



DYNREG



CITIZENS AND GOVERNANCE IN A
KNOWLEDGE-BASED SOCIETY

**Dynamic Regions in a Knowledge-Driven Global Economy:
Lessons and Implications for the European Union - DYNREG**

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**Inequalities in income and education and regional
economic growth in western Europe**

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Aim

- to shed light on the *inequality-growth relationship* at a regional level in western Europe

- to examine how *aggregated microeconomic changes* in income and educational distribution affect the evolution of regional economic growth in the EU

- to contribute to *two different strands* within the field of economic growth
 - “stock” and growth
 - “inequality” and growth
 - to determine which of these factors prevails in shaping growth



Structure of the presentation

- Theoretical considerations
 - Income inequality – growth
 - Educational inequality – growth
- Econometric specification
 - Basic model
 - Data
 - Variables
- Regression results
- Conclusion

Theoretical considerations:

income inequality – economic growth

□ Socioeconomic incentives

- Inequality promotes a productive economy by creating incentives and encouraging competition (i.e. Mirrlees 1971; Rebelo 1991) (+)

□ Investments in physical and human capital

- Inequality favours physical capital accumulation (i.e. Keynes 1920; Kaldor 1956) (+)
- The inequality-growth relationship depends on the stage of economic development (i.e. Galor 2000; Galor and Moav 2004)
 - Early stages: investment in physical capital (+)
 - Later stages: investment in human capital (-)
 - *But*, constraints on the credit market gradually diminish

Theoretical considerations:

income inequality – economic growth

□ Innovation

- *Market size effect*: Unequal distribution of income in small consumer markets favours for innovation and growth (Bertola et al. 2006) (-)
- *Price effect*: Rich consumers willing to pay for new goods may lead to higher growth (Bertola et al. 2006) (+)

□ Political economy models

- The higher the income inequality, the higher the rate of taxation:
 - the lower the incentive to invest, and the lower the growth (Bertola 1993) (-) *and/or*
 - the larger the expenditure on public education, the higher the public investment in human capital, and the higher the growth (Saint-Paul and Verdier 1993) (+)

□ Sociopolitical instability

- When gap between rich and poor widens, greater potential for conflict (-)

Theoretical considerations:

educational inequality – economic growth

□ Socioeconomic incentives

- The higher the educational inequality, the higher the individual returns of higher levels of education and training (+)

□ Technological progress

- *Early stages of development: home (or local) environment externality* (Galor and Tsiddon 1997) (+)
 - ➔ Inequality may encourage the highly-educated to increase investment in human capital. Greater equality may generate low levels of investment in human capital traps
- *Later stages of development: global production externality* (-)
 - ➔ As the investment in human capital of the highly-educated increases, the accumulated knowledge trickles down to the less-educated

Econometric specification: basic model

- Impact of inequality on growth
 - Cross-sectional econometric specification

$$Growth_{i,1997-2002} =$$

$$\beta_1' Incpc_{i,1995} + \beta_2' IncIneq_{i,1995} + \beta_3' EducAtt_{i,1995} + \beta_4' EducIneq_{i,1995} + \beta_5' x_{i,1997} + \varepsilon_{i,1997}$$

- Panel data econometric specification

$$Growth_{i,t-(t+2)} =$$

$$\beta_1' Incpc_{i,t-2} + \beta_2' IncIneq_{i,t-2} + \beta_3' EducAtt_{i,t-2} + \beta_4' EducIneq_{i,t-2} + \beta_5' x_{it} + u_{it}$$

- Cross-sectional *versus* panel data analysis
- Endogeneity
 - Lagged explanatory variables
- Estimators
 - OLS and REs: in theory, long-run impact
 - FEs: in theory, short-run impact

Econometric specification: data and variables

- Sources of data:
 - ECHP
 - 104,953 – 124,663 individuals (1994-2001)
 - 102 regions (NUTS I and II)
 - Eurostat
- Main independent variables
 - Income distribution (average & inequality)
 - Income for the population as a whole
 - Income for normally working people (15+ hours/week)
 - Educational distribution (average & inequality)
 - Education level completed
 - less than the second stage of secondary education
 - second stage of the secondary education
 - a recognised higher education degree

Main Variables	Description	Year	Mean	Std. Dev.	Min	Max	Sources
Regional economic growth	(a) Five-year regional economic growth (1997-2002)	1997-2002	0.2586	0.0814	0.0906	0.5101	EUROSTAT
	(b) Two-year regional economic growth	Average (1996-2002)	0.0990	0.0445	0.0057	0.2686	
Natural logarithm of income per capita	(a) Natural logarithm of income per capita for the whole of the population (/1000)	1995	2.2035	0.4089	1.2239	2.9406	ECHP
		2000	2.4670	0.4443	1.3998	3.0512	
	(b) Natural logarithm of income per capita for normally working (15+ hours/week) people (/1000)	1995	2.5231	0.3469	1.5976	3.3473	
		2000	2.7491	0.3768	1.7584	3.3781	
Income inequality	(a) Income inequality for the whole of the population (Theil index)	1995	0.4162	0.1571	0.1750	0.8296	
		2000	0.3602	0.1365	0.1057	0.7368	
	(b) Income inequality for normally working (15+ hours/week) people (Theil index)	1995	0.2421	0.0754	0.1263	0.4902	
		2000	0.2142	0.0708	0.0569	0.4099	
Educational attainment	Average in education level completed	1995	0.6550	0.2352	0.1223	1.1749	
		2000	0.8050	0.2708	0.1907	1.2345	
Educational inequality	Inequality in education level completed (Theil index)	1995	0.9014	0.4542	0.2123	2.3839	
		2000	0.7176	0.3927	0.1744	2.0223	

Control Variables	Description	Sources
Population ageing	The average age of respondents	ECHP
Work access	(a) The percentage of normally working (15+ hours/week) respondents (b) The percentage of economic activity rate of total population	ECHP EUROSTAT
Unemployment	The percentage of unemployed respondents	ECHP
Inactivity	The percentage of inactive respondents	ECHP
Female's work access	The percentage of female's economic activity rate	EUROSTAT
Road stock (<i>time-invariant</i>)	The average of the length of road-motorways per square kilometres (1995-2000)	EUROSTAT
Rail capital (<i>time-invariant</i>)	The average of the length of railways per square kilometres (1995-2000)	EUROSTAT
Urbanisation (<i>time-invariant</i>)	The percentage of respondents who live in a densely populated area (1999-2000)	ECHP
<i>Welfare State</i>		Esping-Andersen (1990), Ferrera (1996), Berthoud and Iacovou (2004)
Socialism (social-democratic)	Sweden, Denmark	
Liberal	United Kingdom, Ireland	
Corporatist (conservatism)	Luxembourg, Belgium, France, Germany, Austria	
Residual ('Southern')	Portugal, Spain, Italy, Greece	
<i>Religion</i>		http://www.cia.gov http://csi-int.org ; http://www.wikipedia.org/
Mainly Protestant	Sweden, Denmark, Northern Germany, Scotland	
Mainly Catholic	France, Ireland, Luxembourg, Portugal, Spain, Italy, Austria, Southern Germany, Belgium	
Mainly Orthodox	Greece	
Mainly Anglicans	England	
<i>Family Structure</i>		Berthoud and Iacovou (2004)
Nordic (Scandinavian)	Sweden, Denmark	
North/Central	UK, Belgium, Luxembourg, France, Germany, Austria	
Southern/Catholic	Ireland, Portugal, Spain, Italy, Greece	

Regression results: cross-sectional analysis

Cross-sectional: OLS	Without control variables			Time-variant control variables			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Two-year lag of natural logarithm of income per capita	-0.0617 (0.0259)**		0.0639 (0.0359)*	0.0707 (0.0374)*	0.0559 (0.0371)	0.0322 (0.0408)	0.0504 (0.0370)
Two-year lag of income inequality	0.1013 (0.0673)		0.2551 (0.0712)***	0.2258 (0.0903)**	0.3454 (0.0937)***	0.3585 (0.1060)***	0.2362 (0.1111)**
Two-year lag of educational attainment		0.0957 (0.0703)	0.2511 (0.0810)***	0.2721 (0.0857)***	0.2066 (0.0912)**	0.2556 (0.0980)**	0.2899 (0.0989)***
Two-year lag of educational inequality		0.1434 (0.0364)***	0.2189 (0.0433)***	0.2336 (0.0485)***	0.2040 (0.0506)***	0.1993 (0.0533)***	0.2361 (0.0529)***
Population ageing				0.0006 (0.0042)	0.0056 (0.0043)	0.0033 (0.0042)	-0.0015 (0.0049)
Work access (source: ECHP)				-0.1121 (0.1656)			
Work access (source: Eurostat)					0.0036 (0.0022)		
Unemployment						-0.4971 (0.3158)	
Inactivity							0.5565 (0.2484)**
Female's work access						0.0014 (0.0021)	0.0030 (0.0020)
R-squared	0.2064	0.3047	0.3924	0.3968	0.4508	0.4570	0.4740
Observations	94	94	94	94	84	84	84

Cross-sectional: OLS	Time-variant and time-invariant control variables				
	(8)	(9)	(10)	(11)	(12)
Two-year lag of natural logarithm of income per capita	0.1390 (0.0663)**	-0.0505 (0.0706)	0.0287 (0.0656)	0.0704 (0.0462)	0.0569 (0.0546)
Two-year lag of income inequality	0.3859 (0.1380)***	0.4958 (0.1464)***	0.4061 (0.1130)***	0.3180 (0.1102)***	0.3273 (0.1158)***
Two-year lag of educational attainment	0.3156 (0.1591)*	0.3280 (0.1267)**	0.2402 (0.0989)**	0.2624 (0.1011)**	0.2674 (0.1004)***
Two-year lag of educational inequality	0.2179 (0.0724)***	0.1450 (0.0647)**	0.1877 (0.0560)***	0.2236 (0.0545)***	0.2123 (0.0571)***
Population ageing		0.0067 (0.0057)	0.0052 (0.0044)	0.0027 (0.0046)	0.0027 (0.0044)
Unemployment		-0.7674 (0.4959)	-0.3508 (0.3754)	-0.2183 (0.3560)	-0.4554 (0.3273)
Female's work access		0.0034 (0.0026)	0.0007 (0.0021)	0.0011 (0.0021)	0.0016 (0.0021)
Road stock (fixed)	1.0722 (1.3027)				
Rail capital (fixed)	-1.2667 (0.6662)*				
Urbanisation (fixed)		0.0843 (0.0510)			
Liberal			-0.0016 (0.0759)		
Corporatist			-0.0316 (0.0711)		
Residual			-0.0544 (0.0948)		
Mainly Catholic				0.0366 (0.0268)	
Mainly Orthodox				0.0989 (0.0481)**	
Mainly Anglicans				0.0405 (0.0302)	
North/Central family structure					0.0068 (0.0718)
Southern/Catholic family structure					0.0365 (0.0921)
R-squared	0.4328	0.4562	0.4773	0.4891	0.4607
Observations	34	53	84	84	84

Regression results: panel data analysis

Panel data: OLS	Without control variables			Time-variant control variables			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Two-year lag of natural logarithm of income per capita	-0.0269 (0.0107)**		0.0190 (0.0147)	0.0287 (0.0153)*	0.0184 (0.0152)	0.0186 (0.0172)	0.0171 (0.0151)
Two-year lag of income inequality	0.0101 (0.0271)		0.0917 (0.0272)***	0.0455 (0.0333)	0.0903 (0.0344)***	0.0739 (0.0377)*	0.0447 (0.0397)
Two-year lag of educational attainment		0.0574 (0.0196)***	0.0858 (0.0216)***	0.1018 (0.0229)***	0.0911 (0.0262)***	0.0992 (0.0260)***	0.1053 (0.0258)***
Two-year lag of educational inequality		0.0734 (0.0127)***	0.0860 (0.0148)***	0.1047 (0.0167)***	0.0956 (0.0178)***	0.0996 (0.0190)***	0.0995 (0.0171)***
Population ageing				-0.0024 (0.0017)	-0.0001 (0.0017)	-0.0002 (0.0017)	-0.0029 (0.0021)
Work access (source: ECHP)				-0.1598 (0.0701)**			
Work access (source: Eurostat)					0.0000 (0.0008)		
Unemployment						-0.0109 (0.1220)	
Inactivity							0.2312 (0.1095)**
Female's work access						-0.0005 (0.0007)	0.0003 (0.0008)
R-squared	0.0720	0.2015	0.2468	0.2686	0.2712	0.2734	0.2917
Observations	204	196	196	196	180	180	180
LM test	9.15 (0.0025)	5.57 (0.0182)	8.97 (0.0027)	6.76 (0.0093)	8.17 (0.0043)	7.92 (0.0049)	9.57 (0.0020)
Hausman test	5.55 (0.0623)	3.77 (0.1588)	18.76 (0.0009)	33.95 (0.0000)	26.11 (0.0002)	56.84 (0.0000)	33.87 (0.0000)

Panel data: OLS	Time-variant and time-invariant control variables				
	(8)	(9)	(10)	(11)	(12)
Two-year lag of natural logarithm of income per capita	0.0872 (0.0315)***	-0.0263 (0.0283)	-0.0057 (0.0221)	0.0505 (0.0190)***	0.0025 (0.0211)
Two-year lag of income inequality	0.2366 (0.0565)***	0.0627 (0.0555)	0.1103 (0.0384)***	0.0623 (0.0389)	0.0887 (0.0398)**
Two-year lag of educational attainment	0.0479 (0.0578)	0.0694 (0.0342)**	0.0539 (0.0304)*	0.0577 (0.0304)*	0.0775 (0.0271)***
Two-year lag of educational inequality	0.0815 (0.0304)***	0.0485 (0.0242)**	0.0716 (0.0200)***	0.1007 (0.0211)***	0.0843 (0.0197)***
Population ageing		0.0010 (0.0023)	0.0018 (0.0017)	-0.0003 (0.0018)	0.0009 (0.0017)
Unemployment		-0.0883 (0.2165)	0.0834 (0.1382)	0.2672 (0.1379)*	0.0076 (0.1257)
Female's work access		0.0008 (0.0009)	-0.0001 (0.0008)	-0.0002 (0.0007)	0.0001 (0.0008)
Road stock (fixed)	-0.1788 (0.5488)				
Rail capital (fixed)	-0.3848 (0.2953)				
Urbanisation (fixed)		0.0265 (0.0201)			
Liberal			0.0373 (0.0176)**		
Corporatist			0.0199 (0.0165)		
Residual			-0.0113 (0.0260)		
Mainly Catholic				0.0115 (0.0103)	
Mainly Orthodox				0.0663 (0.0205)***	
Mainly Anglicans				0.0296 (0.0111)***	
North/Central family structure					0.0329 (0.0165)**
Southern/Catholic family structure					0.0171 (0.0259)
R-squared	0.3207	0.1995	0.3343	0.3365	0.3003
Observations	74	110	180	180	180
LM test	7.81 (0.0052)	5.86 (0.0155)	9.64 (0.0019)	8.38 (0.0038)	8.45 (0.0036)

Panel data: FEs	Without control variables			With time-variant control variables			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Two-year lag of natural logarithm of income per capita	-0.1193 (0.0501)**		-0.3032 (0.1127)***	-0.1760 (0.1104)	-0.2478 (0.1153)**	-0.1510 (0.1063)	-0.2208 (0.1131)*
Two-year lag of income inequality	0.2690 (0.1505)*		0.2690 (0.1326)**	0.0989 (0.1314)	0.1438 (0.1375)	0.0293 (0.1266)	0.0935 (0.1376)
Two-year lag of educational attainment		0.1139 (0.0706)	0.2453 (0.0924)***	0.2041 (0.0880)**	0.2709 (0.0966)***	0.2181 (0.0900)**	0.2935 (0.0948)***
Two-year lag of educational inequality		0.1639 (0.0650)**	0.1300 (0.0634)**	0.1187 (0.0593)**	0.1244 (0.0664)*	0.1098 (0.0607)*	0.1386 (0.0648)**
Population ageing				-0.0223 (0.0084)***	-0.0236 (0.0089)***	-0.0150 (0.0083)*	-0.0231 (0.0090)**
Work access (source: ECHP)				-0.7997 (0.2655)***			
Work access (source: Eurostat)					-0.0075 (0.0044)*		
Unemployment						1.3112 (0.3674)***	
Inactivity							-0.0521 (0.3421)
Female's work access						-0.0111 (0.0035)***	-0.0114 (0.0040)***
R-within	0.0715	0.0960	0.1929	0.3121	0.2606	0.4056	0.3100
Observations	204	196	196	196	180	180	180

Conclusions

- *Given existing levels of inequality*, an increase in a region's income and educational inequality has a positive and significant association with subsequent economic growth.
- The association between *income per capita* and regional growth is not clear.
- *Educational achievement* has a positive relationship with regional economic growth.
- The association between inequality in education and growth is stronger than that between growth and educational attainment.
- Existing income and human capital inequality are likely to increase growth, but the *magnitude* of their impact is relatively small
- The findings are *robust* to the definition of income distribution and across inequality measurements