Earnings dynamics, foreign workers and the stability of inequality trends in Luxembourg, 1988-2009

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Context

- the rise in income inequality - global policy concern
- the rise in *earnings* inequality - key driver of the growth in family income inequality
  - globalization and skill-biased technological change have amplified returns to skills => main forces behind increasing earnings inequality in the last three decades
  - role of labour market institutions in curtailing inequality increases

Context

- much of the empirical literature - long-term changes in earnings inequality reflect an increase in persistent wage differentials between workers or increased transitory variations
  - the former - consistent with explanations related with increasing returns to skills and education
  - the latter - increased labour market risks and volatility

  (e.g., Abowd and Card (1989), Moffitt and Gottschalk (1995, 1998, 2002, 2011), Baker (1997), Dickens (2000), Haider (2001), Baker and Solon (2003), Ramos (2003), Kalwij and Alessie (2007), Cappellari (2004), Biewen (2005), Gustavsson (2007, 2008), Meghir and Pistaferri (2011), Sologon and O'Donoghue (2012))
- most studies with a long time-series dimension - permanent inequality increased in most industrialized countries between the 1970s/1980s and the 1990s/2000s both in Europe and North America (except Sweden)

Contribution

- trends in permanent and transitory earnings inequality among male workers in Luxembourg between 1988 and 2009
- originality - three-fold :
  - (1) a large-scale administrative dataset on earnings and employment => a flexible model of earnings dynamics that nests many specification recently used (a wide range of dynamics – age, cohort and time variations in both earnings components)
    - complete coverage of the working-age population, spanning 22 years $\approx$ 370,000 men (>3 million person-year observations), with very low reporting or recollection error and no selective attrition (other than migration or death)
    - top-coding correction through a multiple imputation procedure

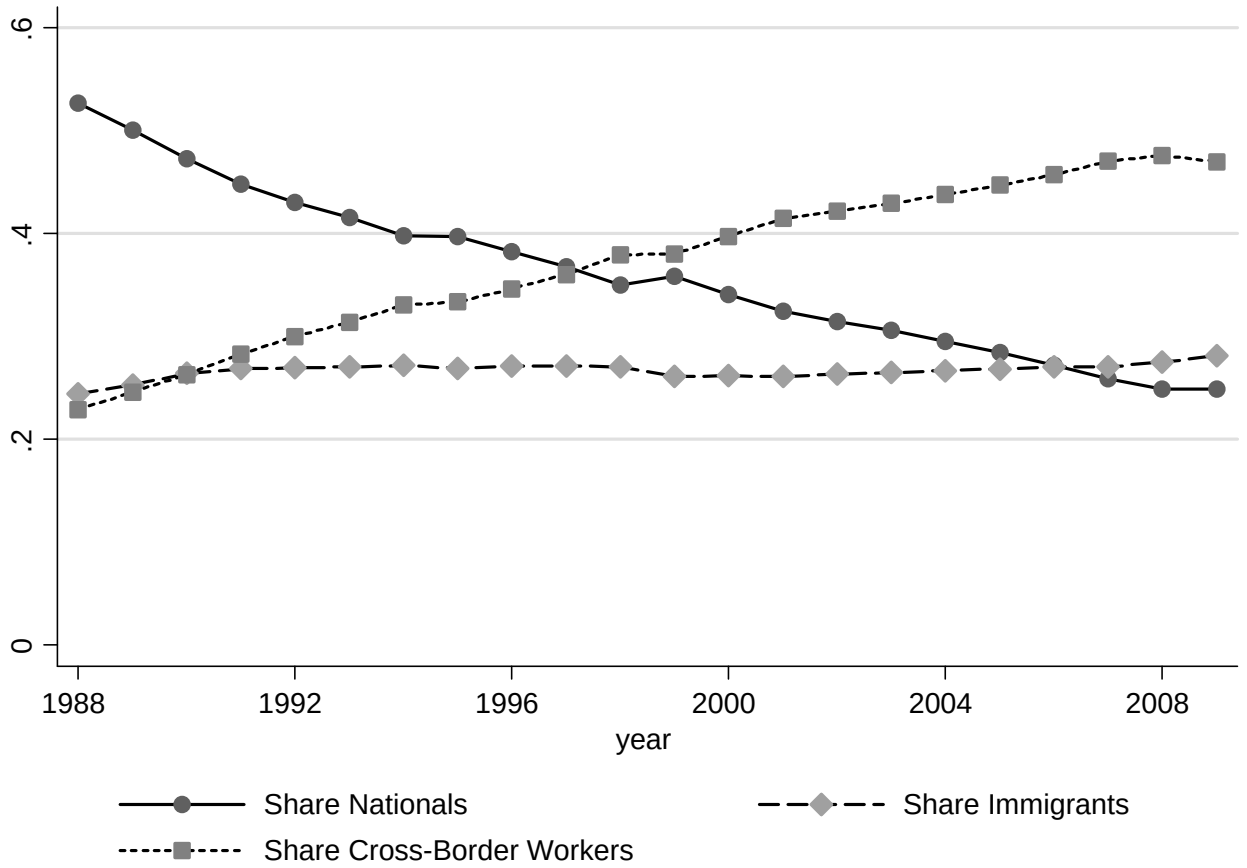
Contribution

- originality - three-fold (contnd) :
  - (2) owing to the scale of our data - distinguish trends for natives and foreign workers by estimating models separately for each subgroup => estimate their contribution to the overall inequality trends (and its components), disentangling trends in within-group inequality, between-group differentials and the relative share of each group in total employment

Contribution

- originality - three-fold (contnd) :
  - (3) Luxembourg case study is yet unexplored and is of interest *per se* due to the industrial transition and the magnitude of the concurrent labour market changes over this period
    - period of sustained economic growth and industrial re-development from an industry-driven economy to an economy dominated by the tertiary sector (financial sector in particular)
    - sustained economic growth => increased labour demand (especially for high skilled workers) => massive inflow of foreign workers—immigrants and cross-borders

Contextual background - Luxembourg



Contribution

- originality - three-fold (contnd) :
  - (3) Luxembourg case study is yet unexplored and is of interest *per se* (contnd)
    - rising demand for high skill labour and the limited supply of domestic workers - strong upward pressure on earnings inequality
    - potentially mitigated by :
    - (i) a growth-induced increase in the demand for labour across the overall skill distribution ;
    - (ii) the abundant supply of cross-border workers
    - (iii) strong labour market institutions
    - the trends in earnings inequality in Luxembourg - empirical indication as to whether strong labour market regulation and large foreign labour supply can counterbalance strong inequality increasing pressures.

Preview of our results

- modest increase in earnings inequality despite drastic labour market changes over this period
- net result of more complex underlying changes :
  - marked increases of persistent inequality among cross-border workers and among immigrants
  - growing contribution of foreign workers
  - divergence in persistent differentials between subgroups
  - decrease in earnings instability (primarily for native workers)

Data

- Administrative data (IGSS) - professional career : 1988-2009
- Measure of earnings real log gross hourly wage (adjusted for CPI 2009) (corrected for top-coding)
- Male workers aged 20 to 57, born between 1940 and 1980, recorded working at least once between 1988 and 2009
- Dropped individuals :
  - at least 5 years of inactivity gaps because of disability or who retired before the age of 57 with a disability
- Analysis by 41 birth-year cohorts

Table: Sample Size by Birth Cohort

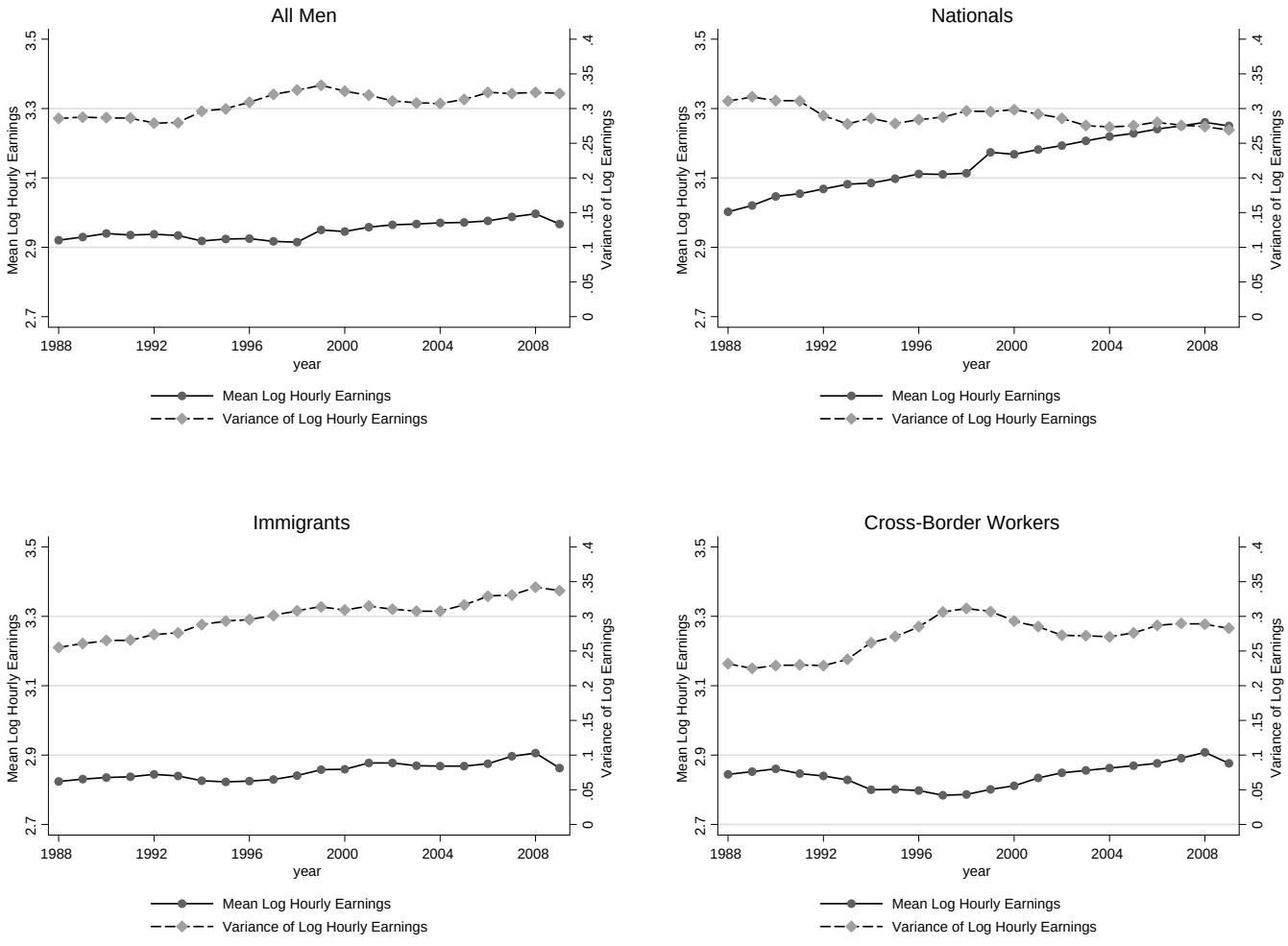
Cohort born in	Persons	Person-years	Years observed	% Persons present in all years	% Observed person-years in theoretical person-years	Year range		Age range	
1940	1982	14832	10	68.57	74.83	1988	1997	48	57
1941	1996	15893	11	65.89	72.39	1988	1998	47	57
1942	2409	18984	12	64.10	65.67	1988	1999	46	57
1943	2629	21434	13	59.07	62.71	1988	2000	45	57
1944	2865	24957	14	60.14	62.22	1988	2001	44	57
1945	2972	27036	15	59.09	60.65	1988	2002	43	57
1946	3782	36983	16	55.81	61.12	1988	2003	42	57
1947	4320	42874	17	54.44	58.38	1988	2004	41	57
1948	4691	48846	18	53.25	57.85	1988	2005	40	57
1949	5038	54614	19	51.38	57.05	1988	2006	39	57
1950	5346	58017	20	49.78	54.26	1988	2007	38	57
1951	5643	64362	21	47.83	54.31	1988	2008	37	57
1952	6361	73236	22	46.53	52.33	1988	2009	36	57
1953	6531	75847	22	46.09	52.79	1988	2009	35	56
1954	7199	82420	22	46.63	52.04	1988	2009	34	55
1955	7377	82045	22	45.08	50.55	1988	2009	33	54
1956	7866	87893	22	44.80	50.79	1988	2009	32	53
1957	8517	94351	22	43.25	50.35	1988	2009	31	52
1958	8995	99613	22	42.60	50.34	1988	2009	30	51
1959	9842	106217	22	41.80	49.06	1988	2009	29	50
1960	10140	107828	22	41.32	48.34	1988	2009	28	49
1961	11145	116668	22	40.28	47.58	1988	2009	27	48
1962	11550	120733	22	40.18	47.51	1988	2009	26	47
1963	12604	130182	22	37.38	46.95	1988	2009	25	46
1964	13351	137151	22	37.09	46.69	1988	2009	24	45
1965	13636	136802	22	33.43	45.60	1988	2009	23	44
1966	13787	133288	22	29.92	43.94	1988	2009	22	43
1967	13949	132386	22	26.69	43.14	1988	2009	21	42
1968	14074	127501	22	22.41	41.18	1988	2009	20	41
1969	13886	120273	21	21.77	41.25	1989	2009	20	40
1970	13857	113777	20	21.27	41.05	1990	2009	20	39
1971	14097	112540	19	20.99	42.02	1991	2009	20	38
1972	13620	102807	18	21.40	41.93	1992	2009	20	37
1973	12978	91822	17	18.64	41.62	1993	2009	20	36
1974	12398	83094	16	18.77	41.89	1994	2009	20	35
1975	11834	75312	15	17.63	42.43	1995	2009	20	34
1976	11548	68404	14	18.40	42.31	1996	2009	20	33
1977	11489	64777	13	20.07	43.37	1997	2009	20	32
1978	11099	57668	12	22.47	43.30	1998	2009	20	31
1979	10971	53147	11	23.80	44.04	1999	2009	20	30
1980	10914	49313	10	26.91	45.18	2000	2009	20	29
Total	369288	3265927							

Solution for top-coded earnings

- impute simulated values for top-coded earnings following Jenkins et al. (2011) - approximate the upper tail of the earnings distribution for each year by the Pareto distribution (see, e.g. Atkinson and Piketty, 2010, Kopczuk et al., 2010, Atkinson et al., 2011, Alfons et al., 2013)
- estimate the parameters of the distribution using ML methods and multiply impute each top-coded earnings observation with $m = 20$ independent random draws from the estimated top income distributions ; drop bottom and top 1% by year
- repeat 20 times $=>$ 20 partially synthetic datasets composed of non-coded and imputed values for top-coded earnings
- all calculations and estimations - replicated on the 20 datasets ; the reported estimates - based on by Reiter (2003).

Trends

Figure: The variance and mean of log hourly earnings, 1988–2009



Model

Model which accommodates fine details of the auto-covariance structure of earnings :

$$r_{it} = \gamma_{1c}\lambda_{1t}\mu_{it} + \gamma_{2c}\lambda_{2t}\upsilon_{it}. \tag{1}$$

$$\mu_{it} = \mu_{i(c+20)} \sim iid(0, \sigma^2_{\mu_{c+20}}) \quad if \ \ t = c + 20 \tag{2}$$

$$\mu_{it} = \mu_{i,t-1} + \pi_{it} \quad if \ \ t > c + 20 \tag{3}$$

$$\pi_{it} \sim iid(0, \sigma^2_{\pi_{t-c}}), E(\mu_{i,t-1}, \pi_{it}) = 0$$

$$\upsilon_{it} = \rho\upsilon_{i,t-1} + \epsilon_{it} + \theta\epsilon_{i,t-1} \tag{4}$$

$$\epsilon_{it} \sim (0, \sigma^2_{\epsilon_{ct}}), \upsilon_{i0} \sim (0, \sigma^2_{c0}).$$

$$\sigma^2_{c0_{leftcensored}} = (1 + \alpha(a_{c0} - 20))\sigma^2_0, c = 1940, ..., 1980 \tag{5}$$

$$\sigma^2_{\epsilon_{ct}} = \beta_0 + \beta_1(a_{ct} - 20) + \beta_2(a_{ct} - 20)^2 + \beta_3(a_{ct} - 20)^3 + \beta_4(a_{ct} - 20)^4 \tag{6}$$

Estimation

- model similar to Kalwij and Alessie (2007), with added features from Baker and Solon (2003) (age-specific heteroskedastic transitory variances), and Ostrovsky (2010) and Moffitt and Gottschalk (2011) for the correction for left-censoring for each cohort in the first year observed.
- parameters θ estimated by fitting the theoretical auto-covariance matrix $f(\theta)$ (determined by the full model specification) onto the empirical covariance structure using *minimum distance methods*
- assessing subgroup contributions :
  – within :

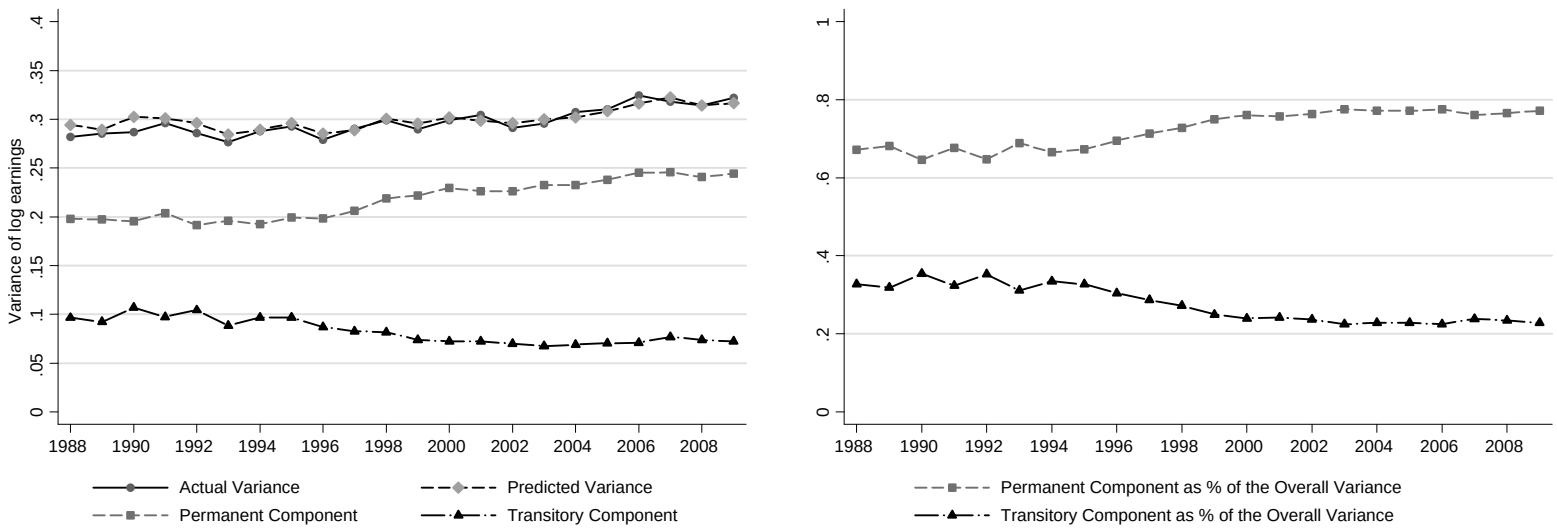
$$\bar{V} = \sum_{g=1}^{k} n_g V_g \tag{7}$$

  – between :

$$B = V - \bar{V}. \tag{8}$$

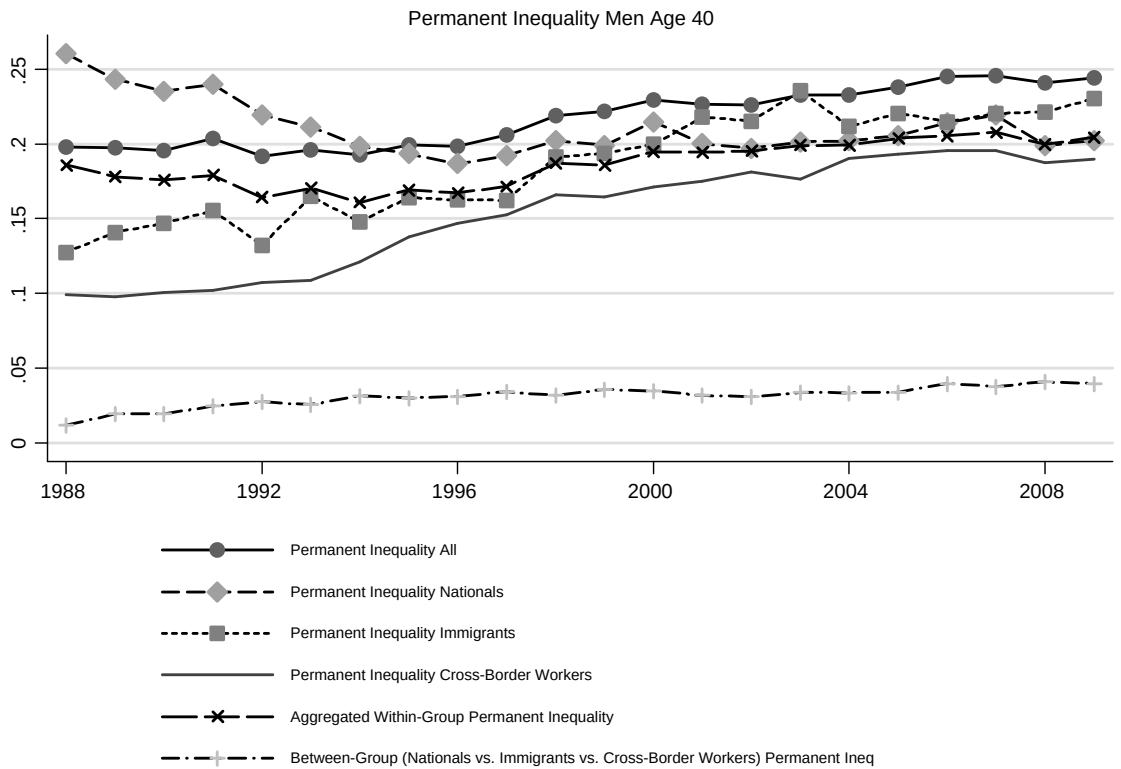
Overall decomposition

Figure: Inequality decomposition all men at age 40



Permanent inequality subgroup decomposition

Figure: Permanent inequality subgroup decomposition : nationals, immigrants and cross-border workers



Transitory inequality

Figure: Transitory inequality : National, immigrants and cross-border workers at age 40

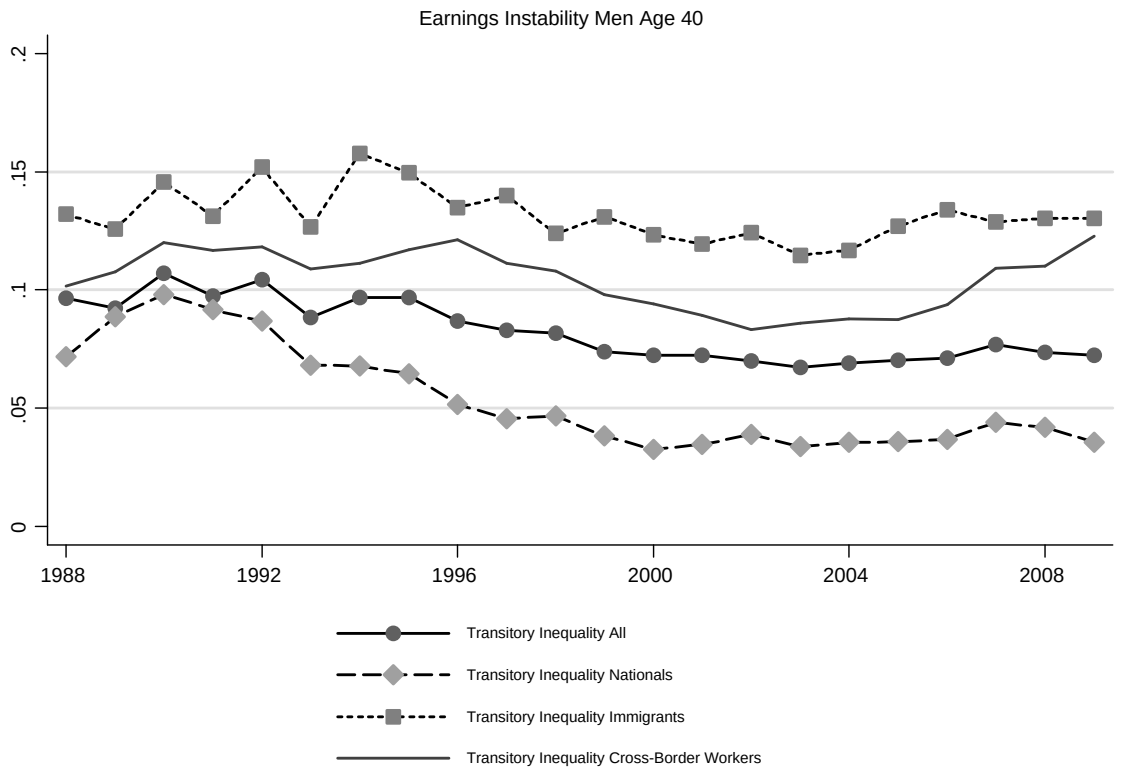
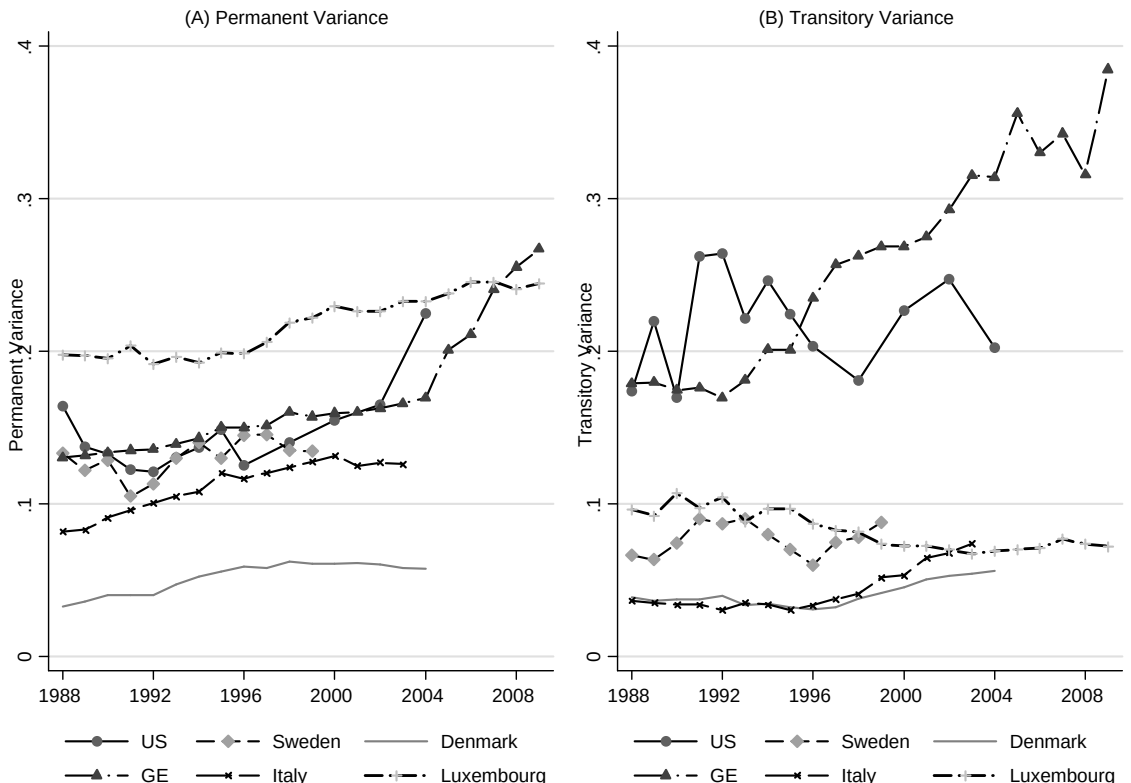


Table: Trend and cyclical variation of the persistent and transitory components

Models	Dependent Variable	Linear trend		Real GDP growth rate		Adjusted R^2
		Est	SE	Est	SE	
All Men	Permanent Variance	0.0032	0.0002	0.1417	0.0352	0.9331
	Transitory Variance	-0.0019	0.0002	-0.0995	0.0417	0.7876
Nationals	Permanent Variance	-0.0011	0.0006	0.1942	0.1063	0.3412
	Transitory Variance	-0.0030	0.0004	-0.0873	0.0812	0.7256
Immigrants	Permanent Variance	0.0053	0.0004	0.0934	0.0840	0.8820
	Transitory Variance	-0.0011	0.0004	-0.1360	0.0670	0.2590
Cross-Border Workers	Permanent Variance	0.0058	0.0003	0.1493	0.0641	0.9360
	Transitory Variance	-0.0012	0.0004	-0.1888	0.0745	0.2668

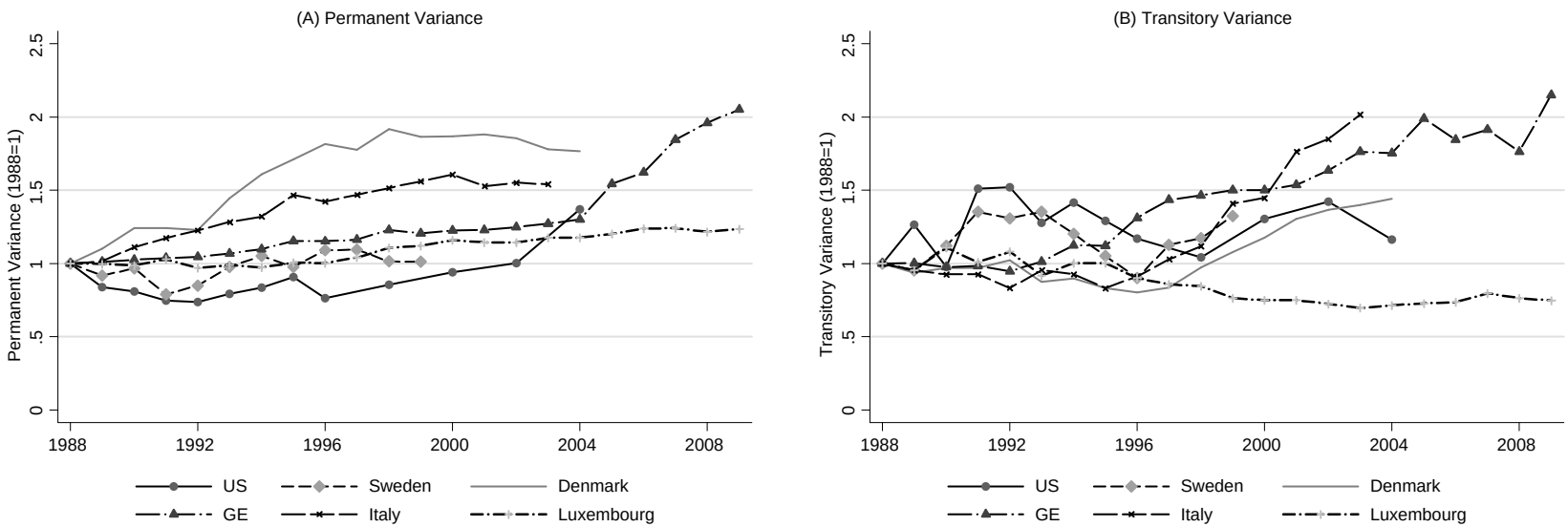
International context

Figure: Evolution of (A) permanent and (B) transitory variance of log earnings for men in the US (1988-2004), Sweden (1988-1999), Denmark (1988-2004), Germany (1988-2009), Italy (1988-2003), and Luxembourg (1988-2009).*(Figure 12, page 29)*



International context

Figure: Relative evolution (1988=100) of (A) permanent and (B) transitory variance of log earnings for men in the US (1988-2004), Sweden (1988-1999), Denmark (1988-2004), Germany (1988-2009), Italy (1988-2003), and Luxembourg (1988-2009).



Concluding remarks

- modest increase in earnings inequality despite drastic labour market changes over this period - net result of more complex underlying changes
- persistent inequality did grow significantly
  - within the cross-border and within the immigrant workers group
  - between the three workers groups => the distribution of skills and jobs - increasingly heterogeneous across the three groups
- the overall inequality growth was contained by
  - decrease in employment share of nationals
  - increase in employment share of foreign workers (with the lowest within-group persistent inequality)
  - decrease in earnings instability
  - overall favourable trends for natives

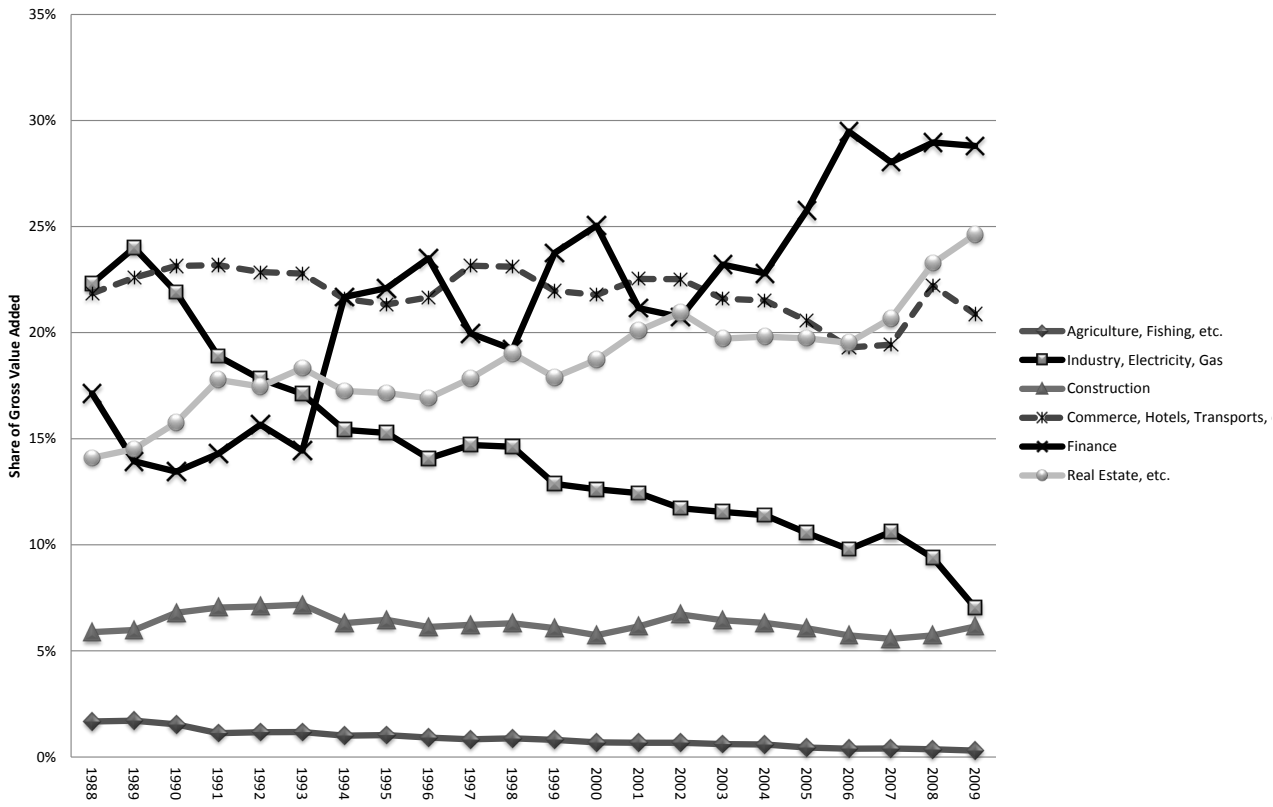
Concluding remarks

- surprising stability of inequality in the face of large changes in the size and structure of employment and fast growth vs. other countries (e.g. Germany)
- results possibly hint at the role of strict labour market regulations and collective bargaining institutions at holding back overall earnings inequality (yet not so much persistent inequality)
- technical note : usefulness of access to large-scale administrative records for inequality trends (detailed analysis within population subgroups and relaxing restrictions on the sophistication of variance component models that can be fit and affect the reliability of inference)

Thank you !

Trends

Figure: Gross value added share contributed by sectors



Source : Calculations based on EUROSTAT data.

Trends

Figure: Decomposition of the variance of log earnings by population subgroups : Native, Immigrant and Cross-Border workers, 1988–2009