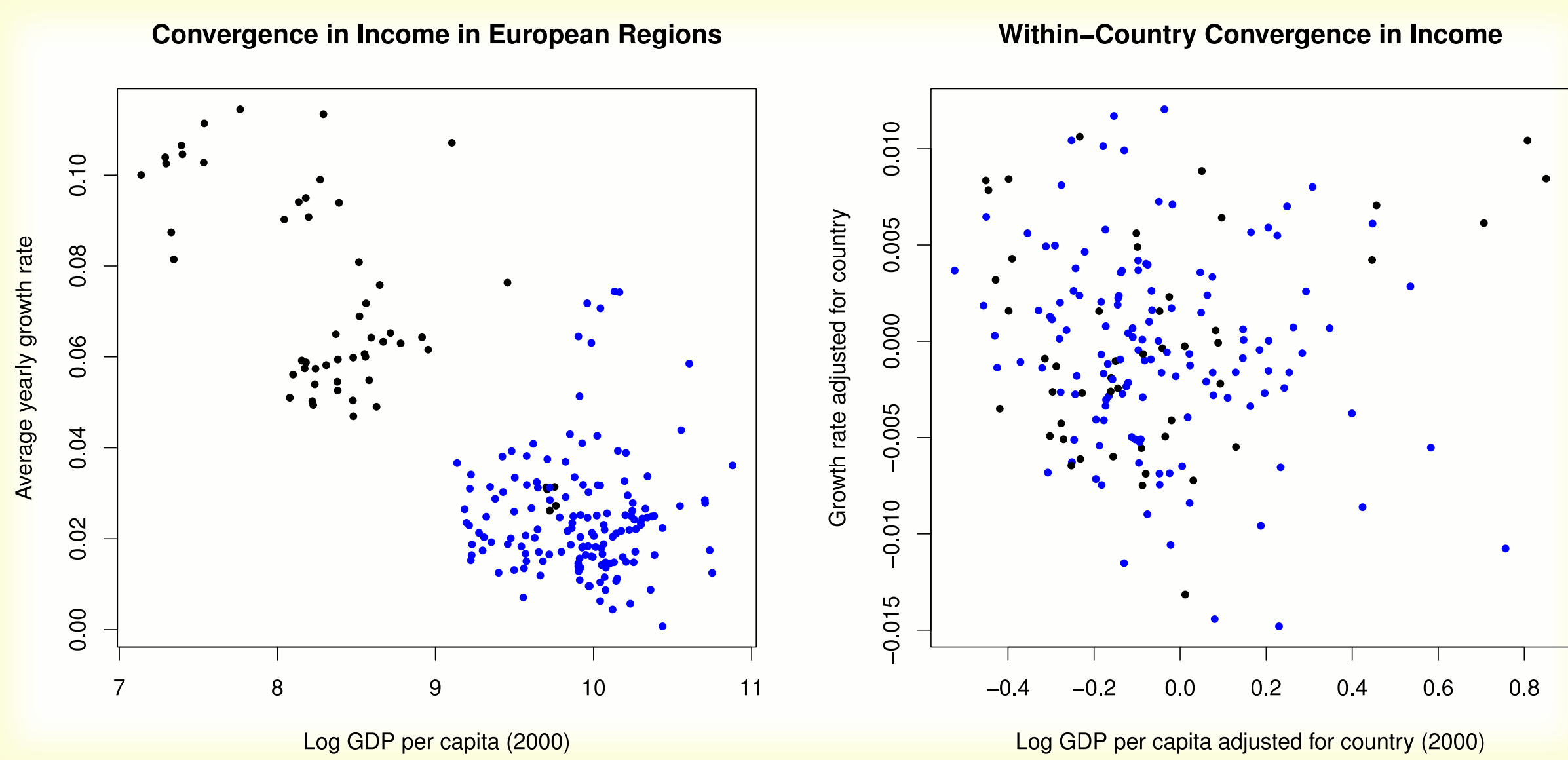


# Tasks, Learning-By-Doing and Economic Growth

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## Motivation

- Lack of convergence of regional income within countries despite strong absolute convergence between countries
- We conjecture that this fact can be explained by persistent differences in human capital
- We measure regional human capital as a result of occupation-specific learning-by-doing, which is determined by the frequency of “complex” tasks in work
- This allows for a more differentiated view of human capital as opposed to crude measures such as years of schooling and socio-demographic characteristics
- Variation in complex tasks predicts variation in income levels on a regional level
- Complex tasks allow better understanding of human capital formation and reduce unexplained growth of income attributed to total factor productivity



## Methodology and Data

- The data on occupational composition is from the Eurostat Labor Force Survey and on economic accounts from Eurostat, Penn World Tables and national statistical offices for 201 NUTS2 European regions
- Tasks are measured using the BIBB BAuA 2012 survey for 3-digit ISCO classification of jobs
- By “complex” tasks we mean: improving existing processes, gathering information, facing new tasks, taking difficult decisions independently etc. — activities that involve solving *novel* and challenging problems
- We look at average yearly growth rates of regional GDP per capita between 2000 to 2012 and relate it to average values of investment, population growth and complexity of tasks in the same period
- Income per capita growth is described by a modified Solow model

$$\frac{\dot{Y}}{Y} = g + \alpha_K \frac{sY}{K} - \alpha_K \delta + (1 - \alpha_K) \left[ n + \frac{\dot{h}_i}{h_i} \right]. \quad (1)$$

A worker doing tasks with complexity value  $x$  accumulates human capital  $h$  according to

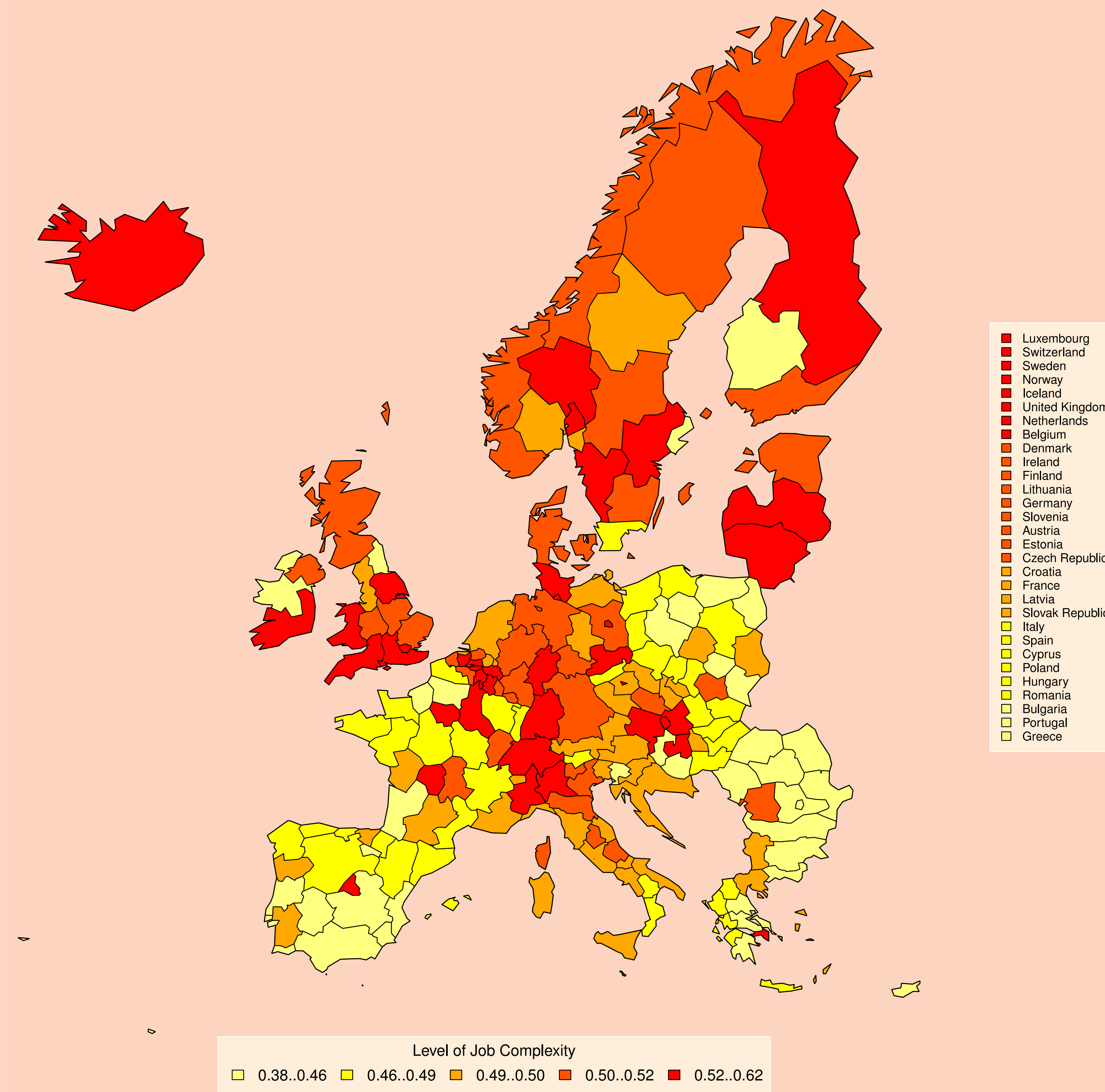
$$\frac{\dot{h}(t)}{h(t)} = x - h(t). \quad (2)$$

With a few assumptions on the starting distribution of  $h$  and mortality, in the entire population the inverse of average human capital is

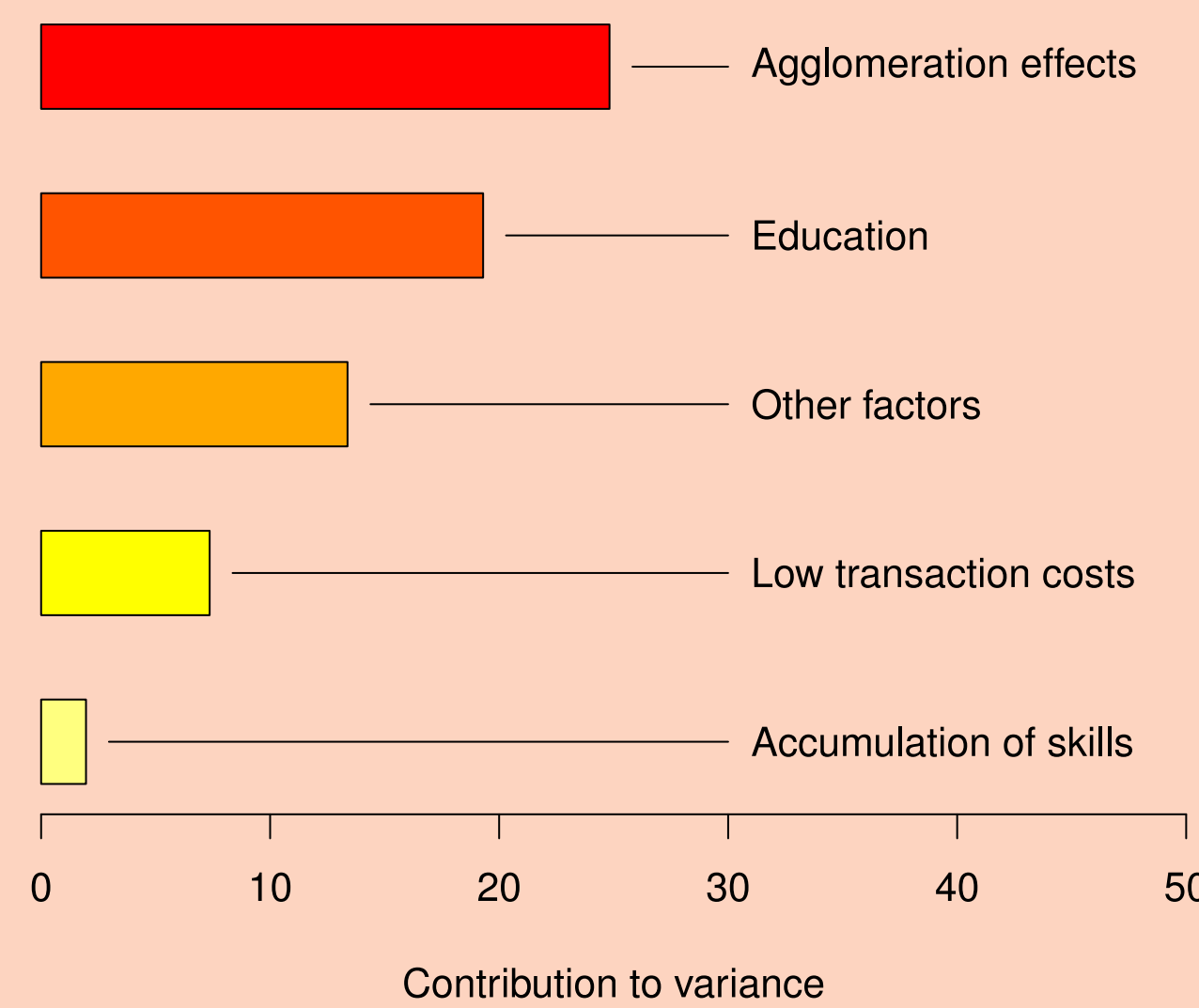
$$\mu_{1/s} = \frac{1}{x} \left[ 1 - \left( \frac{\alpha}{\beta} - \frac{1}{x} \right) \left( 1 - e^{-xT} \right) \right]. \quad (3)$$

- An increase in the complexity of tasks shifts the long run value of labour quality and average productivity, thus positively affecting income growth

## Regional Job Complexity



## Factors That Contribute to Complexity



Notes: All variables significant at 5%.

## First Empirical Results: Regressions of Income Growth

	Solow	+Complexity	+Education	+Both	+Controls	All controls
(Intercept)	0.214*** (0.039)	0.217*** (0.037)	0.098* (0.043)	0.116** (0.041)	0.168*** (0.046)	0.118** (0.042)
log Y(0)	-0.023*** (0.002)	-0.022*** (0.002)	-0.024*** (0.002)	-0.024*** (0.002)	-0.017*** (0.003)	-0.022*** (0.003)
log s	0.018 (0.011)	0.019 (0.010)	0.025** (0.010)	0.025** (0.009)	0.020*** (0.006)	0.024*** (0.006)
log n	-0.022* (0.011)	-0.020 (0.011)	-0.019 (0.010)	-0.017 (0.010)	-0.019 (0.010)	-0.022* (0.009)
$\dot{x}/x$		0.925*** (0.224)		0.720*** (0.156)	0.880*** (0.158)	0.734*** (0.137)
Edu			0.062*** (0.012)	0.053*** (0.012)		0.036** (0.011)
Communist					0.015** (0.005)	0.007 (0.005)
Capital					0.013*** (0.002)	0.013*** (0.002)
R <sup>2</sup>	0.728	0.764	0.782	0.803	0.836	0.849
Adj. R <sup>2</sup>	0.724	0.759	0.777	0.797	0.831	0.843
Num. obs.	201	201	201	201	201	201
df	197	196	196	195	194	193
Mean dep. var	0.039	0.038	0.038	0.038	0.037	0.037
BIC	-1053	-1076	-1092	-1107	-1139	-1149
$\sigma^2$	1.581	1.476	1.420	1.354	1.236	1.192

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05

Notes: dependent variable is nominal regional GDP per capita growth between 2000 and 2012. Numbers in parentheses are standard errors. Y(0) is the level of regional GDP per capita in 2000. s is the investment rate. n is the population growth rate.  $\dot{x}/x$  is growth in average job complexity in a region. Edu is the log of average years of schooling. Capital is a dummy signifying regions that contain national capital. Communist is a dummy for former communist countries. Using robust errors in a weighted OLS regression.

## Open Questions

- What makes some regions have more complex tasks than others?
  - Specialization in certain products due to international trade
  - Differences in local demographics
  - Agglomeration effects
- What is the optimal level of complexity in a region?
- What kind of policy can promote regional complexity?

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