

# Demographic Changes and the Labor Income Share

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## (short) Motivation

Fertility and immigration are more and more often linked in the political debate, as e.g.

- Aging and immigration, in Germany
- Anti-immigrant politicians are often pro-natalist

But not (always) for most macroeconomists!

A single framework to analyze:

- their macroeconomic consequences (GDP, unemployment)
- their consequences on the inequality between capital and labor (which is correlated to other measures of inequality).

A (data-based) empirical analysis and a theory to interpret the findings.

DATA

# Data coverage

Estimation of a structural Vector Auto-Regression model on a panel of 18 countries:

*Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Portugal, UK, US.*

Yearly observations from 1985 to 2015 (balanced panel)

Economic variables are from the *OECD National Accounts Statistics database*.

Demographic variables are from *Eurostat, OECD Population and Vital Statistics*.

Economic variables are expressed in per capita using average population (mid-year estimates).

Demographic variables are expressed in per 1.000 persons using population at 1 January.

# Population change by components

Natural rate of increase = live births - deaths

Net migration as a difference between

- the population sizes on 1 January of two consecutive years
- natural rate of increase

Thus, net migration includes permanent movement of national

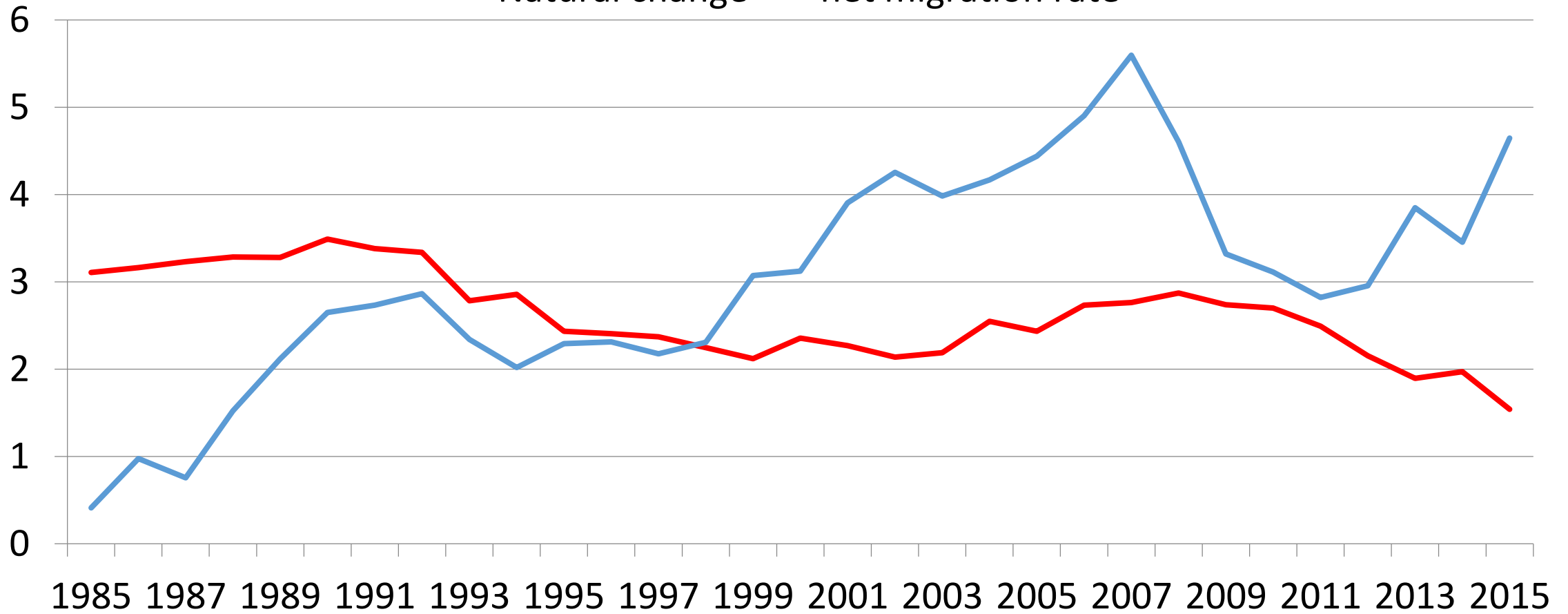
No other (consistent) sources providing annual data for all countries since 1985

- Flow of entries are at best computed since 1990 (when they are)
- Flow of exits are not computed
- No decomposition of the flow

# Population change by component, OECD 1985-2015

per 1000 persons

— Natural change — net migration rate



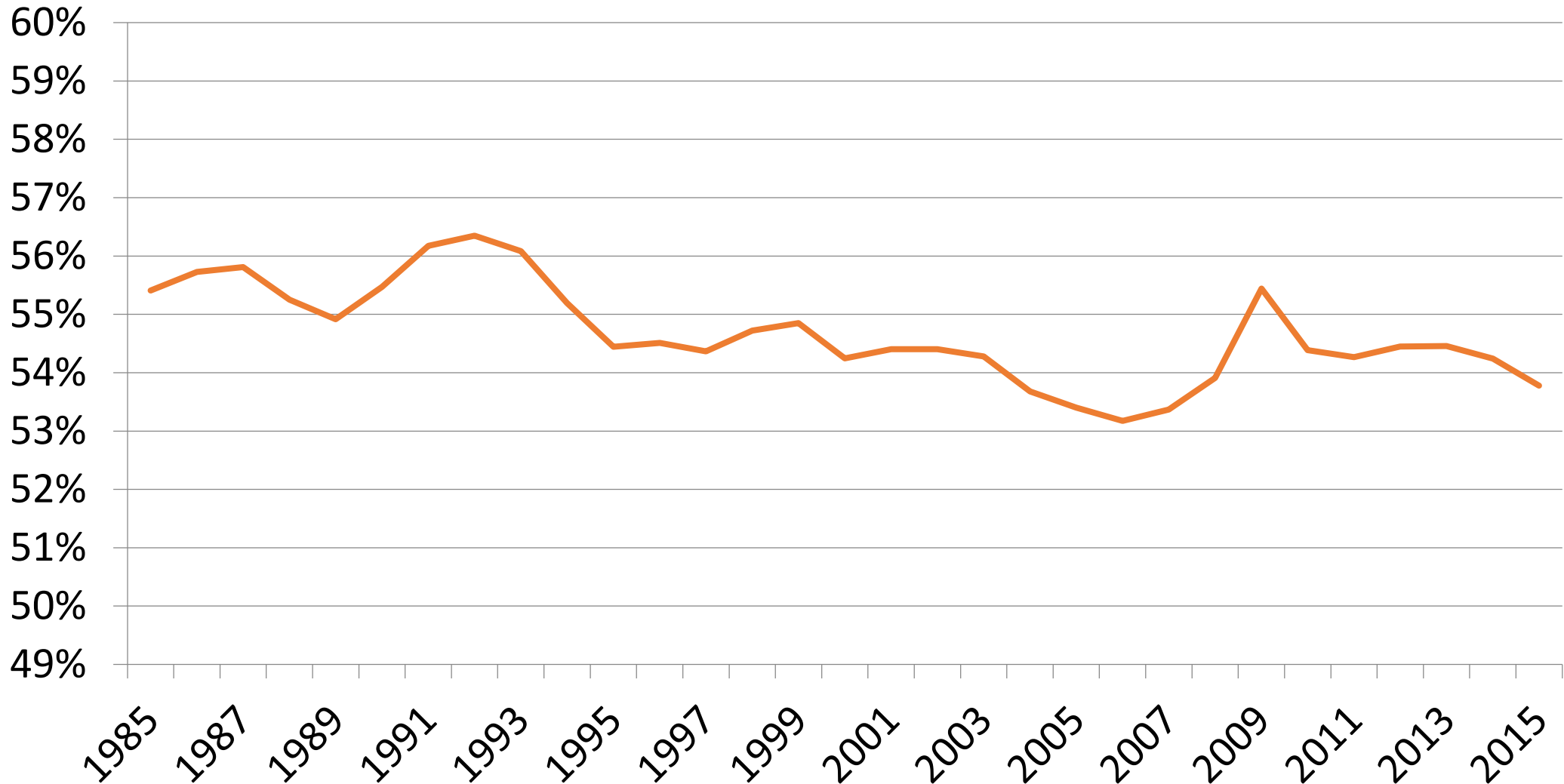
# Economic variables

Domestic production is the source from which the incomes are generated and is therefore used as to remunerate production factors:

- Compensation of employees : labor income
- Gross operating surplus and gross mixed income : capital income

Labor income share = labor income/total income

# Average Labor Income share (in %) OECD 1985-2015





# EMPIRICAL STRATEGY

# The structural VAR model

Two-step procedure:

1/ Estimate a model that writes:

$$Z_{it} = A(L)Z_{it} + v_i + \lambda_i t + f_t + \varepsilon_{it} \text{ for } i = 1, \dots, N \text{ and } t = 1, \dots, T$$

where  $Z$  is the vector of endogenous variables, and  $A(L)$  is the matrix polynomial in the lag operator  $L$  (after tests 2 lags). There is also country-fixed effects, year-specific effects and country specific time trends (to mitigate heterogeneity in the panel, upon existence).

2/ Identify structural shocks and compute Impulse-response functions (*i.e. the response of all the variables to an exogenous shock*).

Strategy:

Evaluate the impact of demographic shocks

# Identification

Identification is based on a Choleski decomposition (*variables can impact contemporaneously the variables that are ordered after them*).

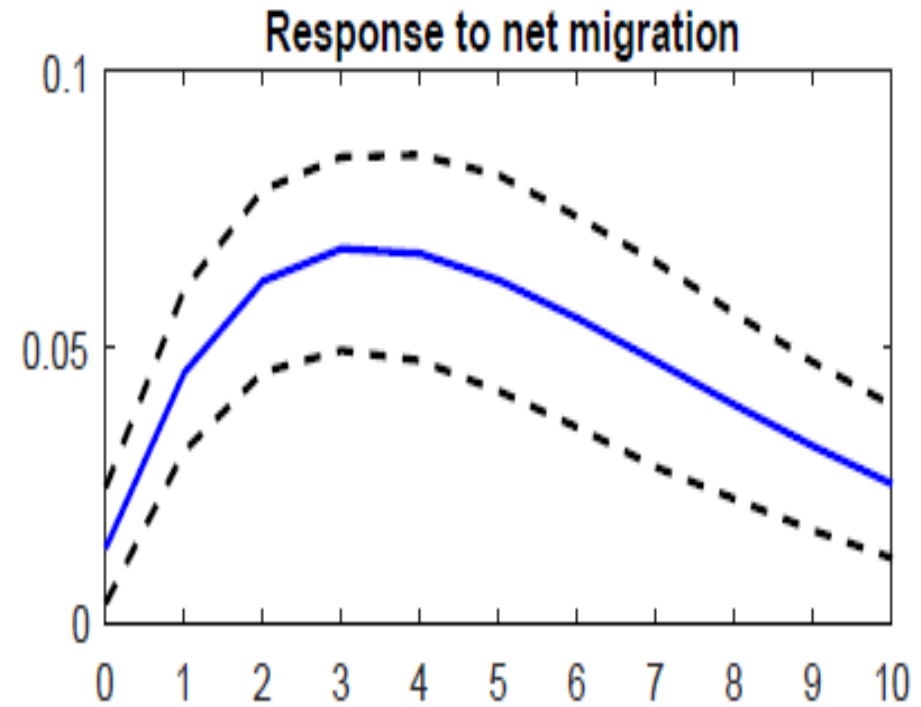
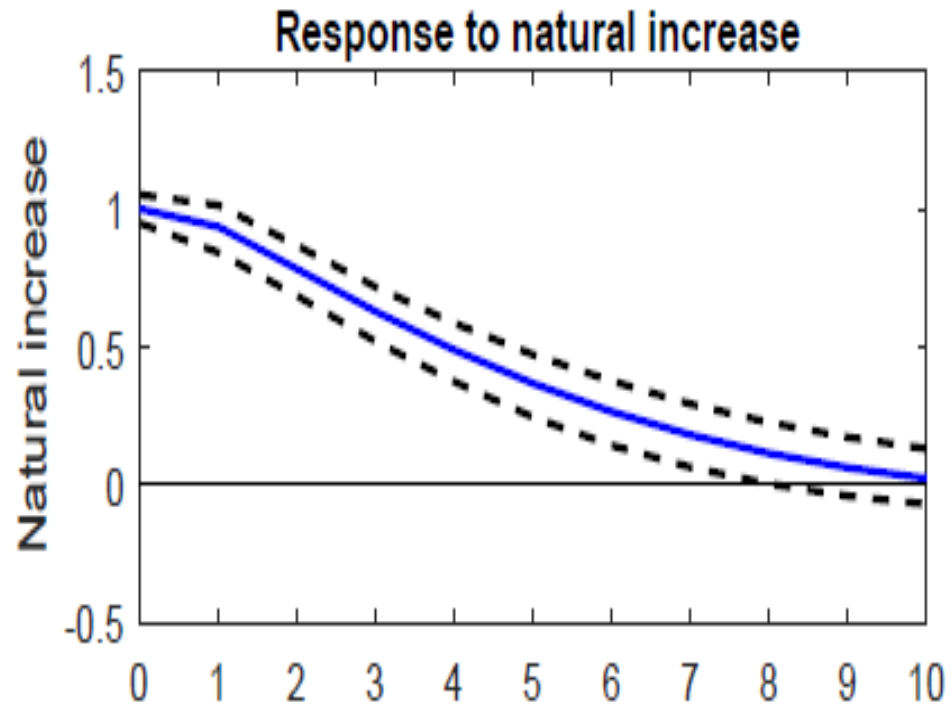
Our benchmark model uses the following order:

1. Net flow of migrants (as a share of the population),
2. Natural rate of increase of population (as a share of the population),
3. Economic variables
  1. Real per capita GDP (+ unemployment).
  2. Real per capital Labor income/share;
  3. Capital income

All variables are in natural logarithms ( $\log(x)$  or  $\log(1+x)$ ).

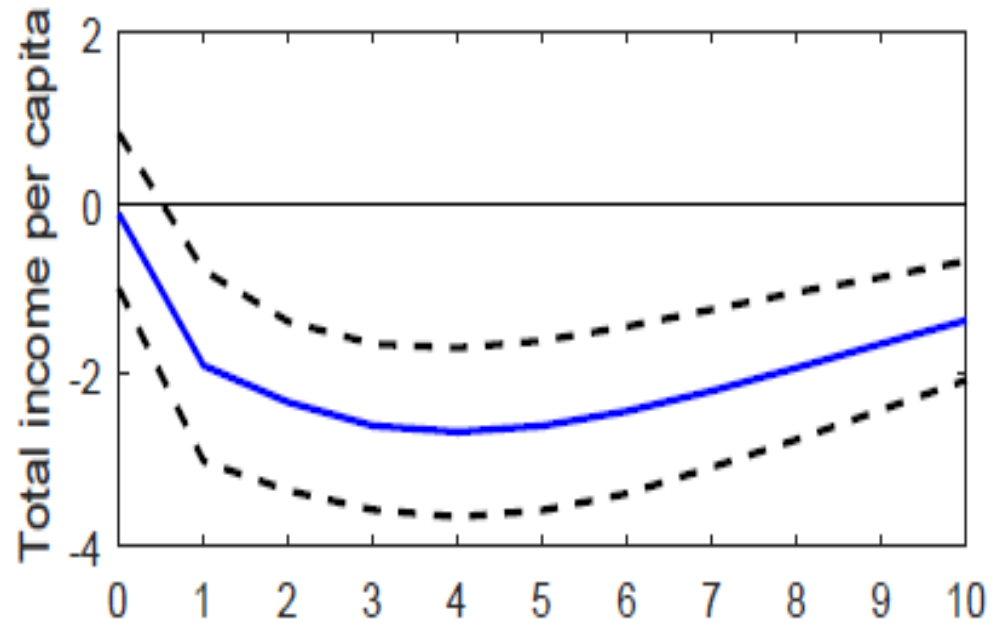
## EMPIRICAL RESULTS (IRF)

# Responses of natural population increase

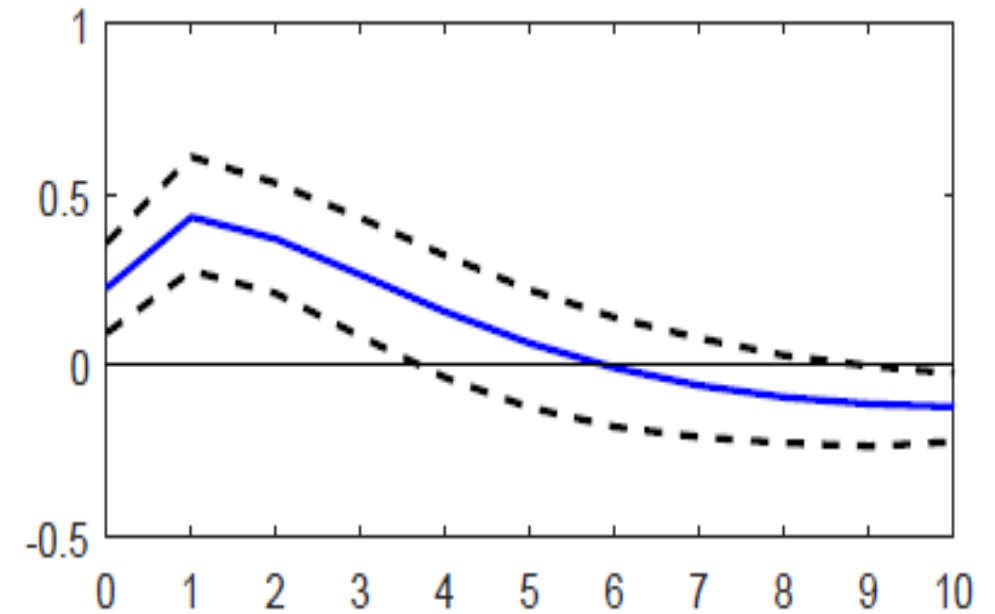


# Responses of income per capita

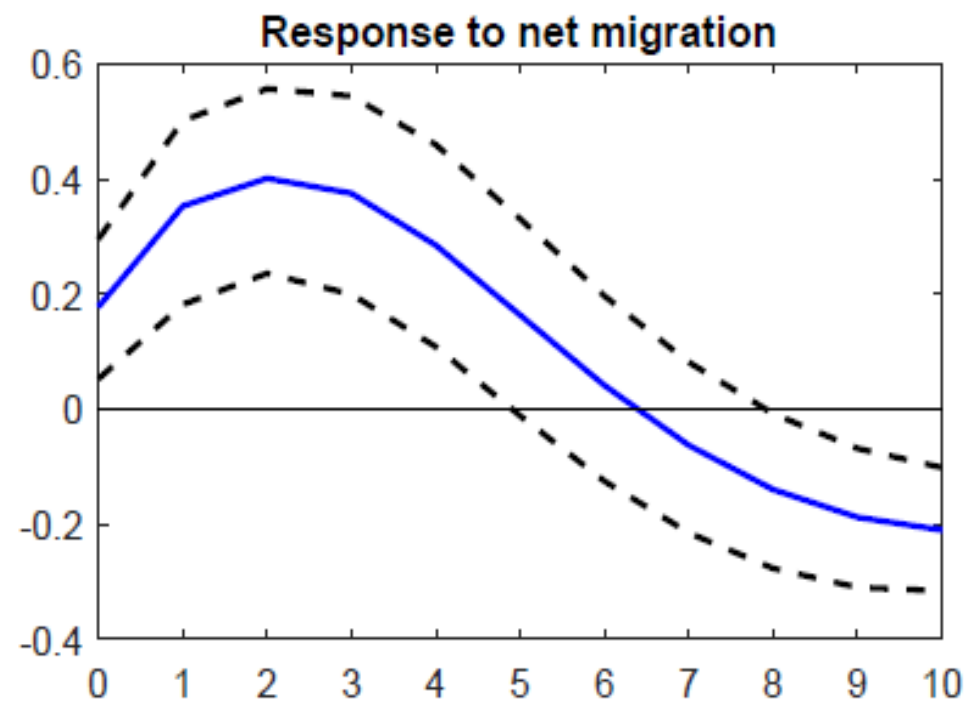
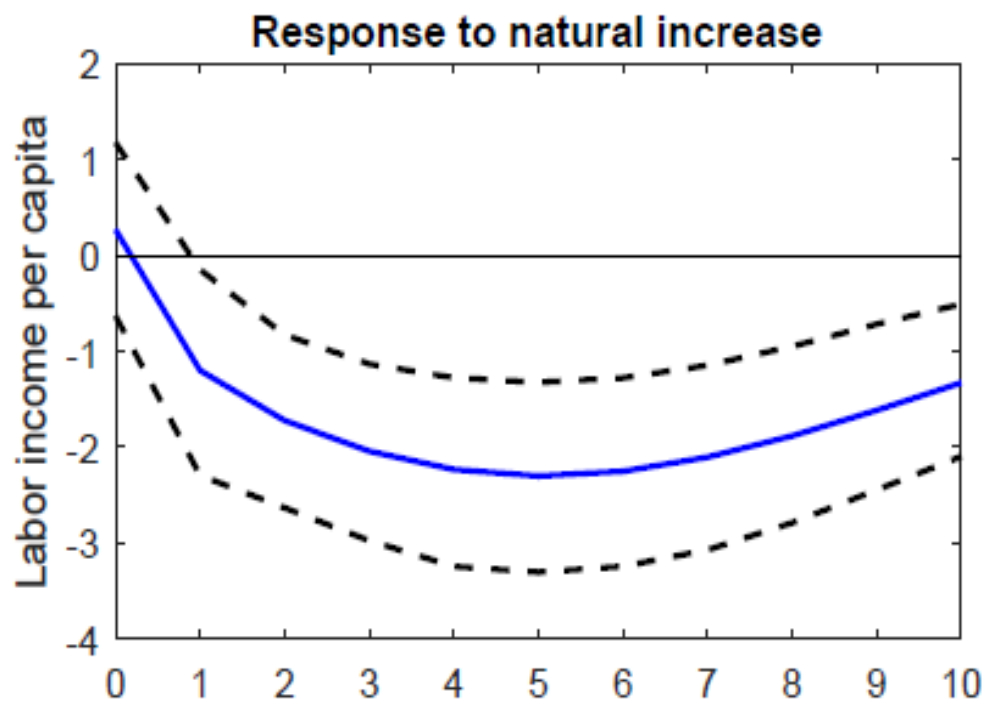
Response to natural increase



Response to net migration

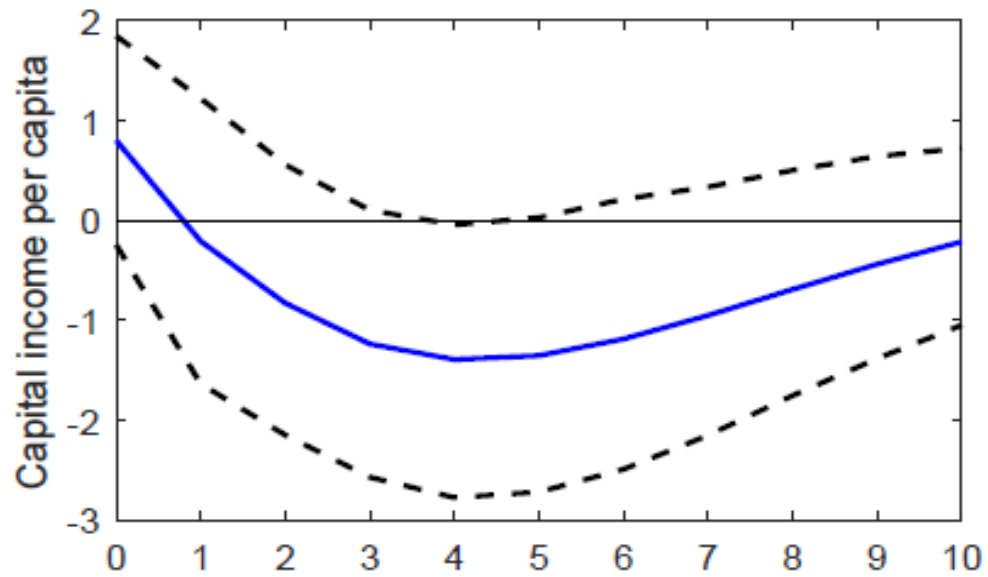


# Responses of labor income per capita



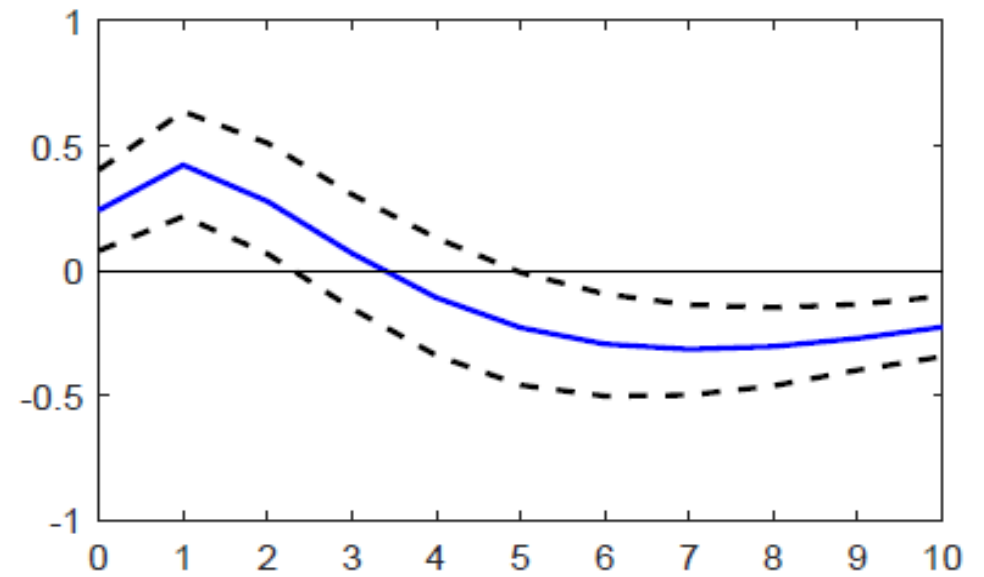
# Responses of capital income per capita

Response to natural increase



0.4

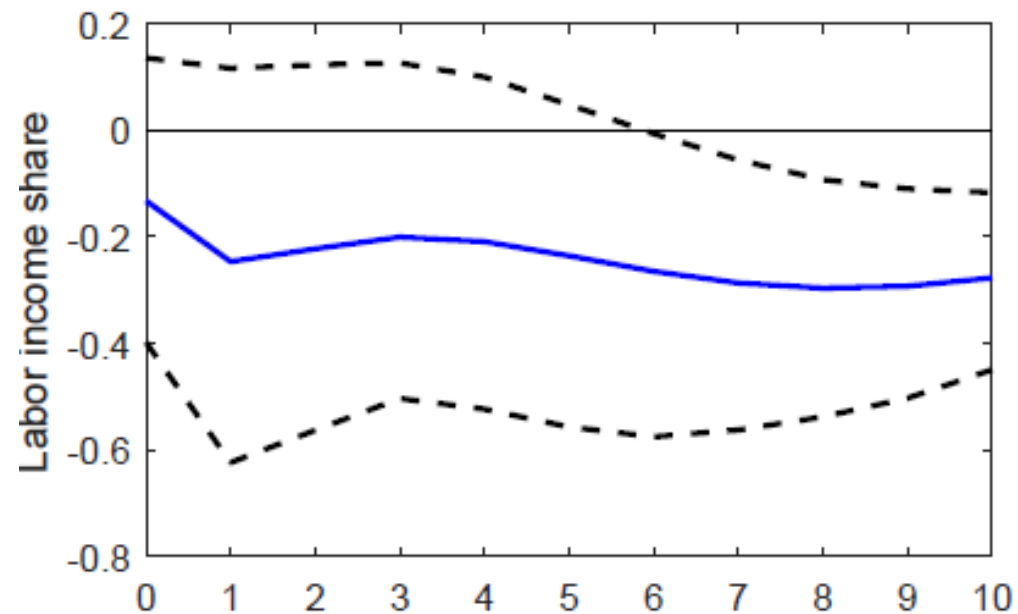
Response to net migration



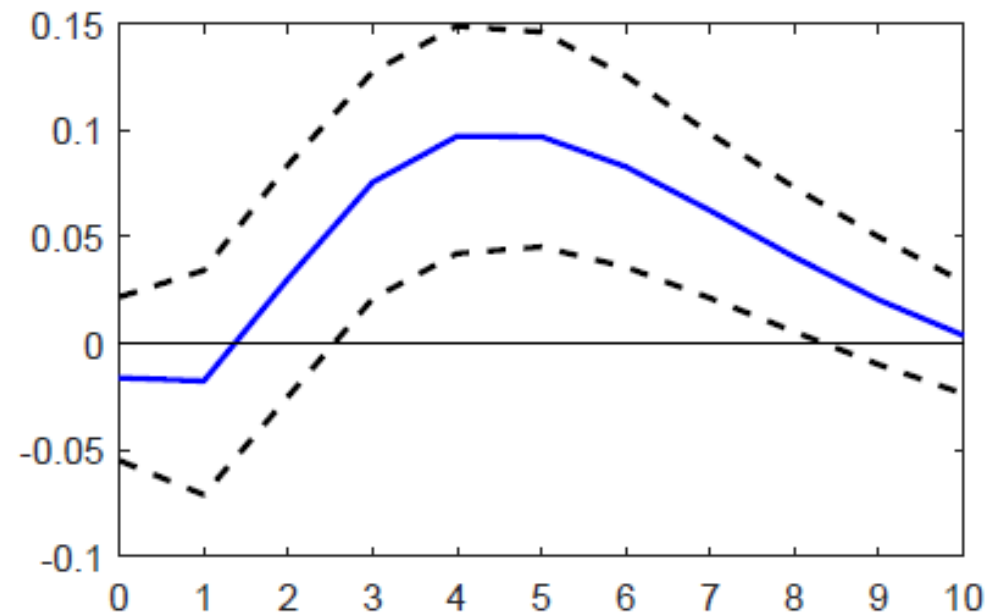


# Responses of labor income share

Response to natural increase

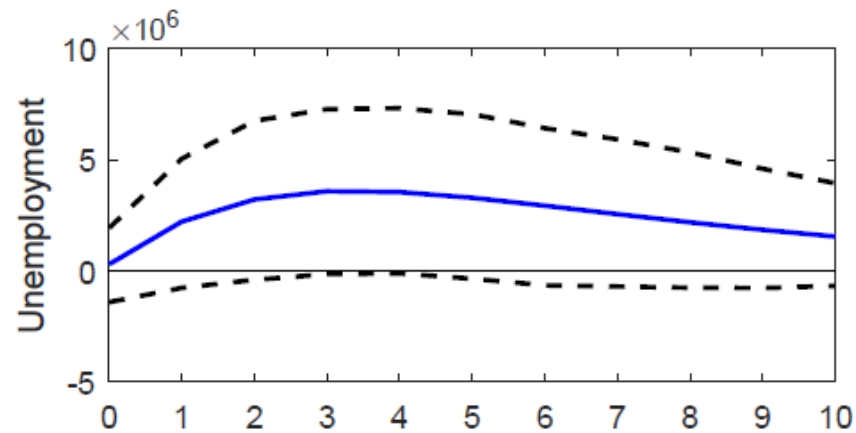
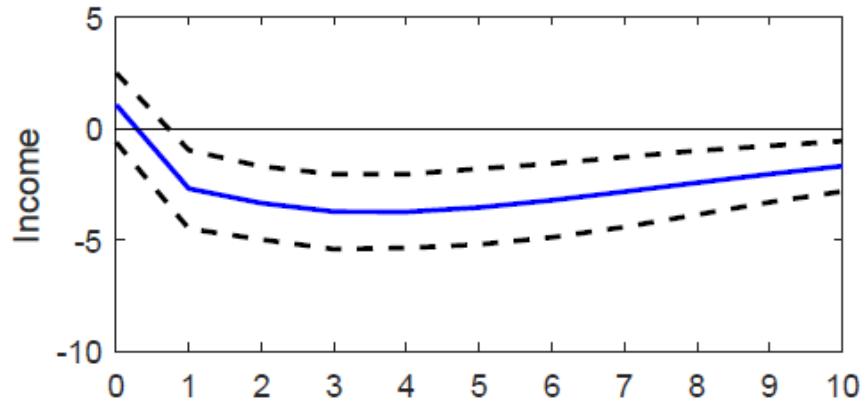


Response to net migration

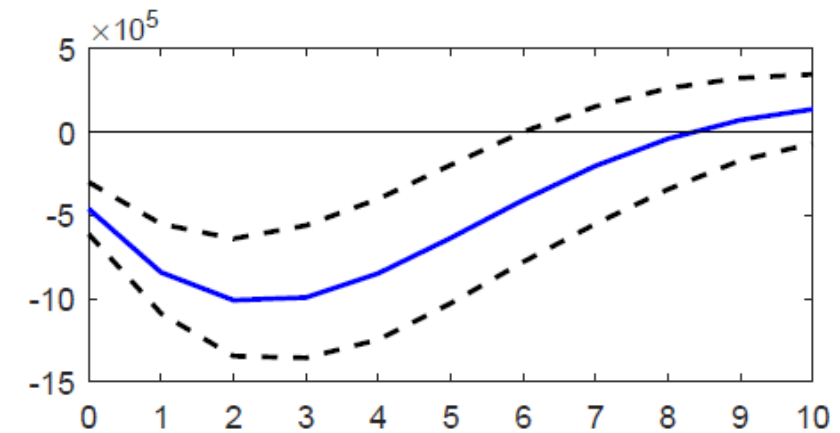
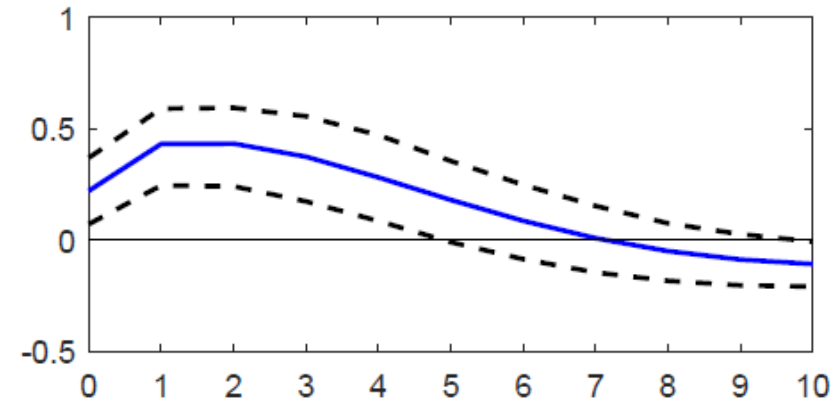


# Demographic shocks and unemployment

## Response to natural increase



## Response to migration



THEORY

# The model

- A Representative Agent deterministic model where the social planner maximize a total utilitarianism criteria over an infinite horizon. The objective function is:  $\max_{c_t} \sum_{t=0}^{\infty} \gamma^t P_t U(c_t)$

$P_t$  is the size of the population,  $U$  is an increasing and concave function and  $c_t$  is the consumption that worth:  $c_t = \frac{F(K_t, L_t) - G(K_t, K_{t+1})}{P_t}$

- The evolution of the initial population is thus given by:  $N_{t+1} = (1 + \beta_t)(1 + \lambda_t)N_t$

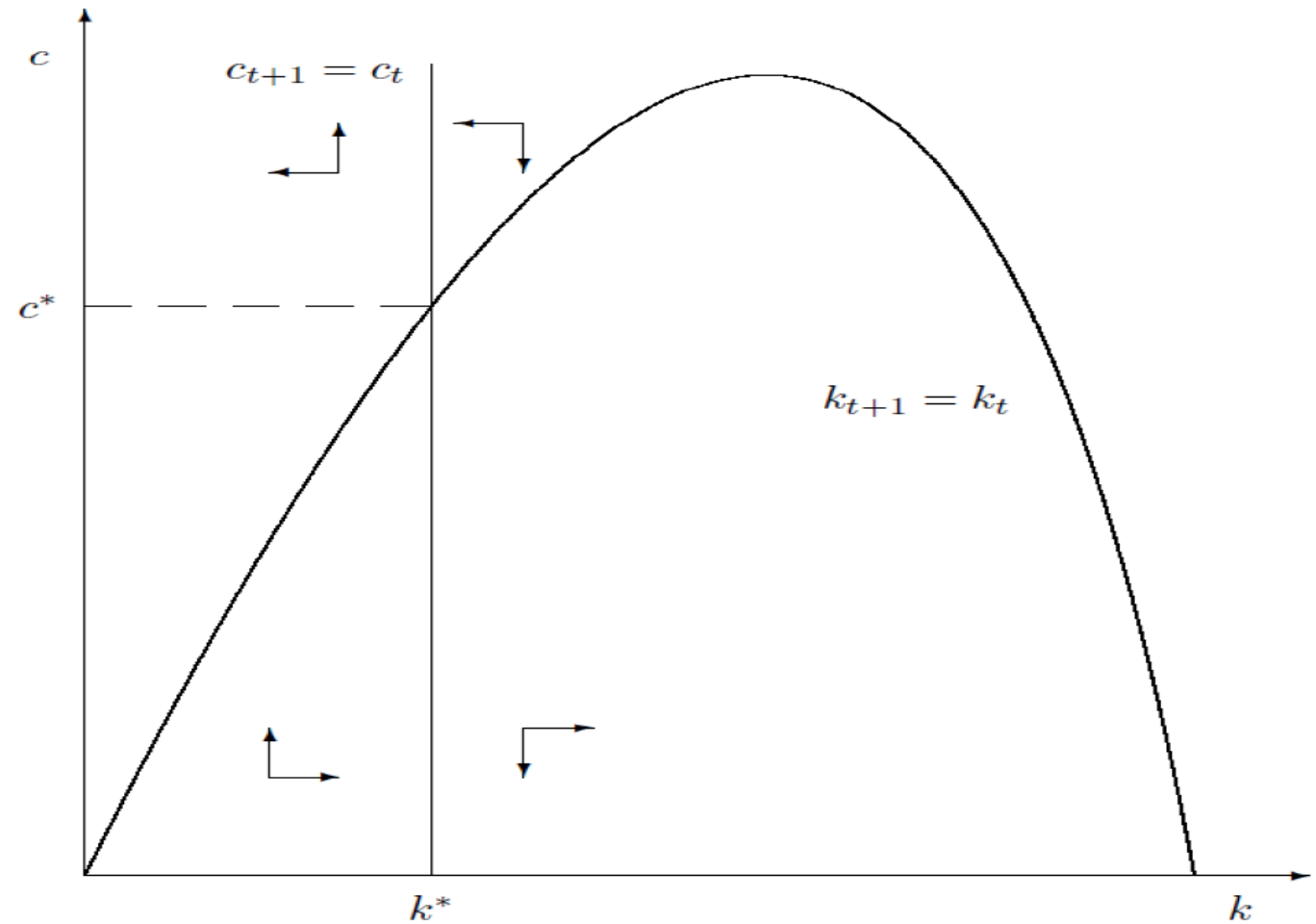
where  $\lambda_t = I_t / N_t$  net migration rate,  $\beta_t > -1$  the fertility rate.

- The population:  $P_t = \mu N_{t+1} + (1 - \mu)N_t = [\mu(1 + \beta_t)(1 + \lambda_t) + (1 - \mu)]N_t$  where  $\mu \in [0, 1]$
- Total workforce:  $L_t := N_t + I_t = (1 + \eta\lambda_t)N_t$  where  $\eta \in [0, 1]$  represents the share of immigrants that participate to the workforce.

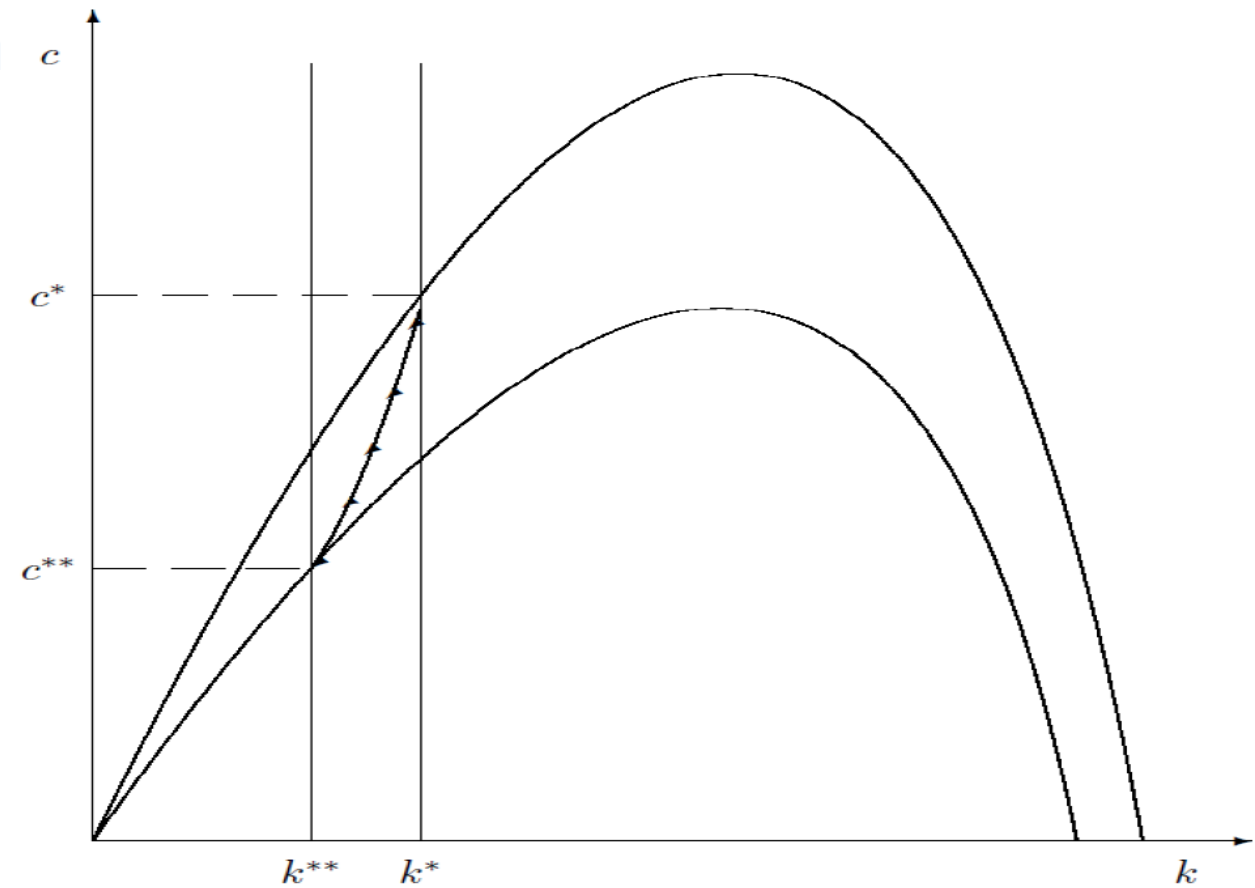
# Some theoretical results (at steady-state)

1. GDP per capita
  1. decreases with the **natural rate of increase** for standard investment functions.
  2. may increase with the **net migration rate** (if the share of immigrants that participate to the labor market is sufficiently large).
2. Productivity
  1. decreases with the **natural rate of increase**
  2. is independent from the **net migration rate**.
3. If the elasticity of substitution between capital and labor is lower than one, the labor share
  1. decrease with the **natural rate of increase**
  2. may increase with the **net migration rate**.

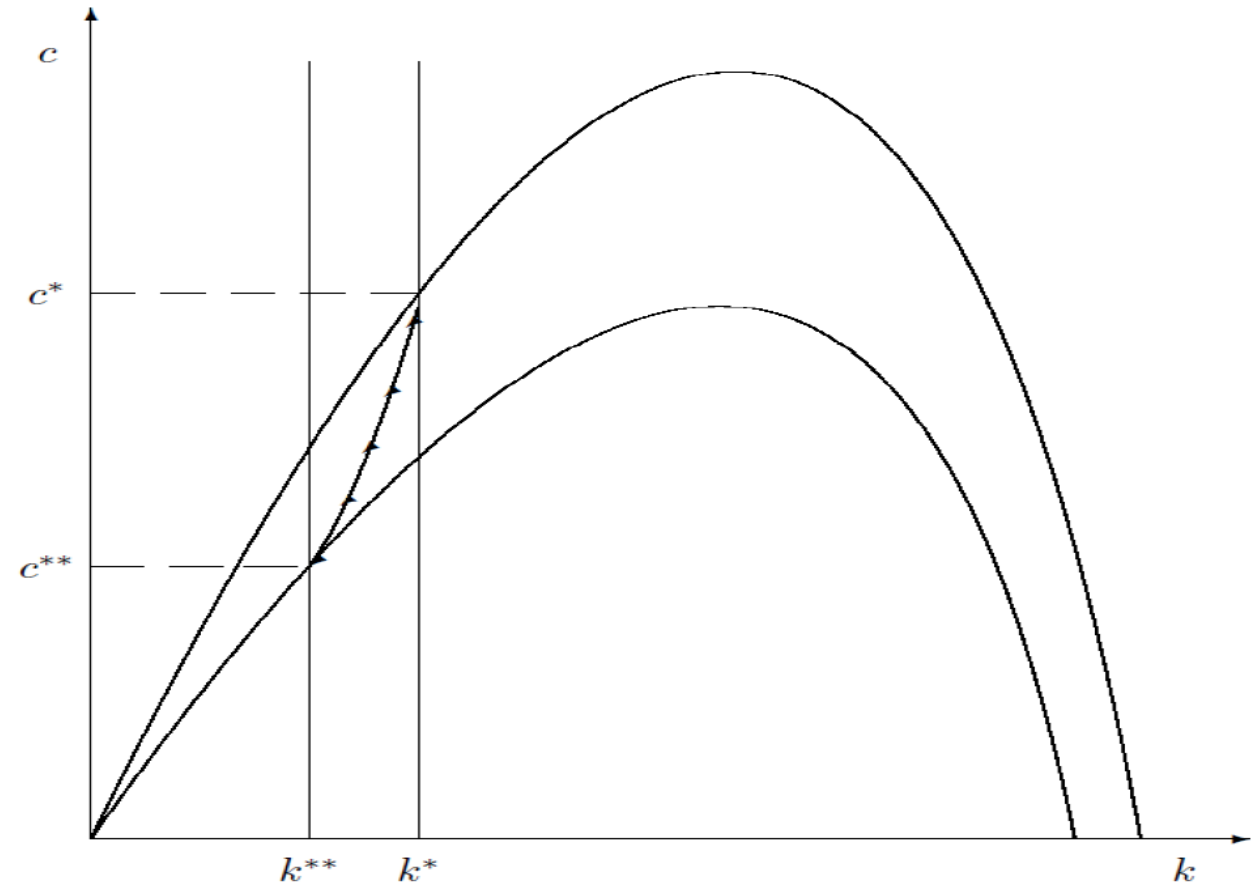
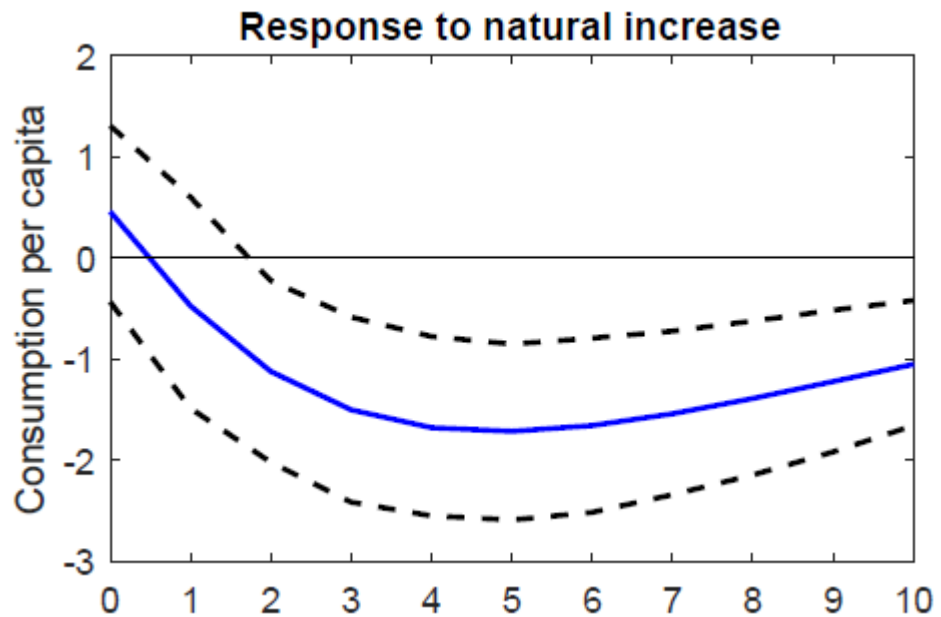
# Phase diagram with consumption and capital



Phase diagram  
after a permanent change in  
the natural rate of increase

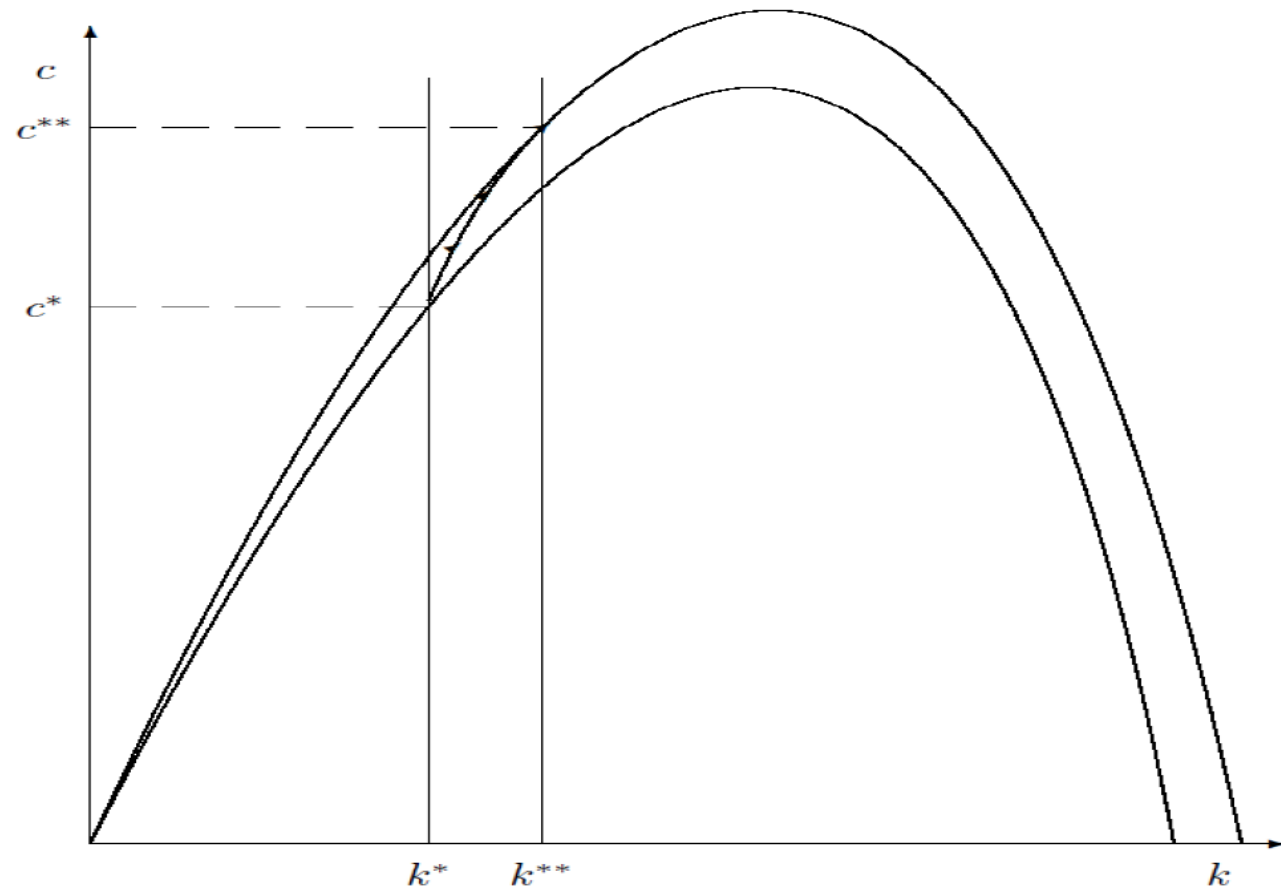


# Phase diagram after a permanent change in the natural rate of increase

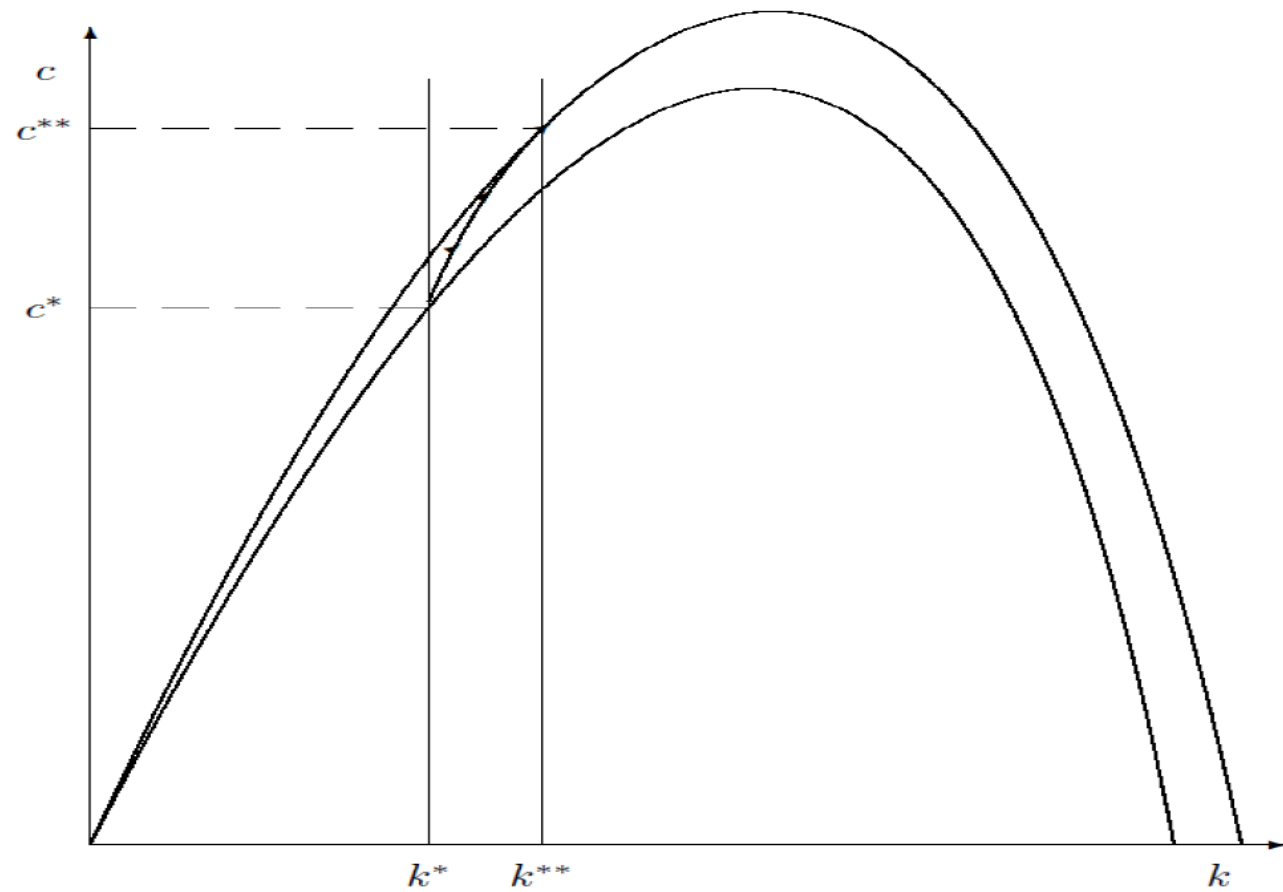
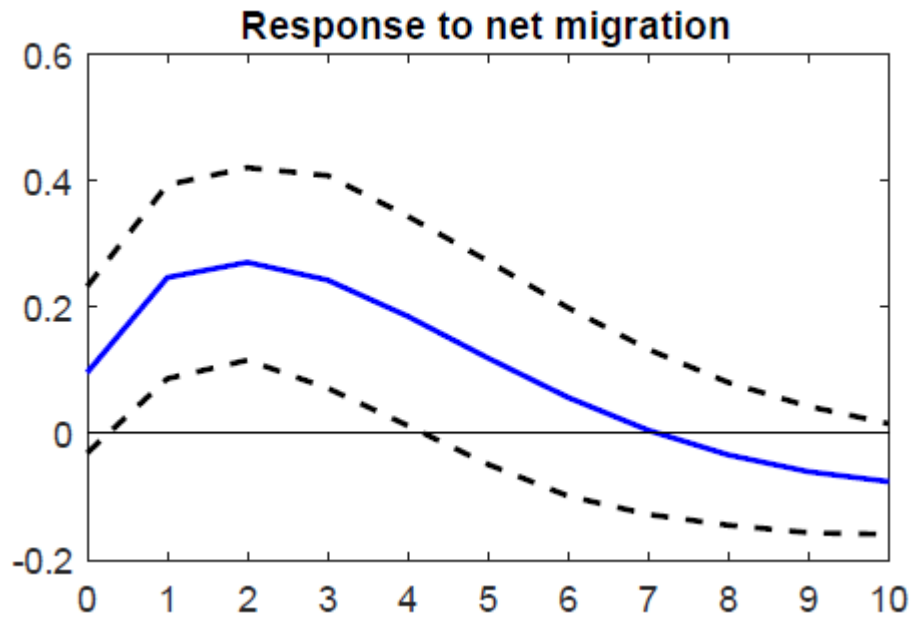




Phase diagram  
after a permanent change in  
the net migration rate



# Phase diagram after a permanent change in the net migration rate



# Conclusion

Fertility and immigration are very different (opposite, might be) from a macroeconomic point of view.

Some evidence and a simple model to understand the main divergence.

Many extensions and robustness checks are possible.