

Assignment 4

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title	code	
Average annual population to calculate regional GDP data (thousand persons) by NUTS 3 region	nama_10r_3popgdp	
Gross domestic product (GDP) at current market prices by NUTS 3 region	nama_10r_3gdp	
concept	code	name
freq	A	Annual
unit	MIO_EUR	Million euro
unit	EUR_HAB	Euro per inhabitant
unit	EUR_HAB_EU27_2020	Euro per inhabitant in percentage of the EU27 (from 2020) average
unit	MIO_NAC	Million units of national currency
unit	MIO_PPS_EU27_2020	Million purchasing power standards (PPS, EU27 from 2020)
unit	PPS_EU27_2020_HAB	Purchasing power standard (PPS, EU27 from 2020), per inhabitant
unit	PPS_HAB_EU27_2020	Purchasing power standard (PPS, EU27 from 2020), per inhabitant in percentage of the EU27 (from 2020) average

concept	code	name
geo	EU27_2020	European Union - 27 countries (from 2020)
geo	BE	Belgium
geo	BE1	Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewest
geo	BE10	Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewest
geo	BE100	Arr. de Bruxelles-Capitale/Arr. Brussel-Hoofdstad
geo	BE2	Vlaams Gewest
geo	BE21	Prov. Antwerpen
geo	BE211	Arr. Antwerpen
geo	BE212	Arr. Mechelen
geo	BE213	Arr. Turnhout

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[1] 30058     3
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```
# A tibble: 30,058 × 3
  geo    time   gdp_n3
  <chr> <chr>   <dbl>
1 AL011 2008  551130000
2 AL011 2009  582160000
3 AL011 2010  664070000
4 AL011 2011  631170000
5 AL011 2012  717600000
6 AL011 2013  696860000
7 AL011 2014  735600000
8 AL011 2015  788630000
9 AL011 2016  801980000
10 AL011 2017  800660000
# i 30,048 more rows
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```
# A tibble: 21 × 3
  geo    time   gdp_n3
  <chr> <chr>   <dbl>
1 IE053 2000  15837300000
2 IE053 2001  17506250000
3 IE053 2002  19395440000
4 IE053 2003  19687190000
5 IE053 2004  21000450000
6 IE053 2005  21776750000
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7 IE053 2006 24081640000
8 IE053 2007 26086890000
9 IE053 2008 22705550000
10 IE053 2009 24012370000
11 IE053 2010 24085200000
12 IE053 2011 26235110000
13 IE053 2012 24346250000
14 IE053 2013 23345250000
15 IE053 2014 25127580000
16 IE053 2018 73687140000
17 IE053 2019 71965850000
18 IE053 2020 75581570000
19 IE053 2021 99064470000
20 IE053 2022 122163400000
21 IE053 2023 103989840000
```

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# A tibble: 24 × 3
  geo    time      gdp_n3
  <chr> <chr>     <dbl>
1 IE053 2000 15837300000
2 IE053 2001 17506250000
3 IE053 2002 19395440000
4 IE053 2003 19687190000
5 IE053 2004 21000450000
6 IE053 2005 21776750000
7 IE053 2006 24081640000
8 IE053 2007 26086890000
9 IE053 2008 22705550000
10 IE053 2009 24012370000
11 IE053 2010 24085200000
12 IE053 2011 26235110000
13 IE053 2012 24346250000
14 IE053 2013 23345250000
15 IE053 2014 25127580000
16 IE053 2015 37267470000
17 IE053 2016 49407360000
18 IE053 2017 61547250000
19 IE053 2018 73687140000
20 IE053 2019 71965850000
21 IE053 2020 75581570000
22 IE053 2021 99064470000
23 IE053 2022 122163400000
24 IE053 2023 103989840000
```

Oppgave 1

Oppgave 2

i

title	code	last Update	data Start	data End	values
Population density by NUTS 3 region	demo_r_d3dens	2025.04.02	1990	2023	55,417
Population on 1 January by age group, sex and NUTS 3 region	demo_r_pjangrp3	2025.12.04	2014	2024	1,386,651
Population on 1 January by broad age group, sex and NUTS 3 region	demo_r_pjanaggr3	2025.12.04	1990	2024	709,822
Population structure indicators by NUTS 3 region	demo_r_pjanind3	2025.12.04	2014	2024	1,031,936
Population change - Demographic balance and crude rates at regional level (NUTS 3)	demo_r_gind3	2025.10.10	2000	2024	462,291
Population by single year of age and NUTS 3 region	cens_11ag_r3	2015.08.26	2011	2011	722,521
Population by marital status and NUTS 3 region	cens_11ms_r3	2019.04.01	2011	2011	1,391,604
Population by family status and NUTS 3 region	cens_11fs_r3	2015.08.26	2011	2011	1,409,421
Population by sex, citizenship and NUTS 3 region	cens_01rsctz	2009.03.27	2001	2001	77,613
Population by sex, age group, current activity status and NUTS 3 region	cens_01rapop	2009.03.27	2001	2001	555,759
Total and active population by sex, age, employment status, residence one year prior to the census and NUTS 3 region	cens_01ramigr	2009.03.27	2001	2001	1,482,371
Population by sex, age group, educational attainment level, current activity status and NUTS 3 region	cens_01rews	2009.03.27	2001	2001	210,708
Population by sex, age group, household status and NUTS 3 region	cens_01rhstype	2009.03.27	2001	2001	354,029
Population by sex, age group, size of household and NUTS 3 region	cens_01rhsiz	2011.02.09	2001	2001	288,476
Average annual population to calculate regional GDP data (thousand persons) by NUTS 3 region	nama_10r_3popgdp	2025.03.12	2000	2023	40,358
Population by country of citizenship, age groups and NUTS 3 region	cens_21ctz_r3	2025.05.21	2021	2021	31,169,981
Population by country of citizenship, age groups, family status and NUTS 3 region	cens_21ctzf_r3	2025.05.21	2021	2021	5,931,246
Population by country of citizenship, age groups, type of housing arrangements and NUTS 3 region	cens_21ctzha_r3	2025.05.21	2021	2021	3,670,227
Population by country of birth, age groups and NUTS 3 region	cens_21cob_r3	2025.05.21	2021	2021	34,416,168
Population by country of birth, age groups, household status and NUTS 3 region	cens_21cobhs_r3	2025.05.21	2021	2021	7,912,772
Population by country of birth, age groups, type of housing arrangements and NUTS 3 region	cens_21cobha_r3	2025.05.21	2021	2021	3,671,639
Population by marital status, broad age groups and NUTS 3 region	cens_21m_r3	2025.05.21	2021	2021	212,370
Population by family status, broad age groups and NUTS 3 region	cens_21f_r3	2025.05.21	2021	2021	424,168
Population by size of the locality, age groups and NUTS 3 region	cens_21l_r3	2025.05.21	2021	2021	1,982,428
Population by size of the locality, housing arrangements and NUTS 3 region	cens_21lha_r3	2025.05.21	2021	2021	424,891
Population by year of arrival in the country since 2010, age groups, groups of country of birth and NUTS 3 region	cens_21argc_r3	2025.05.21	2021	2021	3,958,020
Population by year of arrival in the country, age groups, family status and NUTS 3 region	cens_21arf_r3	2025.05.21	2021	2021	4,591,462
Population with Ukrainian citizenship by 5-year age group and NUTS 3 region	cens_21ua_a5r3	2023.03.13	2021	2021	20,511
Population with Ukrainian citizenship by age and NUTS 3 region	cens_21ua_ar3	2023.03.13	2021	2021	54,936
Population with Ukrainian citizenship by 5-year age group, marital status and NUTS 3 region	cens_21ua_msrr3	2022.07.07	2021	2021	34,680
Population on 1st January by age, sex, type of projection and NUTS 3 region	proj_19rp3	2021.04.23	2019	2100	91,535,616

```
      code  
<char>  
1: nama_10r_3popgdp
```

ii

#iii-v

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[1] 30038     3
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```
# A tibble: 30,038 × 3  
  geo    time  pop_n3  
  <chr> <chr>   <dbl>  
1 AL011 2001  186720  
2 AL011 2002  182380  
3 AL011 2003  178710  
4 AL011 2004  174710  
5 AL011 2005  170370  
6 AL011 2006  165610  
7 AL011 2007  160540  
8 AL011 2008  155390  
9 AL011 2009  150430  
10 AL011 2010  146140  
# i 30,028 more rows
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Table 1: First 126 observations in pop

NUTS3	År	Befolknings NUTS3	NUTS3	År	Befolknings NUTS3	NUTS3	År	Befolknings NUTS3
AL011	2001	186,720	AL013	2001	109,440	AL015	2001	254,300
AL011	2002	182,380	AL013	2002	107,150	AL015	2002	251,190
AL011	2003	178,710	AL013	2003	105,580	AL015	2003	248,800
AL011	2004	174,710	AL013	2004	104,020	AL015	2004	246,860
AL011	2005	170,370	AL013	2005	102,130	AL015	2005	244,520
AL011	2006	165,610	AL013	2006	99,930	AL015	2006	241,500
AL011	2007	160,540	AL013	2007	97,540	AL015	2007	237,710
AL011	2008	155,390	AL013	2008	94,970	AL015	2008	233,840
AL011	2009	150,430	AL013	2009	92,430	AL015	2009	230,580
AL011	2010	146,140	AL013	2010	90,310	AL015	2010	227,350
AL011	2011	142,580	AL013	2011	88,580	AL015	2011	224,090
AL011	2012	139,340	AL013	2012	86,930	AL015	2012	221,090
AL011	2013	136,020	AL013	2013	85,180	AL015	2013	218,010
AL011	2014	132,690	AL013	2014	83,370	AL015	2014	214,820
AL011	2015	130,050	AL013	2015	81,850	AL015	2015	211,660
AL011	2016	127,320	AL013	2016	80,420	AL015	2016	209,050
AL011	2017	123,290	AL013	2017	78,480	AL015	2017	206,460
AL011	2018	119,970	AL013	2018	76,990	AL015	2018	203,940
AL011	2019	117,410	AL013	2019	76,010	AL015	2019	201,450
AL011	2020	114,770	AL013	2020	74,910	AL015	2020	198,590
AL011	2021	111,630	AL013	2021	73,580	AL015	2021	195,090
AL012	2001	246,560	AL014	2001	158,490	AL021	2001	359,510
AL012	2002	249,440	AL014	2002	157,160	AL021	2002	353,950
AL012	2003	251,450	AL014	2003	155,230	AL021	2003	348,310
AL012	2004	253,310	AL014	2004	153,280	AL021	2004	342,610
AL012	2005	255,540	AL014	2005	151,230	AL021	2005	336,550
AL012	2006	257,710	AL014	2006	148,840	AL021	2006	330,410
AL012	2007	259,480	AL014	2007	146,410	AL021	2007	324,140
AL012	2008	261,630	AL014	2008	144,060	AL021	2008	317,930
AL012	2009	264,250	AL014	2009	141,810	AL021	2009	312,210
AL012	2010	267,710	AL014	2010	140,250	AL021	2010	308,300
AL012	2011	270,870	AL014	2011	138,750	AL021	2011	304,900
AL012	2012	272,990	AL014	2012	136,740	AL021	2012	300,930
AL012	2013	275,040	AL014	2013	134,710	AL021	2013	296,960
AL012	2014	277,010	AL014	2014	132,790	AL021	2014	292,800
AL012	2015	279,090	AL014	2015	131,040	AL021	2015	289,140
AL012	2016	282,510	AL014	2016	129,640	AL021	2016	285,710
AL012	2017	287,230	AL014	2017	127,910	AL021	2017	281,190
AL012	2018	289,870	AL014	2018	126,000	AL021	2018	276,770
AL012	2019	290,410	AL014	2019	123,950	AL021	2019	272,530
AL012	2020	291,360	AL014	2020	121,690	AL021	2020	268,160
AL012	2021	291,680	AL014	2021	118,980	AL021	2021	262,680

Table 2: Next 126 observations in pop (the rest of Albania).

NUTS3	År	Befolknings NUTS3	NUTS3	År	Befolknings NUTS3	NUTS3	År	Befolknings NUTS3
AL022	2001	607,130	AL032	2001	379,850	AL034	2001	263,230
AL022	2002	625,630	AL032	2002	375,470	AL034	2002	260,050
AL022	2003	642,240	AL032	2003	370,570	AL034	2003	256,910
AL022	2004	659,090	AL032	2004	365,070	AL034	2004	253,590
AL022	2005	675,670	AL032	2005	358,930	AL034	2005	250,250
AL022	2006	692,050	AL032	2006	352,670	AL034	2006	246,590
AL022	2007	707,750	AL032	2007	346,110	AL034	2007	242,730
AL022	2008	723,170	AL032	2008	339,500	AL034	2008	238,890
AL022	2009	739,090	AL032	2009	333,370	AL034	2009	235,360
AL022	2010	755,370	AL032	2010	327,620	AL034	2010	232,040
AL022	2011	772,230	AL032	2011	322,830	AL034	2011	229,190
AL022	2012	789,570	AL032	2012	318,700	AL034	2012	226,880
AL022	2013	807,350	AL032	2013	314,420	AL034	2013	224,320
AL022	2014	825,230	AL032	2014	310,120	AL034	2014	221,610
AL022	2015	838,610	AL032	2015	306,560	AL034	2015	218,800
AL022	2016	852,690	AL032	2016	303,810	AL034	2016	215,870
AL022	2017	873,160	AL032	2017	300,320	AL034	2017	212,250
AL022	2018	889,570	AL032	2018	296,450	AL034	2018	209,040
AL022	2019	900,660	AL032	2019	292,320	AL034	2019	206,360
AL022	2020	909,170	AL032	2020	287,950	AL034	2020	203,510
AL022	2021	915,850	AL032	2021	282,210	AL034	2021	199,750
AL031	2001	190,830	AL033	2001	111,120	AL035	2001	193,010
AL031	2002	187,020	AL033	2002	108,110	AL035	2002	193,460
AL031	2003	183,110	AL033	2003	105,050	AL035	2003	193,660
AL031	2004	179,080	AL033	2004	101,790	AL035	2004	193,540
AL031	2005	174,690	AL033	2005	98,410	AL035	2005	193,200
AL031	2006	169,910	AL033	2006	94,830	AL035	2006	192,520
AL031	2007	164,970	AL033	2007	91,180	AL035	2007	191,460
AL031	2008	160,060	AL033	2008	87,610	AL035	2008	190,280
AL031	2009	155,340	AL033	2009	84,060	AL035	2009	188,600
AL031	2010	151,370	AL033	2010	80,320	AL035	2010	186,250
AL031	2011	148,200	AL033	2011	77,220	AL035	2011	185,750
AL031	2012	145,300	AL033	2012	74,910	AL035	2012	187,040
AL031	2013	142,480	AL033	2013	72,650	AL035	2013	187,960
AL031	2014	139,740	AL033	2014	70,570	AL035	2014	188,370
AL031	2015	136,900	AL033	2015	68,780	AL035	2015	188,220
AL031	2016	133,690	AL033	2016	66,990	AL035	2016	188,410
AL031	2017	129,690	AL033	2017	64,450	AL035	2017	189,040
AL031	2018	126,300	AL033	2018	62,190	AL035	2018	189,300
AL031	2019	123,580	AL033	2019	60,400	AL035	2019	189,120
AL031	2020	120,730	AL033	2020	58,710	AL035	2020	188,300
AL031	2021	117,250	AL033	2021	56,660	AL035	2021	186,320

Table 3: Table of GDP data for six random NUTS3 zones in the dataset.

nuts3	År	GDP in €1000	nuts3	År	GDP in €1000	nuts3	År	GDP in €1000
BE235	2000		ITI17	2000	9329 010	TR713	2000	
BE235	2001		ITI17	2001	9647370	TR713	2001	
BE235	2002		ITI17	2002	9534 050	TR713	2002	
BE235	2003	2671320	ITI17	2003	9641 890	TR713	2003	
BE235	2004	2642240	ITI17	2004	9713 720	TR713	2004	1985 320
BE235	2005	2643880	ITI17	2005	10173 620	TR713	2005	2126 810
BE235	2006	2846680	ITI17	2006	10693 400	TR713	2006	2194 670
BE235	2007	3027240	ITI17	2007	11592210	TR713	2007	2464 250
BE235	2008	3072480	ITI17	2008	12053350	TR713	2008	2598 160
BE235	2009	2969410	ITI17	2009	11484 160	TR713	2009	2554 020
BE235	2010	3121520	ITI17	2010	11490 460	TR713	2010	3021 010
BE235	2011	3216200	ITI17	2011	12150580	TR713	2011	3324 120
BE235	2012	3337870	ITI17	2012	11942190	TR713	2012	3426 150
BE235	2013	3316240	ITI17	2013	11804580	TR713	2013	3457 140
BE235	2014	3139490	ITI17	2014	11739160	TR713	2014	3880 710
BE235	2015	3259860	ITI17	2015	12044400	TR713	2015	4443 900
BE235	2016	3340460	ITI17	2016	12648310	TR713	2016	4206 920
BE235	2017	3377070	ITI17	2017	13089980	TR713	2017	4462 470
BE235	2018	3440840	ITI17	2018	13481480	TR713	2018	4458 160
BE235	2019	3541530	ITI17	2019	13813160	TR713	2019	4520 260
BE235	2020	3111010	ITI17	2020	13057740	TR713	2020	4479 080
BE235	2021	3542050	ITI17	2021	14076840	TR713	2021	4496 120
BE235	2022	3978640	ITI17	2022	15464940	TR713	2022	5738 160
BE235	2023	4257460	ITI17	2023		TR713	2023	6591 990
DE21I	2000	1746 460	NO081	2000		TRB13	2000	
DE21I	2001	1882330	NO081	2001		TRB13	2001	
DE21I	2002	1927250	NO081	2002		TRB13	2002	
DE21I	2003	2043920	NO081	2003		TRB13	2003	
DE21I	2004	2124210	NO081	2004		TRB13	2004	835390
DE21I	2005	2145910	NO081	2005		TRB13	2005	933330
DE21I	2006	2268740	NO081	2006		TRB13	2006	1004 420
DE21I	2007	2369540	NO081	2007		TRB13	2007	1121 100
DE21I	2008	2484580	NO081	2008	33816480	TRB13	2008	1243 910
DE21I	2009	2428030	NO081	2009	32313120	TRB13	2009	1221 340
DE21I	2010	2646590	NO081	2010	35410650	TRB13	2010	1522 650
DE21I	2011	2720790	NO081	2011	36890670	TRB13	2011	1741 970
DE21I	2012	2775500	NO081	2012	39598600	TRB13	2012	1842 160
DE21I	2013	2683910	NO081	2013	40922950	TRB13	2013	2068 560
DE21I	2014	2761580	NO081	2014	41551720	TRB13	2014	2212 030
DE21I	2015	2867730	NO081	2015	40568560	TRB13	2015	2329 400
DE21I	2016	3022850	NO081	2016	40387300	TRB13	2016	2636 640
DE21I	2017	3232350	NO081	2017	42911160	TRB13	2017	2720 180
DE21I	2018	3341520	NO081	2018	44798260	TRB13	2018	2670 800
DE21I	2019	3444350	NO081	2019	46276180	TRB13	2019	2699 850
DE21I	2020	3494400	NO081	2020	46103950	TRB13	2020	2772 780
DE21I	2021	3492480	NO081	2021	50752680	TRB13	2021	2755 040
DE21I	2022	3627760	NO081	2022		TRB13	2022	3084 050
DE21I	2023		NO081	2023		TRB13	2023	3631 720

Oppgave 3

[1] 30061 4

geo	time	gdp_n3	pop_n3
AL011	2008	551,130,000	155,390
AL011	2009	582,160,000	150,430
AL011	2010	664,070,000	146,140
AL011	2011	631,170,000	142,580
AL011	2012	717,600,000	139,340
AL011	2013	696,860,000	136,020

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[1] 27584      5
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```
[1] 0 5
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Oppgave 4

n3	n2	n1	nc
AL011	AL01	AL0	AL
AL012	AL01	AL0	AL
AL013	AL01	AL0	AL
AL014	AL01	AL0	AL
AL015	AL01	AL0	AL
AL021	AL02	AL0	AL
AL022	AL02	AL0	AL
AL031	AL03	AL0	AL
AL032	AL03	AL0	AL
AL033	AL03	AL0	AL

Oppgave 5

```
# A tibble: 0 × 3
# i 3 variables: n3 <chr>, time <chr>, pop_n3 <dbl>
```

Oppgave 6

nc	Antall
DE	400
IT	107
FR	100
TR	81
PL	73
ES	59
EL	52
BE	44
RO	42
AT	35
BG	28
RS	25
HR	21
SE	21
HU	20
FI	19
CZ	14
AL	12
SI	12
DK	11
LT	10
IE	8
MK	8
SK	8
EE	5
LV	5
MT	2
CY	1
LU	1

Land	Antall nuts3 regioner						
DE	400	RO	42	CZ	14	EE	5
IT	107	AT	35	AL	12	LV	5
FR	100	BG	28	SI	12	MT	2
TR	81	RS	25	DK	11	CY	1
PL	73	HR	21	LT	10	LU	1
ES	59	SE	21	IE	8		
EL	52	HU	20	MK	8		
BE	44	FI	19	SK	8		

Oppgave 7

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
2214	14994	21144	22782	27952	180416

Oppgave 8

```
# A tibble: 29 × 2
  nc_name      nc
  <chr>        <chr>
1 Albania      AL
2 Østerrike    AT
3 Belgia       BE
4 Bulgaria     BG
5 Kypros        CY
6 Tjekkia      CZ
7 Tyskland     DE
8 Danmark      DK
9 Estland      EE
10 Hellas       EL
11 Spania      ES
12 Finland     FI
13 Frankrike   FR
14 Kroatia     HR
15 Ungarn      HU
16 Irland      IE
17 Italia       IT
18 Litauen     LT
19 Luxemburg   LU
20 Latvia       LV
21 Nord-Makedonia MK
22 Malta        MT
23 Polen        PL
24 Romania     RO
25 Serbia       RS
26 Sverige     SE
27 Slovenia    SI
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28 Slovakia      SK
29 Tyrkia       TR

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Oppgave 9

```

# A tibble: 5,724 × 10
  n2    time   n1    nc  nc_name gini_n2 pop_n2    gdp_n2 gdp_pc_n2
  <chr> <chr> <chr> <chr> <dbl>   <dbl>    <dbl>    <dbl>
1 AL01  2008  AL0   AL   Albania  0.166  889890  4.45e9  4997.
2 AL01  2009  AL0   AL   Albania  0.153  879500  4.66e9  5297.
3 AL01  2010  AL0   AL   Albania  0.159  871760  5.25e9  6022.
4 AL01  2011  AL0   AL   Albania  0.148  864870  5.28e9  6104.
5 AL01  2012  AL0   AL   Albania  0.119  857090  5.40e9  6304.
6 AL01  2013  AL0   AL   Albania  0.122  848960  5.22e9  6153.
7 AL01  2014  AL0   AL   Albania  0.103  840680  5.36e9  6371.
8 AL01  2015  AL0   AL   Albania  0.114  833690  5.69e9  6824.
9 AL01  2016  AL0   AL   Albania  0.109  828940  5.74e9  6922.
10 AL01  2017  AL0   AL   Albania  0.121  823370  5.90e9  7169.
# i 5,714 more rows

```

gini_n2	num_reg_n2	pop_n2	gdp_n2
Min. :0.00038	Min. : 1.000	Min. : 25740	Min. :6.814e+08
1st Qu.:0.06753	1st Qu.: 2.000	1st Qu.: 992732	1st Qu.:1.595e+10
Median :0.10893	Median : 4.000	Median : 1529210	Median :3.030e+10
Mean :0.12316	Mean : 4.819	Mean : 1947314	Mean :4.679e+10
3rd Qu.:0.16290	3rd Qu.: 6.000	3rd Qu.: 2361818	3rd Qu.:5.388e+10
Max. :0.47793	Max. :23.000	Max. :15874440	Max. :7.083e+11
NA's :856			
gdp_pc_n2			
Min. : 3157			
1st Qu.:15317			
Median :21839			
Mean :23011			
3rd Qu.:28793			
Max. :96746			

Oppgave 10

```
# A tibble: 4 × 9
  nc_name nc   n1    n2    time  gini_n2 num_reg_n2  pop_n2 gdp_pc_n2
  <chr>    <chr> <chr> <chr> <dbl>      <int>     <dbl>      <dbl>
1 Slovakia SK   SK0   SK03  2004  0.000379          2 1352530    9967.
2 Italia   IT   ITF   ITF5  2006  0.000545          2 588300     18935.
3 Polen    PL   PL4   PL43  2011  0.000854          2 1010350    14181.
4 Danmark  DK   DK0   DK02  2019  0.000977          2 837050     27678.
```

```
# A tibble: 1 × 2
  num_reg_n2    n
  <int>        <int>
1         2        4
```

Regioner med svært lav gini kjennetegnes ved at de består av få NUTS3 regioner. Vi ser at disse regionene har nettopp dette til felles.

Oppgave 11

```
    gini_n1      num_reg_n1      gdp_n1      pop_n1
Min. :0.01601  Min. : 1.00  Min. :6.814e+08  Min. : 25740
1st Qu.:0.09123 1st Qu.: 6.00  1st Qu.:4.256e+10 1st Qu.: 2689490
Median :0.13959 Median : 9.00  Median :7.888e+10 Median : 3934280
Mean   :0.15364 Mean   :12.22   Mean   :1.187e+11 Mean   : 4938602
3rd Qu.:0.18790 3rd Qu.:14.00  3rd Qu.:1.411e+11 3rd Qu.: 5992840
Max.   :0.42934 Max.   :96.00   Max.   :7.287e+11 Max.   :18031860
NA's    :177
    gdp_pc_n1
Min.   : 3802
1st Qu.:15750
Median :22295
Mean   :23523
3rd Qu.:29340
Max.   :90512
```

Oppgave 12

```
    gini_nc      num_reg_nc      gdp_nc      pop_nc
Min. :0.1111  Min. : 1.00  Min. :5.892e+09  Min. : 386200
1st Qu.:0.1742 1st Qu.: 8.00  1st Qu.:4.350e+10 1st Qu.: 2810745
Median :0.2094 Median : 20.00 Median :1.516e+11 Median : 6984230
Mean   :0.2149 Mean   : 42.37 Mean   :4.114e+11 Mean   :17122006
3rd Qu.:0.2553 3rd Qu.: 44.00 3rd Qu.:3.447e+11 3rd Qu.:11352985
Max.   :0.3991 Max.   :400.00  Max.   :3.550e+12 Max.   :84979990
NA's    :46
    gdp_pc_nc
Min.   : 4854
1st Qu.:15103
```

```
Median :22224  
Mean   :23761  
3rd Qu.:29362  
Max.   :90512
```

Oppgave 13

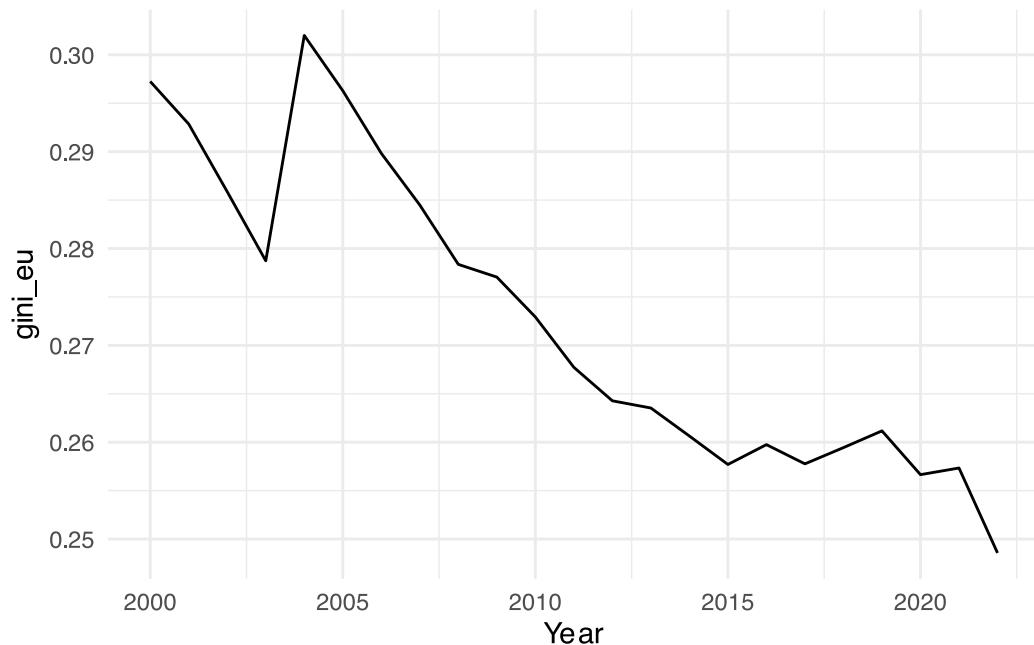
Oppgave 14

Oppgave 15

Oppgave 16

Oppgave 17

Oppgave 18



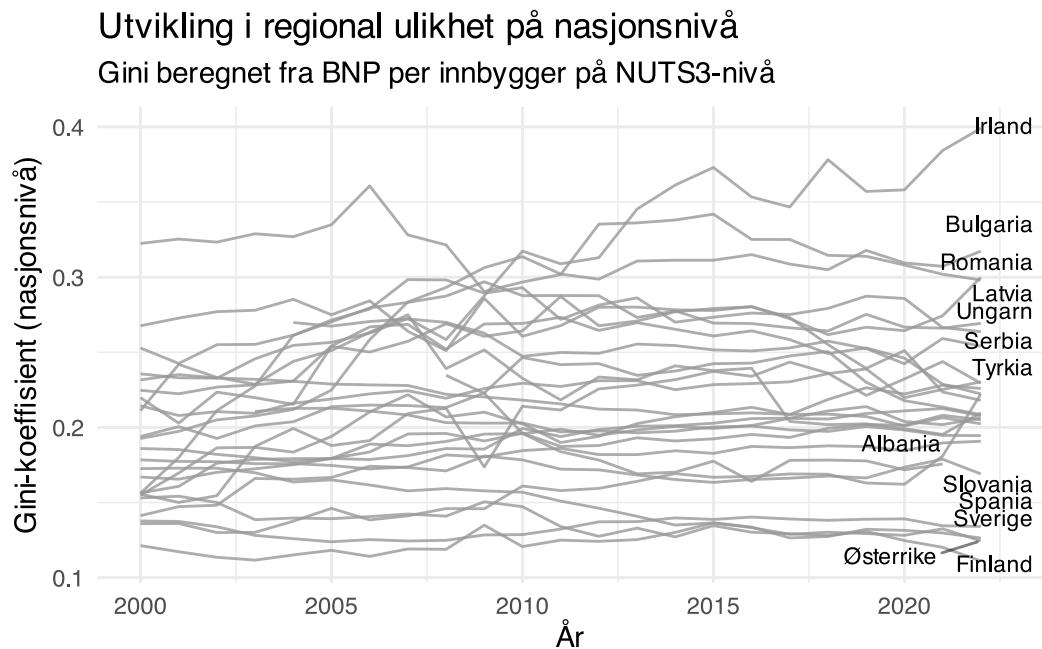
Oppgave 19

Figuren viser at den regionale ulikheten målt ved Gini-koeffisienten på NUTS3-nivå, har hatt en fallende trend over tid. Dette kan tyde på at forskjellene mellom regioner har blitt noe mindre, og er i tråd med målsettingene bak EUs politikk. Samtidig må vi være litt kritisk til konklusjonen, ettersom utviklingen også kan påvirkes av andre faktorer som økonomiske konjunkturer, strukturelle endringer og endringer i datagrunnlaget.

Oppgave 20

Oppgave 21

Warning: ggrepel: 14 unlabeled data points (too many overlaps). Consider increasing max.overlaps



Oppgave 22

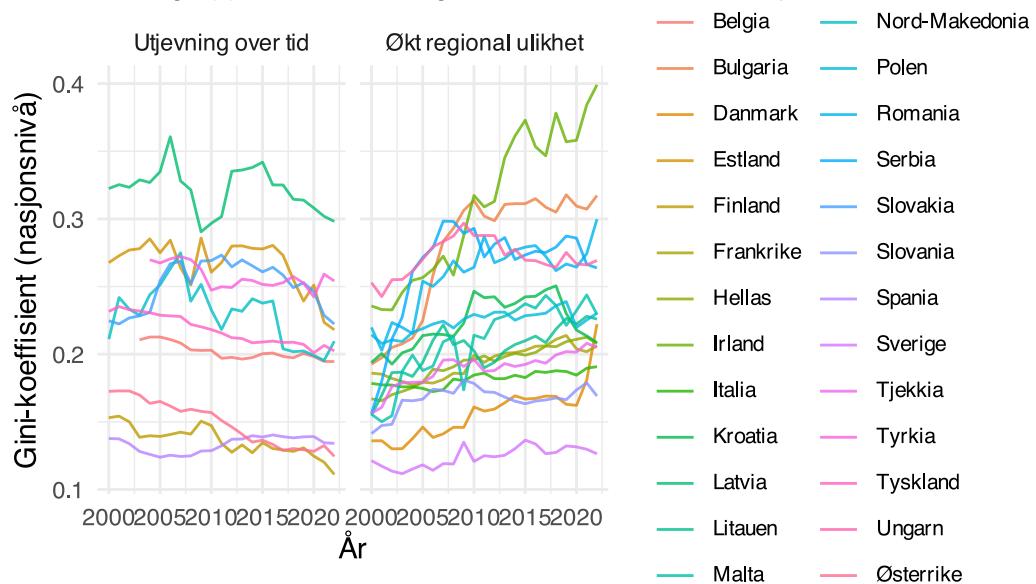
Land	Gini (2022)	Antall NUTS3-regioner	BNP per innbygger
Finland	0.111	19	38,436
Østerrike	0.124	35	44,270
Sverige	0.126	21	41,440
Spania	0.134	59	31,609
Slovenia	0.169	12	32,060
Italia	0.191	107	35,225
Belgia	0.195	44	42,699
Tyskland	0.202	400	42,369
Tjekkia	0.205	14	32,151
Frankrike	0.206	100	35,306
Hellas	0.208	52	24,099
Kroatia	0.209	21	25,884
Nord-Makedonia	0.210	8	15,087
Estland	0.218	5	30,348
Danmark	0.222	11	47,768
Slovakia	0.222	8	25,651
Litauen	0.226	10	31,655
Malta	0.229	2	37,802
Polen	0.230	73	28,152
Tyrkia	0.254	81	24,510
Serbia	0.264	25	16,444
Ungarn	0.269	20	27,596
Latvia	0.298	5	24,929
Romania	0.300	42	26,441
Bulgaria	0.317	28	22,452
Irland	0.399	8	85,531

Oppgave 23

1

Utvikling i regional ulikhet på nasjonsnivå

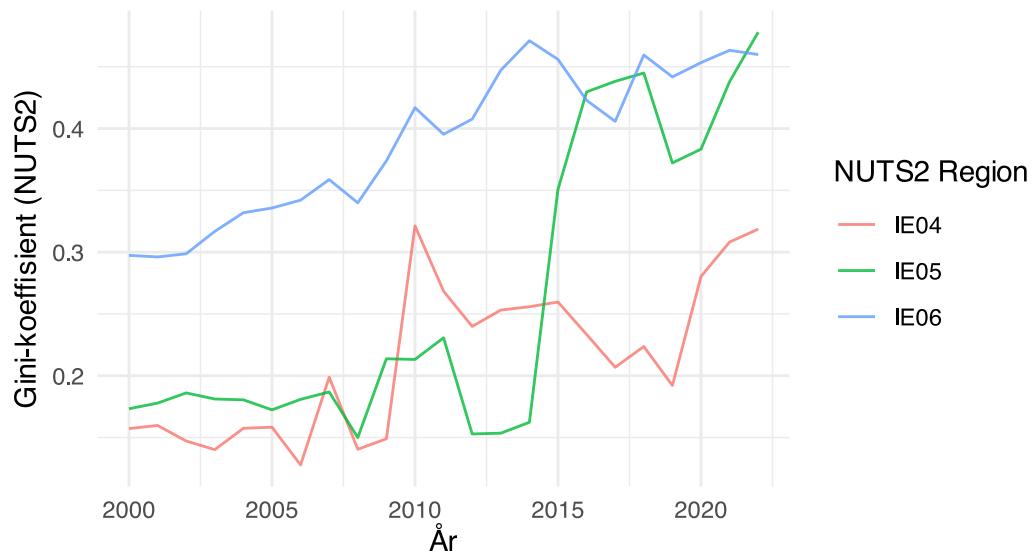
Land gruppert etter endring i Gini fra første observasjonsår til 2022



Oppgave 24

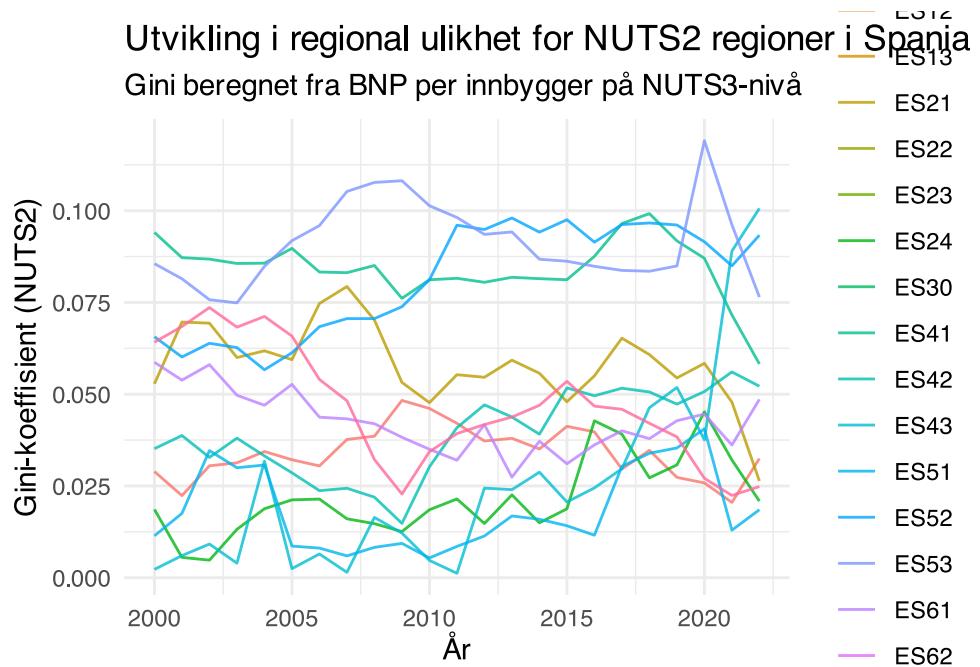
Utvikling i regional ulikhet for NUTS2 regioner i Irland

Gini beregnet fra BNP per innbygger på NUTS3-nivå



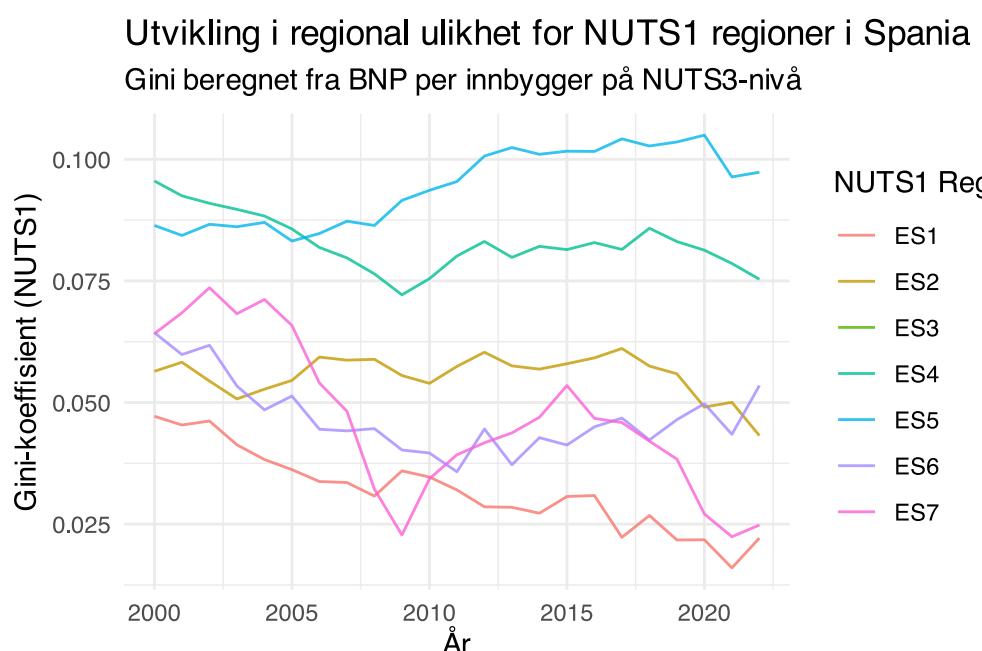
Oppgave 25

```
Warning: Removed 184 rows containing missing values or values outside the
scale range
(`geom_line()`).
```

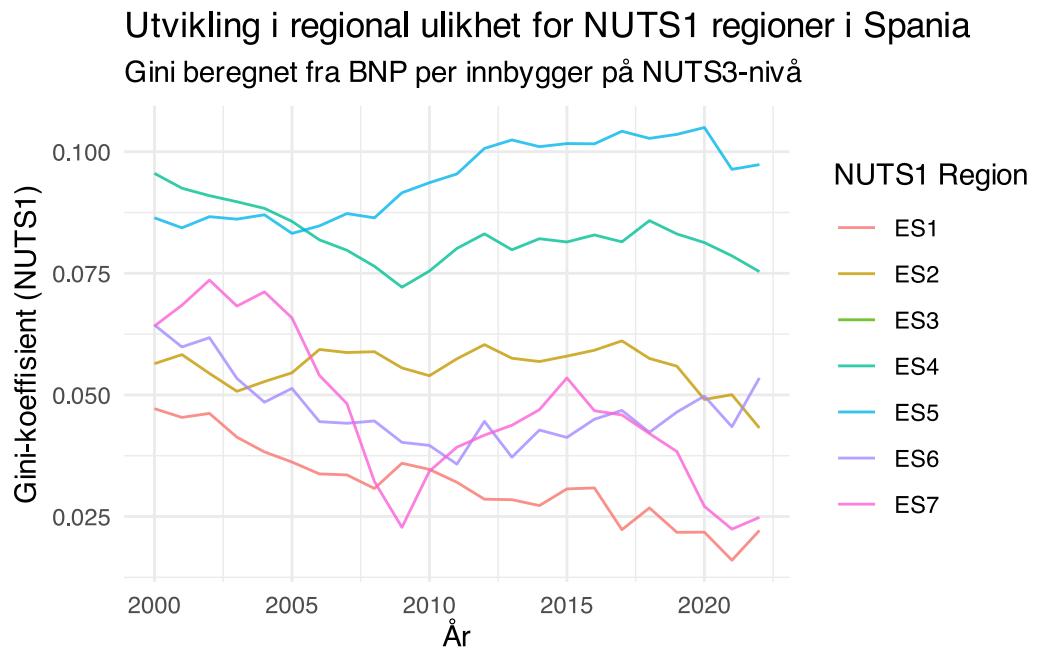


Oppgave 26

```
Warning: Removed 23 rows containing missing values or values outside the
scale range
(`geom_line()`).
```



```
Warning: Removed 23 rows containing missing values or values outside the
scale range
(`geom_line()`).
```



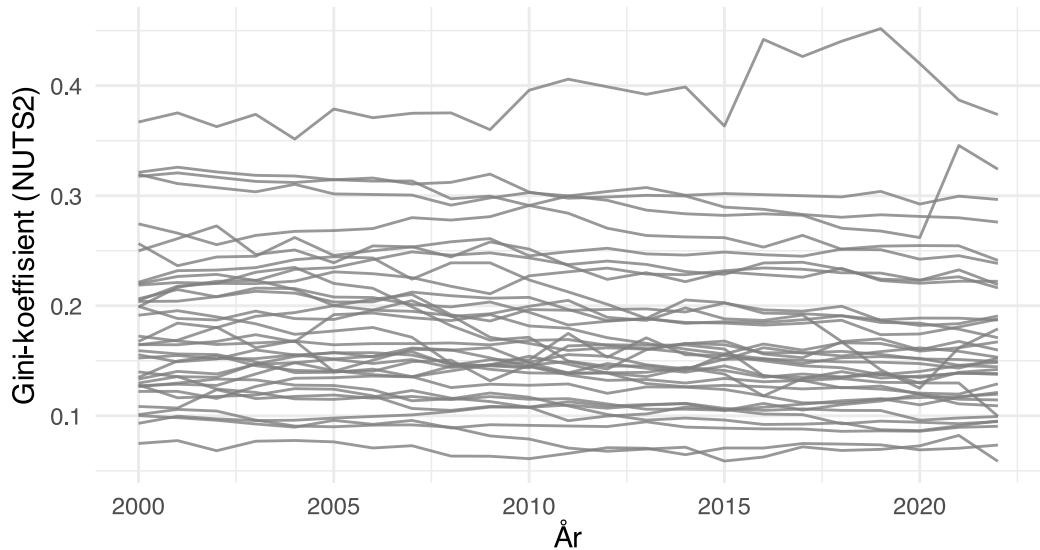
Som vi kan se i grafen over har flesteparten av NUTS1 regionene i Spania hatt en økt utgjevning i perioden 2000-2022. Dette er når GINI koefisienten har en nedgående trend over en årekke. ES5 skiller seg ut da den har vist en økning i forskjell. I 2000 var GINI 0,08, og i år 2022 var den på 0,1.

Oppgave 27

```
Warning: Removed 46 rows containing missing values or values outside the
scale range
(`geom_line()`).
```

Utvikling i regional ulikhet for NUTS2 regioner i Tyskland

Gini beregnet fra BNP per innbygger på NUTS3-nivå



NUTS2 Region	År	Gini Koeffisient	Befolking (NUTS2)	BNP per innbygger (NUTS2)
DE91	2022	0.3737	1,601,160	45,253
DEB3	2022	0.3241	2,078,320	42,277
DE21	2022	0.2965	4,765,540	61,907
DE71	2022	0.2760	4,057,360	52,661
DE25	2022	0.2412	1,791,490	46,161
DE23	2022	0.2385	1,125,240	44,527
DEA2	2022	0.2222	4,500,270	43,804
DE24	2022	0.2192	1,067,860	39,251
DE26	2022	0.2163	1,327,440	41,334

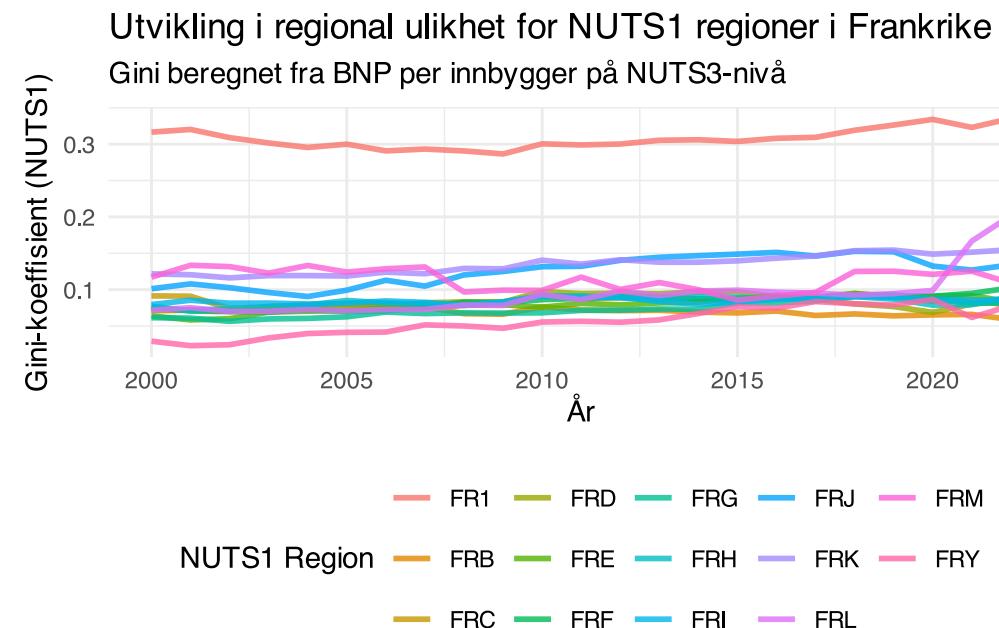
I tabellen over er NUTS regionene som hadde en GINI verdi over 0,2 i 2022 filtrert ut. Dette gir en oversikt over hvilken regioner som har størst ulikhet mellom sine NUTS3 regioner. Av disse 9 regionene ligger DE21, DE25, DE23, DE24 og DE26 i Bayern NUTS1 regionen. Dette indikerer at i Tyskland finner man størst ulikhet i den sør-østlige delen av landet.

Oppgave 28

n1	gini_n1	num_reg_n1
DEB	0.2529	36
DE2	0.2477	96
DE7	0.2394	26
DE9	0.1978	45
DE5	0.1790	2
DE1	0.1726	44
DEA	0.1616	53
DEC	0.1445	6
DEF	0.1421	15
DE4	0.1291	18
DEG	0.1196	22
DED	0.1111	13
DEE	0.0953	14
DE8	0.0947	8
DE3		1
DE6		1

Når vi sammenligner data på NUTS1 nivå med de vi fant på NUTS2 nivå kan vi se lignende trender i en stor spredning i ulket. GINI koefisienten varier fra 0,097 til 0,253 mellom regionene med mest og minst ulikhet.

Oppgave 29



oppgave 30

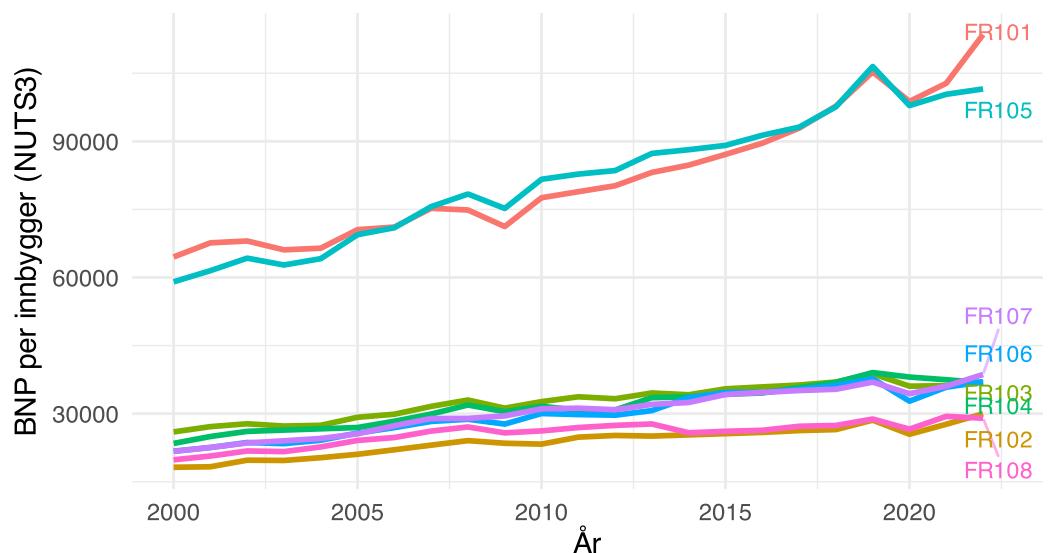
NUTS1 Region	Gini Koeffisient (2022)	Antall NUTS3-regioner	Befolknings (NUTS1)
FR1	0.3354	8	12,378,100
FRL	0.2018	6	5,160,400
FRK	0.1549	12	8,171,500
FRJ	0.1341	13	6,078,700
FRM	0.1091	2	351,000
FRF	0.1025	10	5,574,700

Regionen FR1 har en Gini-koeffisient på 0.3354, som er surevent høyere enn den nest høyeste regionen, FRL (0.2018)

Den sonen som opplever størst ulikhet er ile de france, som er sentrert rundt Paris området. Dette tilsier at områdene med størt ulikhet er rundt Frankrikes hovedstad.

Oppgave 31

Utvikling i BNP per innbygger for NUTS3 regioner i FR1 (Île
Gini (FR1, 2022) var 0.3354



NUTS3 Region	År	BNP per innbygger (2022)	Befolknings (NUTS3)
FR101	2022	113,523	2,123,800
FR105	2022	101,546	1,644,400
FR107	2022	38,625	1,424,600
FR106	2022	37,017	1,682,500
FR103	2022	36,897	1,465,000
FR104	2022	36,840	1,322,400

#Oppgave 32

I disse illustrasjonene kan vi se at det er to NUTS3 regioner som bidrar til FR1 sin høye GINI verdi. FR101 og FR105 skiller seg kraftig ut fra de andre NUTS3 regionene, med omtrent 3 ganger så mye som den tredje på listen. FR101 er NUTS3 regionen til Paris, mens FR105 er Seine-et-Marne, som er et departement øst for Paris. Det tyder sterkt på at ulikhet i og rundt hovedstaden er hovedårsaken til FR1 sin høye grad av ulikhet.

#Oppgave 33

```
[1] 218
```

Oppgave 34

Oppgave 35

Oppgave 36

Oppgave 37

```
# A tibble: 1 × 2
  n1    min_r_sq
  <chr>   <dbl>
1 ITH    0.000102
```

```
# A tibble: 1 × 2
  n1    max_r_sq
  <chr>   <dbl>
1 PL8    0.772
```

Oppgave 38

```
# A tibble: 1 × 2
  n1    max_koeffisient
  <chr>           <dbl>
1 BG3        0.0000122
```

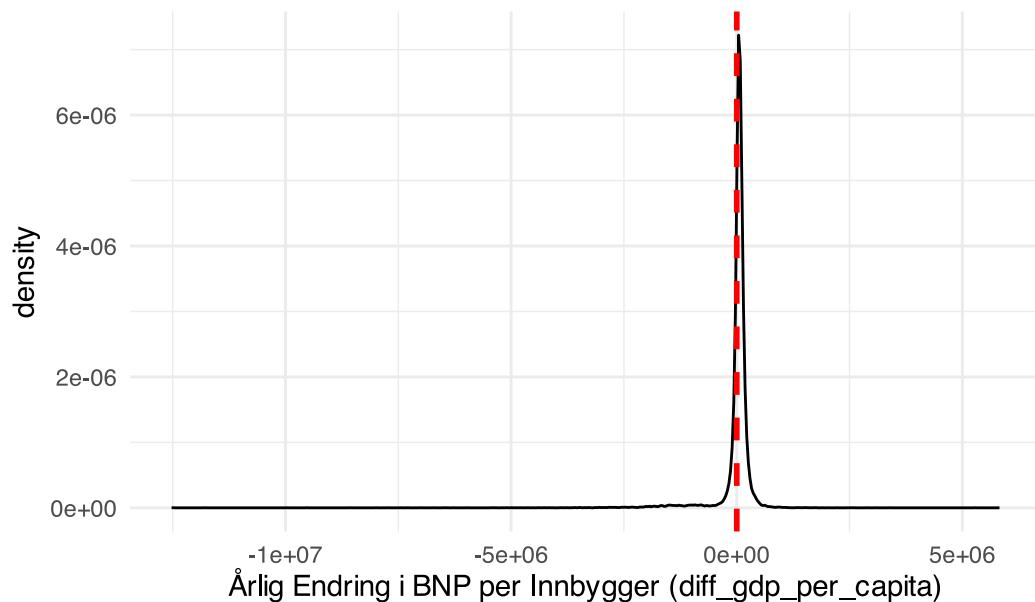
Oppgave 39

```
[1] "Antall signifikante koeffisienter (p < 0.05): 162"
```

162 av regionene viser et signifikant nivå

Oppgave 40

Density Plot av Endring i BNP per Innbygger



Oppgave 41

```
[1] "Antall positive koeffisienter: 132"
```

Oppgave 42

```
`summarise()` has grouped output by 'nc_name'. You can override using the
`.groups` argument.
```

```
# A tibble: 218 × 4
# Groups: nc_name [27]
  nc_name n2    gjennomsnitt      median
  <chr>   <chr>     <dbl>        <dbl>
1 Albania AL01 -0.00000888 -0.00000888
2 Albania AL02 -0.0000188  -0.0000188 
3 Albania AL03  0.00000970  0.00000970
4 Belgia  BE21 -0.00000150 -0.00000150
5 Belgia  BE22 -0.00000312 -0.00000312
6 Belgia  BE23  0.00000202  0.00000202
7 Belgia  BE24  0.00000132  0.00000132
8 Belgia  BE25  0.000000207 0.000000207
9 Belgia  BE32 -0.00000178 -0.00000178
10 Belgia BE33 -0.000000486 -0.000000486
# i 208 more rows
```

```
[1] "Mean: 8e-07"
```

```
[1] "Median: 5e-07"
```

Oppgave 43

```
One Sample t-test

data: koeffisient_verdier
t = 3.7658, df = 217, p-value = 0.0001069
alternative hypothesis: true mean is greater than 0
95 percent confidence interval:
 4.583272e-07      Inf
sample estimates:
mean of x
8.16482e-07
```

T verdien som kommer frem av testen er 3,76. Det kommer frem at dette er signifikant høyere enn 0.

Oppgave 44

Oppgave 45

```
Oneway (individual) effect Within Model

Call:
plm(formula = diff_gini_nuts2 ~ diff_gdp_per_capita, data = panel_data,
     index = c("n3", "time"))

Unbalanced Panel: n = 1186, T = 13-23, N = 26700

Residuals:
    Min.   1st Qu.   Median   3rd Qu.   Max. 
-37.335219 -0.559292 -0.035798  0.505712 27.300139

Coefficients:
            Estimate Std. Error t-value Pr(>|t|)    
diff_gdp_per_capita 3.9320e-07 2.4694e-08 15.923 < 2.2e-16 ***
...
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 78060
Residual Sum of Squares: 77291
R-Squared: 0.0098397
Adj. R-Squared: -0.036189
F-statistic: 253.536 on 1 and 25513 DF, p-value: < 2.22e-16
```

I denne analysen finner vi en positiv sammenheng mellom økt økonomisk vekst og ulikhet, Til tross for svært signifikante resultat, har vi en ganske lav forklaringskraft, ettersom R2 verdi bare er 0,009.

Oppgave 46

I den alternative summary modellen blir en spesifikk kovariasjon matrise anvendt til å beregne standardfeil for koefisientene. Målet med denne fremgangsmåten er å sikre at t-verdiene og P-verdiene er gyldige, selv om modellen skulle lide av heteroskedastisitet, som er et vanlig problem i paneldata.

Siden Fixed Effects-estimatet for koeffisienten (Estimate) ikke endres når man korrigerer for heteroskedastisitet, forblir effekten av diff_gdp_per_capita uendret. Imidlertid endres standardfeilene, t-verdiene og F-statistikken.

Dette førte til en reduksjon i den beregnede t-verdien (fra 15.923 til 14.155). Selv om endringene i standardfeil og t-verdi var merkbare, var koeffisienten for diff_gdp_per_capita fortsatt ekstremt statistisk signifikant i begge tilfeller (P-verdi 2.2×10^{-16}). Dette indikerer at konklusjonen om sammenhengen er robust, selv når det korrigeres for heteroskedastisitet.