193,622 (0.30)	5,765,544 (0.42)
Public service letter, <i>n</i> =1061	575 (0.93)	551 (0.41)	64 (0.73)	156,819,023 (0.21)	13,758,779 (0.46)
Deterrence letter, <i>n</i> =1060	580 (0.90)	562 (0.77)	55 (0.65)	64,544,598 (0.90)	1,187,699 (0.75)
Control letter, <i>n</i> =1060	584 (0.77)	582 (0.59)	50 (0.35)	46,117,467 (0.41)	1,864,978 (0.97)
Public service email, <i>n</i> =1060	585 (0.74)	558 (0.62)	56 (0.72)	64,118,771 (0.98)	3,807,057 (0.55)
Deterrence email, <i>n</i> =1060	577 (1.00)	559 (0.65)	49 (0.26)	57,649,104 (0.54)	2,774,061 (0.72)
Control email, <i>n</i> =1060	578 (0.97)	552 (0.45)	60 (1.00)	90,947,172 (0.95)	4,274,751 (0.36)
Control group, <i>n</i> =1270	691	682	72	78,615,632	3,543,558

Balance tests: PIT

Variable:	(1) Real regime	(2) Zero tax due lagged	(3) Large and top-medium	(4) Gross profit lagged (in RWF)	(5) Tax due lagged (in RWF)
Public service SMS, $n=1059$	153 (0.90)	200 (0.59)	11 (0.69)	19,812,249 (0.88)	711,457 (0.59)
Deterrence SMS, $n=1060$	151 (1.00)	193 (0.91)	14 (1.00)	14,677,833 (0.66)	457,015 (0.78)
Control SMS, $n=1060$	151 (1.00)	193 (0.95)	16 (0.85)	23,327,287 (0.62)	782,983 (0.32)
Control group, $n=699$	151	191	14	18,594,594	523,102

Implementation

- RRA staff briefing: delivery and reactions
- Delivery reports for all methods (\Rightarrow LATE)
 - Letters: 53%
 - SMS: 97%
 - Some uncertainty for emails, assume 90%
- All messages sent in the first week of February
- Second round of SMS in mid-March
- Early filers: 3% CIT, 10% PIT
- Late / non filers: 13% CIT, 21% PIT
 \Rightarrow Reduced sample, but still balanced

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Heterogeneous effects: Size

Small TP: ITT with pooled treatments

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
Public service	71,379.87 (59,433)	-0.02 (0)	203,365.12 (177,688)	172,870.61 (120,017)
Deterrence	83,668.79*** (20,040)	-0.02 (0)	407,569.38** (186,688)	357,160.02** (157,132)
Reminder	43,290.04** (18,589)	-0.03*** (0)	52,280.38 (97,069)	131,003.18 (97,238)
SMS	54,887.48*** (8,301)	-0.03** (0)	118,409.71 (177,726)	111,039.64* (56,947)
Letter	46,600.14 (66,606)	-0.02 (0)	114,368.56* (56,997)	183,386.51* (99,649)
Email	95,928.08*** (30,942)	-0.02 (0)	419,158.44*** (39,111)	356,433.71*** (61,113)
Observations	7235	7235	2868	2676

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Small TP: LATE with pooled treatments

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
Public service	355,797.54 (351,975)	-0.08 (0)	239,755.00 (193,401)	207,804.37 (131,457)
Deterrence	432,246.03*** (142,495)	-0.06 (0)	493,886.59** (226,570)	429,379.11*** (60,142)
Reminder	220,853.18* (116,540)	-0.09** (0)	62,457.33*** (10,577)	159,859.57 (123,960)
SMS	227,928.72*** (26,502)	-0.07** (0)	119,255.32 (79,566)	111,100.10* (54,485)
Letter	327,406.42 (596,536)	-0.09 (0)	192,946.12*** (42,099)	319,229.06* (171,969)
Email	450,071.88** (174,580)	-0.06 (0)	466,759.97*** (29,252)	392,770.36*** (6,207)
Observations	7235	7235	2868	2676

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Large TP: ITT with pooled treatments

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax>0
Public service	3,749,856.48 (2,930,759)	0.01 (0)	12,578,287.45 (7,739,032)	11,410,608.19 (8,512,742)
Deterrence	2,944,920.02* (1,485,843)	-0.03 (0)	5,170,221.06 (3,472,578)	7,087,552.47 (4,303,277)
Reminder	7,547,035.33** (3,033,921)	0.01 (0)	26,220,209.94** (10,744,791)	24,261,006.39** (10,095,785)
SMS	2,073,840.87 (1,482,930)	0.01 (0)	6,604,484.69 (5,384,828)	10,719,783.03 (6,152,219)
Letter	4,499,963.34 (3,409,729)	-0.00 (0)	14,731,055.07 (8,687,894)	15,032,905.95** (6,912,178)
Email	7,722,691.94* (4,009,348)	-0.01 (0)	22,151,693.86* (12,373,178)	17,162,693.93 (13,156,189)
Observations	1446	1446	913	949

Large TP: LATE with pooled treatments

	(1) Tobit	(2) Part 1: probit	(3) Part 2: OLS	(4) Baseline tax > 0
Public service	9,653,244.56 (6,137,954)	0.03 (0)	14,620,783.06 (8,238,727)	13,443,256.04 (10,010,063)
Deterrence	8,048,031.68** (3,390,568)	-0.09*** (0)	5,943,613.05* (3,204,003)	8,335,491.97** (3,513,177)
Reminder	22,467,762.63*** (5,880,489)	0.04 (0)	32,299,017.73** (13,150,904)	29,779,091.59** (10,714,815)
SMS	4,931,374.78** (2,026,196)	0.02 (0)	6,685,501.76*** (1,887,814)	10,952,616.67*** (3,314,231)
Letter	16,671,489.49*** (4,651,086)	0.00 (0)	22,675,553.20** (9,093,498)	23,871,587.45*** (8,201,630)
Email	20,157,511.72** (8,677,631)	-0.05 (0)	24,440,671.27 (14,088,796)	19,036,376.94 (13,136,948)
Observations	1446	1446	913	949