

Income inequality in the Netherlands, 1860–1920: evidence from municipal taxes

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September 1, 2023

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Introduction

Introduction

- Inequality is back on the agenda, but attention is largely focused on two periods:
 - National income tax era starting in twentieth century (following Piketty and Saez 2003; Piketty 2014), showing a great compression in wake of WWI, GD, WWII.
 - Premodern period (Alfani 2021 e.a.), showing a long secular rise in inequality.
- Nineteenth and early twentieth centuries have seen far less attention (cf. Modalsli 2018), despite great economic, institutional, and demographic change.
- Many proposed drivers of inequality currently on the table (economic growth, institutions, epidemics, war, unionisation, (de)globalisation).
- Heavy reliance on social tables for earlier periods (Lindert and Williamson 2017), though these are known known to underestimate inequality (Modalsli 2015; Fintel, Links, and Green 2023).

- New sources and estimates for income inequality for the Netherlands, 1860-1920, complimenting WID series (Atkinson and Salverda 2005).
- Look at the proximate drivers of inequality in this period:
 - Growing inequality in developing regions of the Netherlands
 - Compression in middle combined with continued growth of top income shares.
- Extensive look on processing of imperfect sources:
 - Income harmonisation
 - Imputations
 - Weighting

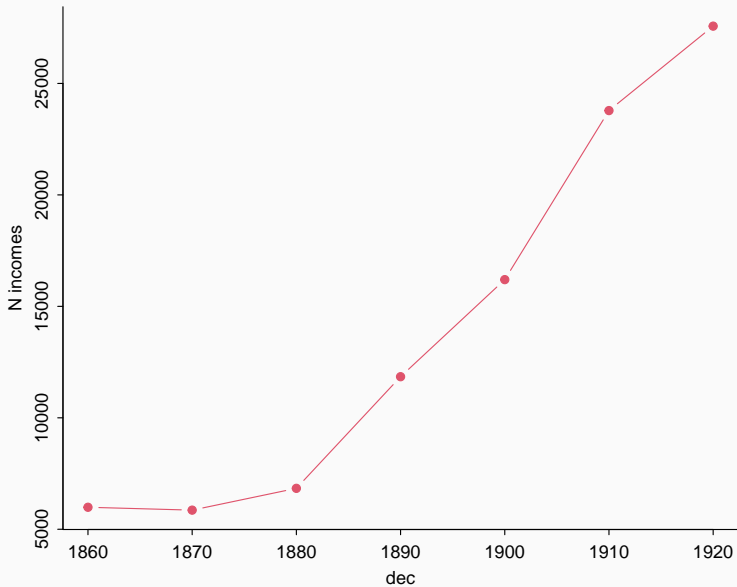
The HIP-NL project

- The Historical Income Panel for the Netherlands (HIP-NL) is creating a panel out municipal income taxes for the period 1850-1920.
- Observations will be eventually be linked to population and civil registers.
- Work in progress. Income panel will eventually cover a 10% (100) sample of municipalities observed at 10-year intervals.
- Today: work-in-progress sample, with 38 municipalities, for 170 completed municipalities-years covering 98078 tax payers.

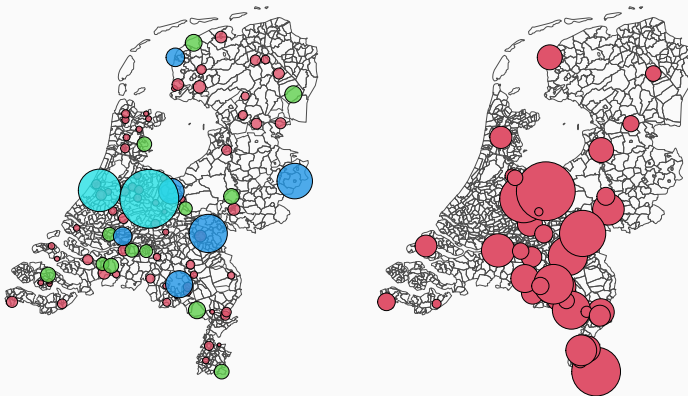
Number of municipalities covered over time



Number of taxed units



Planned and current sample



- Netherlands a relatively stagnant economy since the glory days of the Dutch Republic, most growth taking place in agriculture
- New constitution in 1848 puts the country on modern footing.
- Late to industrialise: 1880s and after.

The *Hoofdelijke omslag* taxes

The hoofdelijke omslag tax

- *Hoofdelijke Omslag* tax was an income tax by and for municipalities after the *Gemeentewet* of 1851.
- Variation in how this was implemented, with shared characteristics:
 - C. 1-3% of income, usually either a progressive tax, or allowing for subsistence deductions (often tied to household size).
 - Subsistence threshold: exempted poorest households living near subsistence.
 - Usually exempted: married women, (domestic) servants, children.
 - Tax unit is fairly close to the household, with the exemption of non-relatives living in one household, households with adult children with income (rare), institutional households.

The hoofdelijke omslag tax

Door BURGMESTER en					WILHELMUS LINDEN															
Arti- kel.	Wijk nummer der huizen.	Namen der belastingsschuldigen.	Beroep.	Klas- se.	Door BURGMESTER en				Klas- se.	WILHELMUS LINDEN				Klas- se.						
					Geschat inkom- st.	Bedrag waardoor op het tot bezoed gebracht.	Belast- ing op het baar tot bezoed gebracht.	Belast- ing op het baar tot bezoed gebracht.		Factor van pro- gressie.	Maatsch. van belasting.	Bedrag van den santing.	Factor van pro- gressie.		Maatsch. van belasting.	Bedrag van den santing.				
			Transport	1	1	1	1													
18.	16.	Thommes Thommes landbouwer		8.	1100	1200	1100	800	107	556.	10.44	8	1100	1200	1100	800	107	556.	10.44	
19.	16.	Hj. G. Thommes zander		8.						556.	10.44							556.	10.44	
20.	66.	H. Meinders landbouwer		8.						556.	10.44							556.	10.44	
21.	93.	Wid. O. van Thommes		2.	7	1000	1100	1000	700	1.06	742.	9.05	8	1000	1100	1000	700	1.06	742.	9.05
22.	35.	Wid. 2. Vonema zander		6.	6.	900	1000	900	600	1.05	620.	7.68	6	900	1000	900	600	1.05	620.	7.68
23.	95.	Wid. A. van Sijden boek		6.						630.	7.68							630.	7.68	
24.	54.	H. de Vries	landbouwer	6.						630.	7.68							630.	7.68	
25.	112.	J. B. B. B.	verruur	6.						630.	7.68							630.	7.68	
26.	57.	C. L. B. B.	landbouwer	6.						630.	7.68							630.	7.68	
27.	109.	L. L. W. W. W.	afgehoed	5.	500	900	800	500	1.04	520.	6.34	5	800	900	800	500	1.04	520.	6.34	
28.	22.	A. L. L.		5.						520.	6.34							520.	6.34	
29.	42.	A. J. J.	landbouwer	4.	700	800	700	400	1.03	412.	5.02	4	700	800	700	400	1.03	412.	5.02	
30.	54.	H. H. H.		4.						412.	5.02							412.	5.02	
31.	80.	G. B. B.		4.						412.	5.02							412.	5.02	
32.	77.	H. B. B.	landbouwer	4.						412.	5.02							412.	5.02	
33.	49.	J. H. H.	landbouwer	4.						412.	5.02							412.	5.02	
34.	82.	L. B. B.		4.						412.	5.02							412.	5.02	
Totaal					1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	

Issues

- HO reports different numbers:
 - Gross incomes
 - Income classes
 - Taxable incomes
 - Taxes due
- Because tax rates are not flat or because deductions affect the bottom of the distribution much more, we need to harmonise these estimates.
- If we ever want to analyse income dynamics, we also need consistent numbers.
- However: tax calculation not always reported.

Estimating incomes

- Solution here is to use 32229 observations where gross incomes are available, and use these to train a model to predict gross incomes from other data.
- Gradient boosting (Chen and Guestrin 2016; Hastie, Tibshirani, and Friedman 2009): ensemble of decision trees that partition the feature space and assigns outputs to each regions.
- A flexible and robust model that can – in principle – handle missing data, non-linearities, and interactions
- 70/30 test/training split: 22546 and 9683 observations in each.
- After modelling on test and evaluating on training data, we use this model to predict gross incomes where none are reported.

Estimating incomes

- Predict $\log(\text{gross income})$ using the following features
 - $\log(\text{taxable income})$
 - $\log(\text{unspc. income})$
 - $\log(\text{tax})$
 - $\log(\text{tax brackets})$
 - $\log(\text{income brackets})$
 - $\log(\text{corrected tax})$
 - in top 0.5% tax
 - in top 0.5% taxable income
 - N. children
 - decade and municipality dummies
- Separate models:
 - taxable incomes present: RSME 0.10 (on average, predictions are fl. 1.10 off)
 - taxable incomes masked: RSME 0.15 (on average fl. 1.15 off)

Estimating incomes

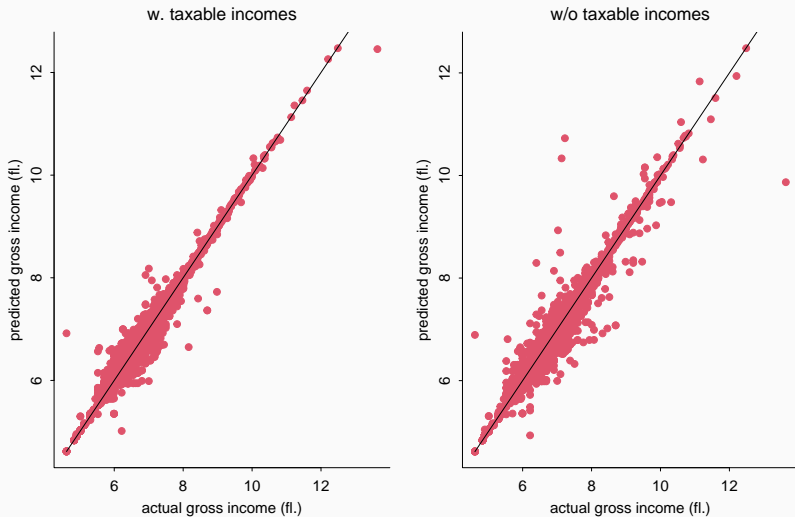
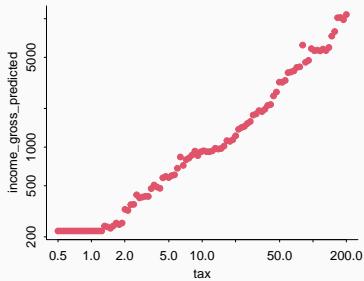
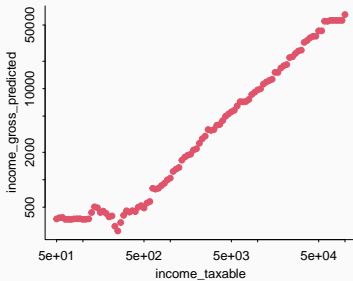
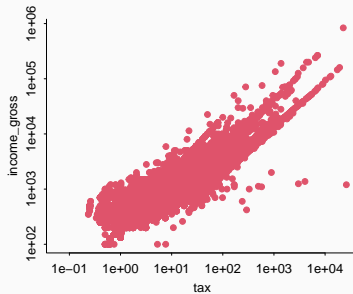
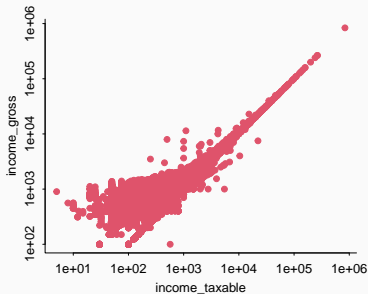


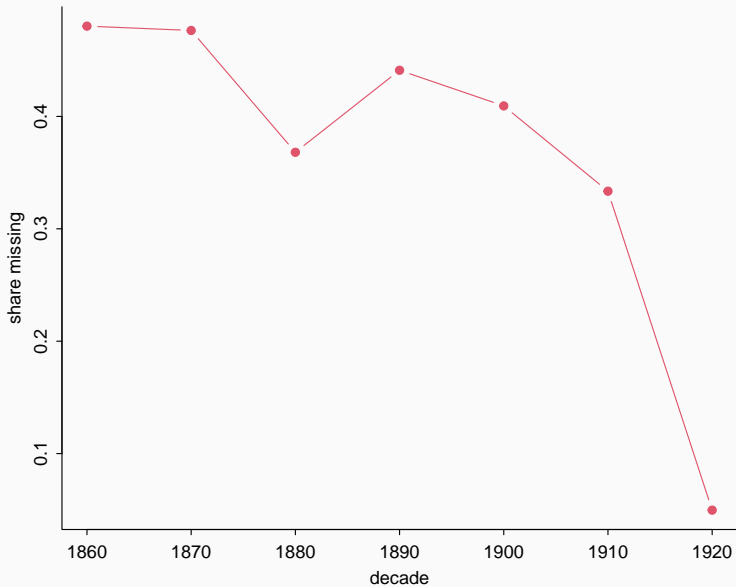
Figure 2: Actual and predicted incomes

Estimating incomes: non-linearities



- Know that HO implemented a tax threshold, usually motivated by part of population living at subsistence.
- These numbers could be fairly high.
- Use census count of households to estimate the number of missing tax units, assuming here that each household is taxed once.
 - Possible to improve this number

Imputations



Imputations

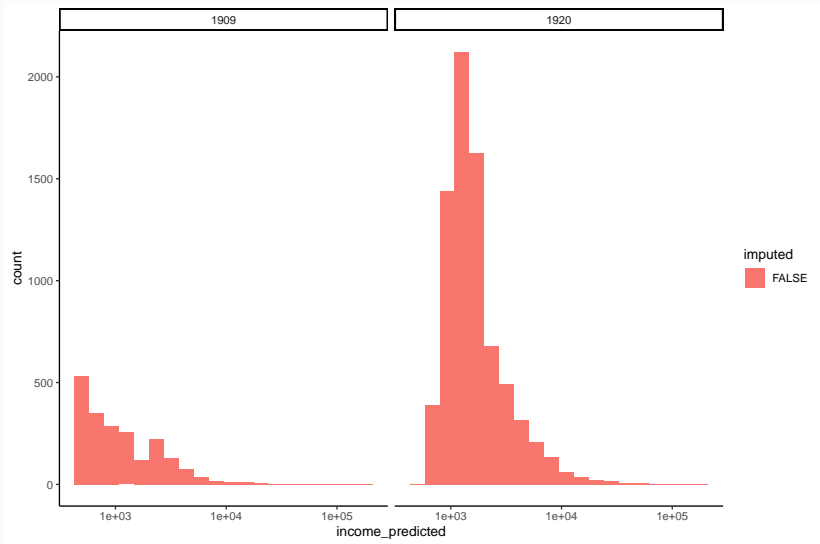


Figure 4: Censored distributions in Amersfoort

- Missing households below the tax threshold might mean we are dealing with truncated distributions
- We use the number of missing tax units to estimate a censored lognormal distribution, and draw additional tax units from that.

Imputations

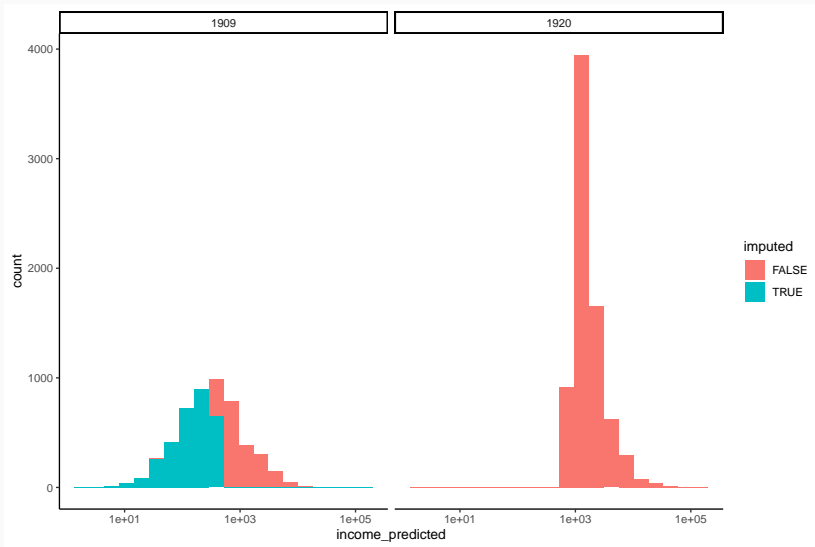
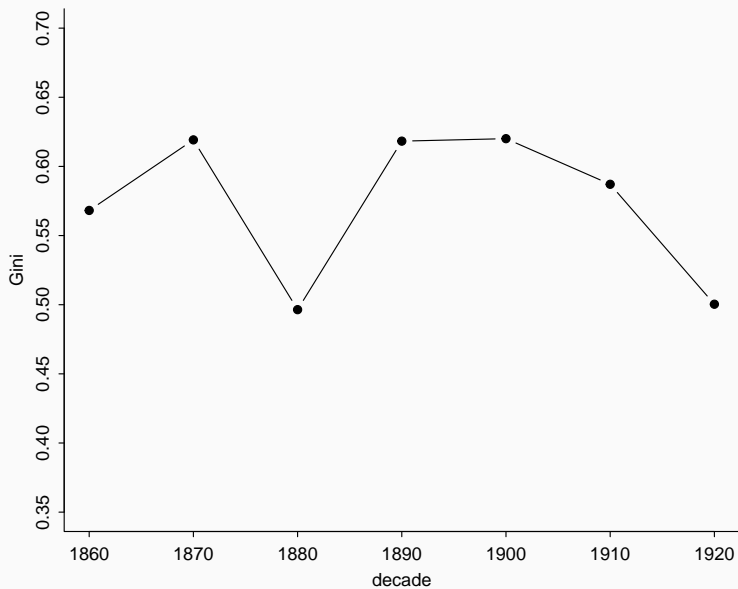


Figure 5: Imputed distributions in Amersfoort

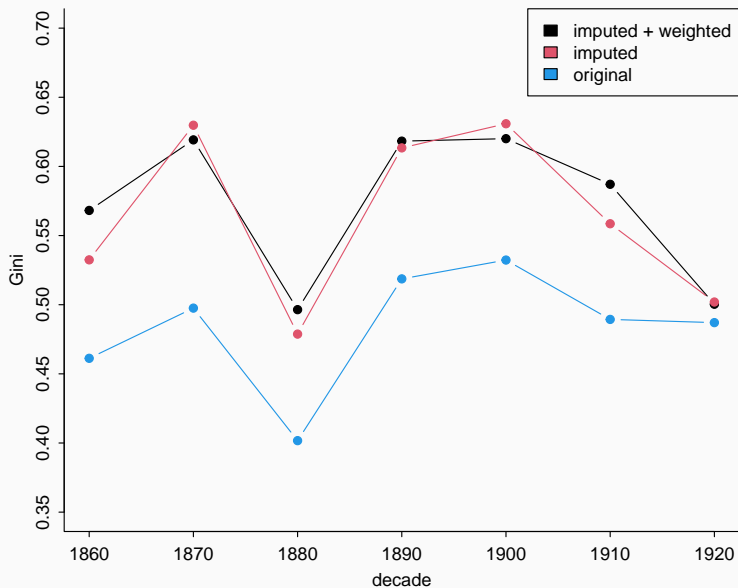
- Weighting necessary as current sample reflects work in progress, not actual sample design.
- In particular: rural, southern bias.
- Simple weighting scheme because data needs to be richer to support more extensive weighting schemes
- Rural/new urban/old urban (Soltow and Zanden 1998) for each decade.
 - new/old urban based on 1850-1920 population growth exceeding Dutch growth (100%).
- Calculate total tax units in each category for all of Netherlands, and stratified those numbers w. replacement from empirical sample distribution.

Results

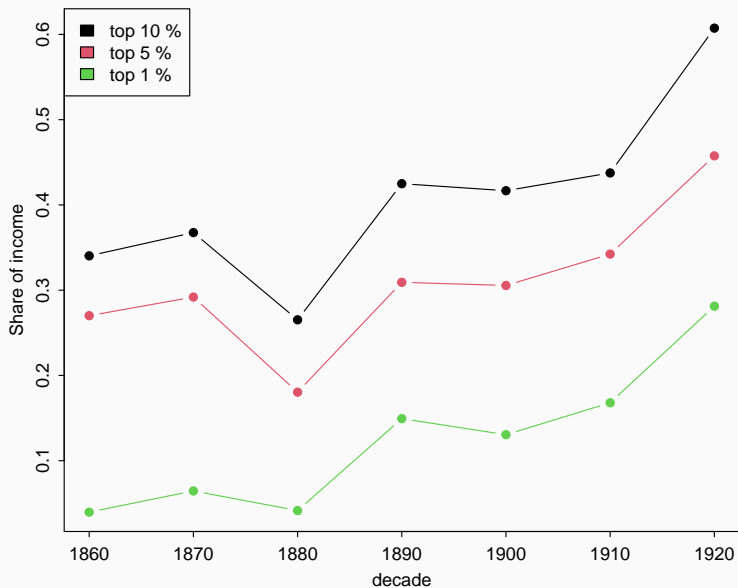
Results: Gini,1860–1920



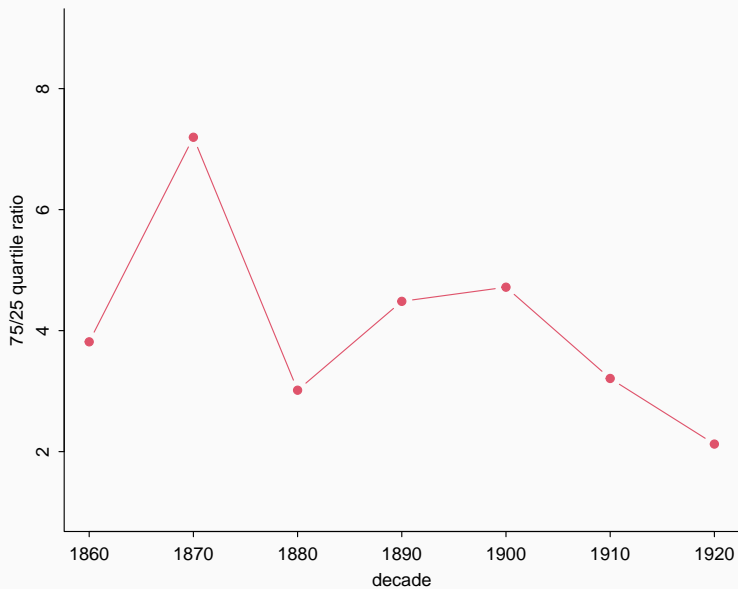
Results: Gini by method



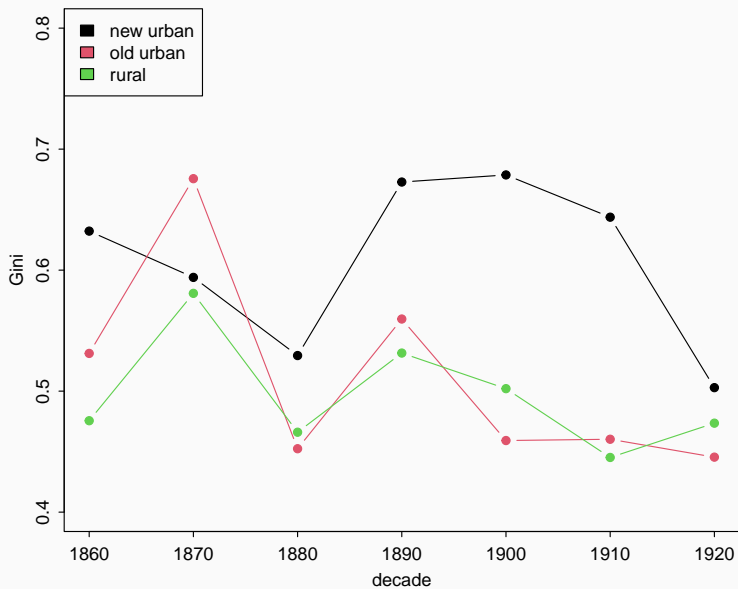
Results: Top 10%, 5%, and 1% income shares



Results: 75%/25% quintile ratio



Results Gini by type of settlement



- New sources allow us to push income distributions back into nineteenth century, though the data require considerable work.
- Rise of inequality in early days of Dutch industrialisation.
- Pre-WW1 decline in inequality.
- Rising top incomes coinciding with compression in rest of income distribution.

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