

# The Role of Labour Market Changes in the Slowdown of European Productivity Growth

Ian Dew-Becker and Robert J. Gordon

Presented to Northwestern

Macro Workshop, September 24, 2007

# Why the English Spelling of “Labour”?

- This paper is written for the October Lisbon meeting of *Economic Policy*, the premier European clone of BPEA, Carnegie-Rochester, and NBER Macro Annual.
- They insist on English spelling and are the most draconian of all these conference series in making the authors jump through multiple hoops. We have been jumping, and there are still hurdles to jump over.
- This paper takes the discussion of European productivity and employment behavior, and policy responses, to a new level, thanks to our 2006 econ/MMSS grad Ian Dew-Becker
- All references to “Europe” are to the EU-15, not EU-25
- Introduce Bobby

# This Paper is about: Employment, Productivity, Causation, and Policy

- Slowdown in productivity growth in Europe post-1995 compared to US
- Revival in hours growth in Europe post-1995 compared to US
- Which way is the causation? TFP shocks to employment or labor market shocks to labor productivity?
- Primary emphasis on *heterogeneity* within Europe post-1995.
  - Before 1995, most countries had negative growth in H/N and rapid growth in productivity (Y/H). After 1995 country performance split to a much wider dispersion of outcomes.
- We track the negative productivity-employment correlation across time periods, countries, types of workers, and industries.

# Symbols to Remember

- Key Identity

$$Y/N \equiv Y/H * H/N \equiv Y/H * H/E * E/N$$

Our paper starts from the identity and then asks, can we identify the two-way causation between Y/H and E/N

We neglect H/E because there's been no major turnaround



# Perhaps Our Most Important Contribution is to Policy Debates

- Europe for 20 years has had higher unemployment
- Lower hours per capita
- Slowdown in productivity growth post-95
- Europe wants to change it all with political reforms – some reforms to raise productivity, others to raise employment
- Our big point: they can't have it both ways, most reforms will move productivity and employment in opposite directions

# New Criterion for Choosing Policies

- Policies we examine include the tax wedge, employment protection legislation (EPL), product market regulation (PMR), average replacement rate (ARR), and union density
- Most of these move  $Y/H$  and  $E/N$  in opposite directions
- Consider EPL vs. ARR. They have different consequences for the government budget

# Where does the Value of Leisure Come In?

- By using  $Y/N$  as a metric of welfare in policy evaluation, we would appear to be neglecting the value of leisure by those who are not working
- Yet, as our initial data charts show, the post-1995 turnaround in European hours consists largely of  $E/N$ , not of  $H/E$
- This post-1995 transition is not about short weeks and long vacations
- This is about increased LFPR, people (primarily women) moving from home production to market production. Leisure is not involved (Freeman-Schettkat, 2005)

# Before Previewing our Approach, Let's Look at State-of-Art of the Current Literature

- To keep this straight, remember two dimensions: pre/post 1995 and European hours vs. productivity
- About the post-1995 productivity slowdown, most of the best research has come from van Ark's data-intensive Groningen NL group
- But it has not considered the role of employment changes in pushing productivity growth changes
- In its many papers, vintage 2001 it diagnosed the entire US vs EU difference as concentrated in two industries, trade and finance. The difference is in the use of ICT, not the production of ICT equipment.

# The Prescott Literature is about Employment and Unemployment

- Prescott's famous conclusion, *all* of the decline in H/N in EU relative to US was due to high tax wedge in Europe
  - Prescott did not notice the post-1995 turnaround in both taxes and H/N
  - He has not shown that the tax wedge explains *both* the pre-95 decline in EU hours and the post-95 recovery
  - He does not control for other policy/institutional variables
- Alesina and others have doubted his claims based on calibration rather than econometric evidence
- Much other empirical work (Blanchard-Wolfers, Davis-Henrekson) has data ending in mid-1990s and doesn't notice or explain the turnaround
- Our work moves beyond this by splitting pre/post 95 and by using the best data and econometric framework from OECD's Bassanini and Duval. But they don't look at turnaround either.



# The Dimensions of Our Move Beyond the Previous Literature

- Previous Groningen literature studies EU productivity slowdown at the industry level but does not tie it to effects of policy on employment.
- Prescott literature looks only at low European H/N pre-1995 and its link with taxes. Other Prescott-related literature looks at other controls but does not quantify the role of taxes and other controls on the post-1995 employment turnaround.
- Only a few papers have addressed the direction of causation between employment and productivity, and no previous paper in the tradeoff literature has explicitly studied the twin post-1995 turnarounds



# Further Summary of Our New Contributions

- We Create new Data Aggregates Using Chain-Weighted Methods
  - EU-15 into four country groups (N, A-S, C, M)
  - 57 Industries into 12 industry groups for total economy including GHI (Government, Households, Institutions)
  - Cuts dimensionality from 855 to 48
- We are among the first to use the new EU-KLEMS data set, released in 3/07.
- We have new data and econometric results across countries, time, input types (capital vs. labor), age-sex groups, and industries
- All address the same question, how much did policy and institutional changes in the labor market cause the twin post-1995 turnarounds in productivity and employment growth?

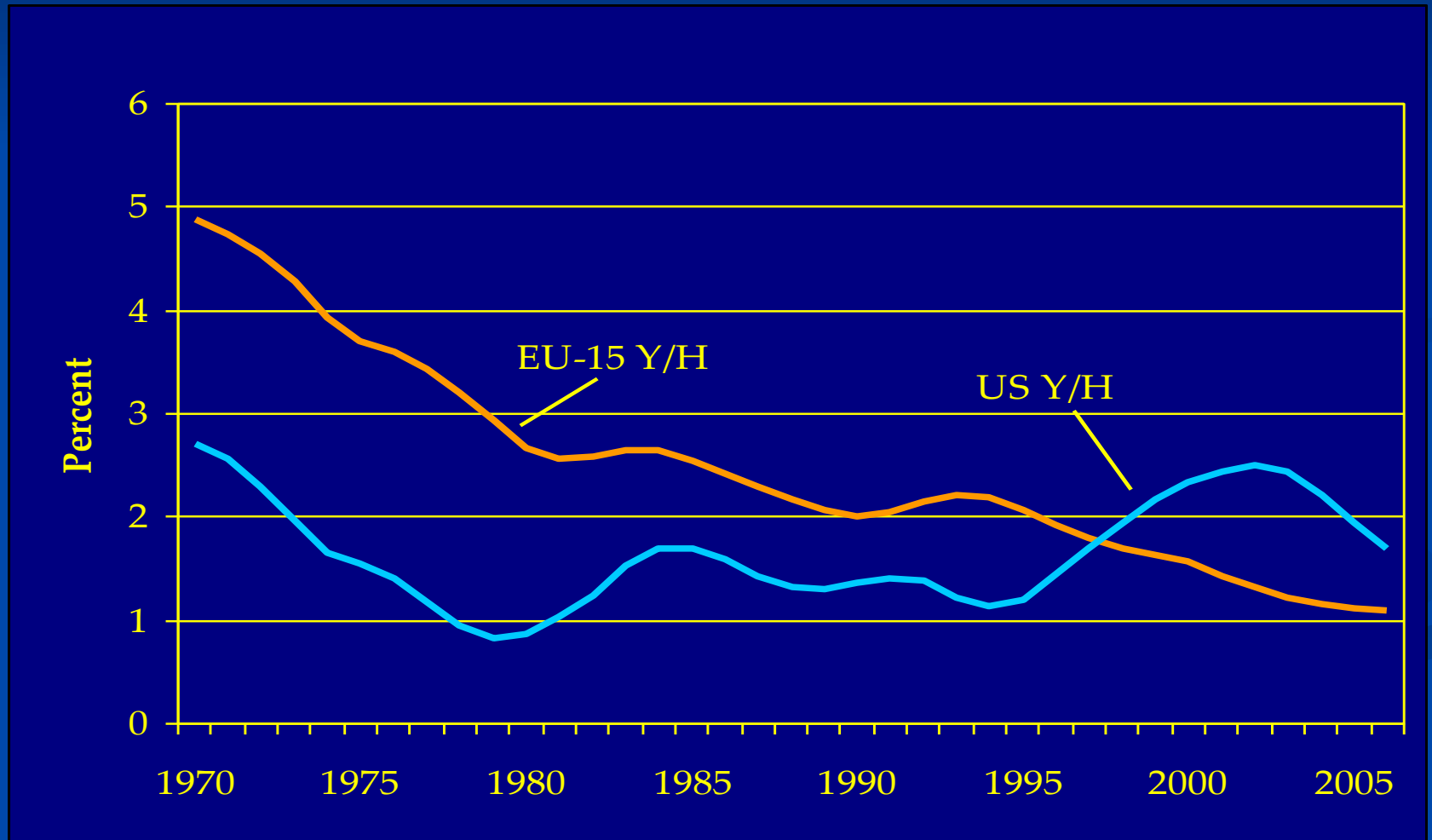
# Outline of the Paper

- Part 2, graphs and tables on the basic macro data, including the US
- Part 3, regressions of  $E/N$  on policy/institutional variables
- Part 4, the demographics of employment
- Part 5, effects of employment shifts on productivity growth (model and estimates)
- Part 6, industry analysis

# Preview of the Data Charts You Will See

- First set of charts, EU vs. US
  - $Y/H$
  - $H/N$
  - $Y/N$
- Next charts, nonimportance of  $H/E$ 
  - Recall  $H/N = H/E * E/N$
- Third set of charts, allowing for growth in capital ( $K/H$ ) and the resulting implication for total factor productivity (TFP).

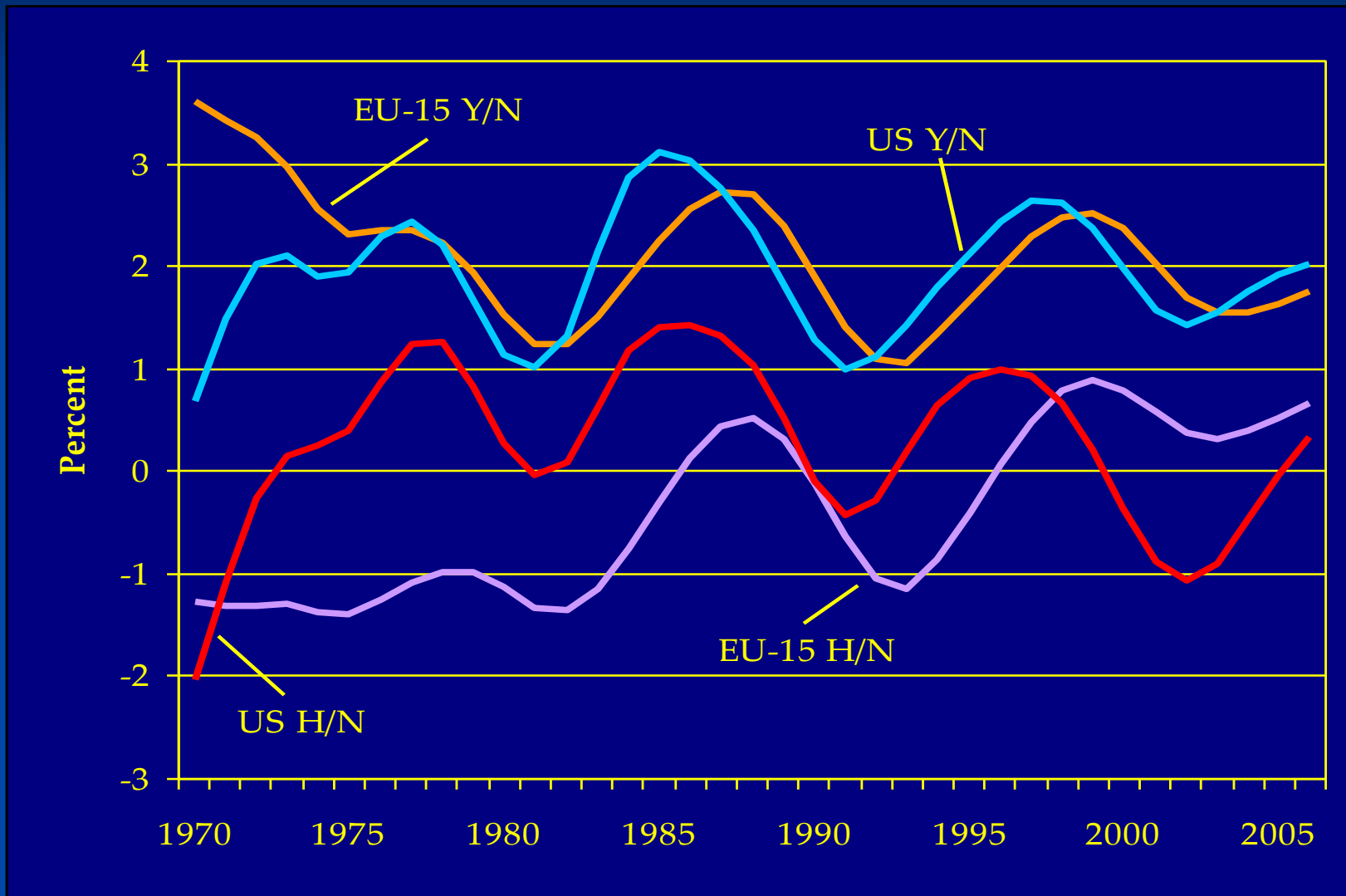
# Top Fig 1, the Great Post-1995 Labor Productivity Growth Turnaround



# What to Notice About LP

- The EU Slowdown is steady and continuous
- The US post-1995 revival is looking increasingly temporary
  - We created the US trend from quarterly data through 2007, not just the annual data through 2004 used by EU-KLEMS
- The fact that the US trend is turning around is important for interpretations of what caused the post-1995 US revival
- That's a separate paper. Today we primarily look inside Europe and exclude the US from the employment and productivity regressions

# Notice how the EU Turnaround in H/N cancels out the Y/H Slowdown

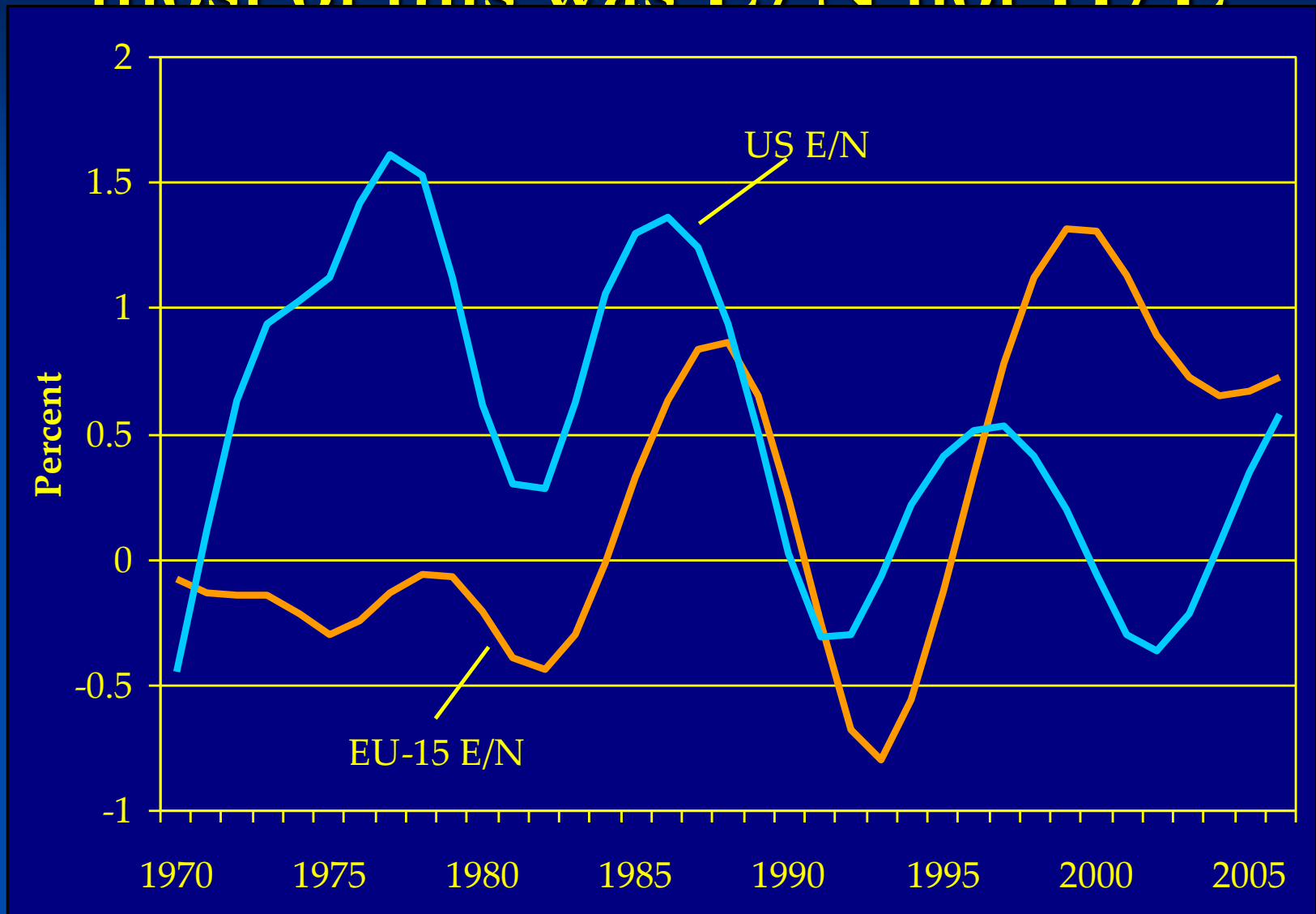




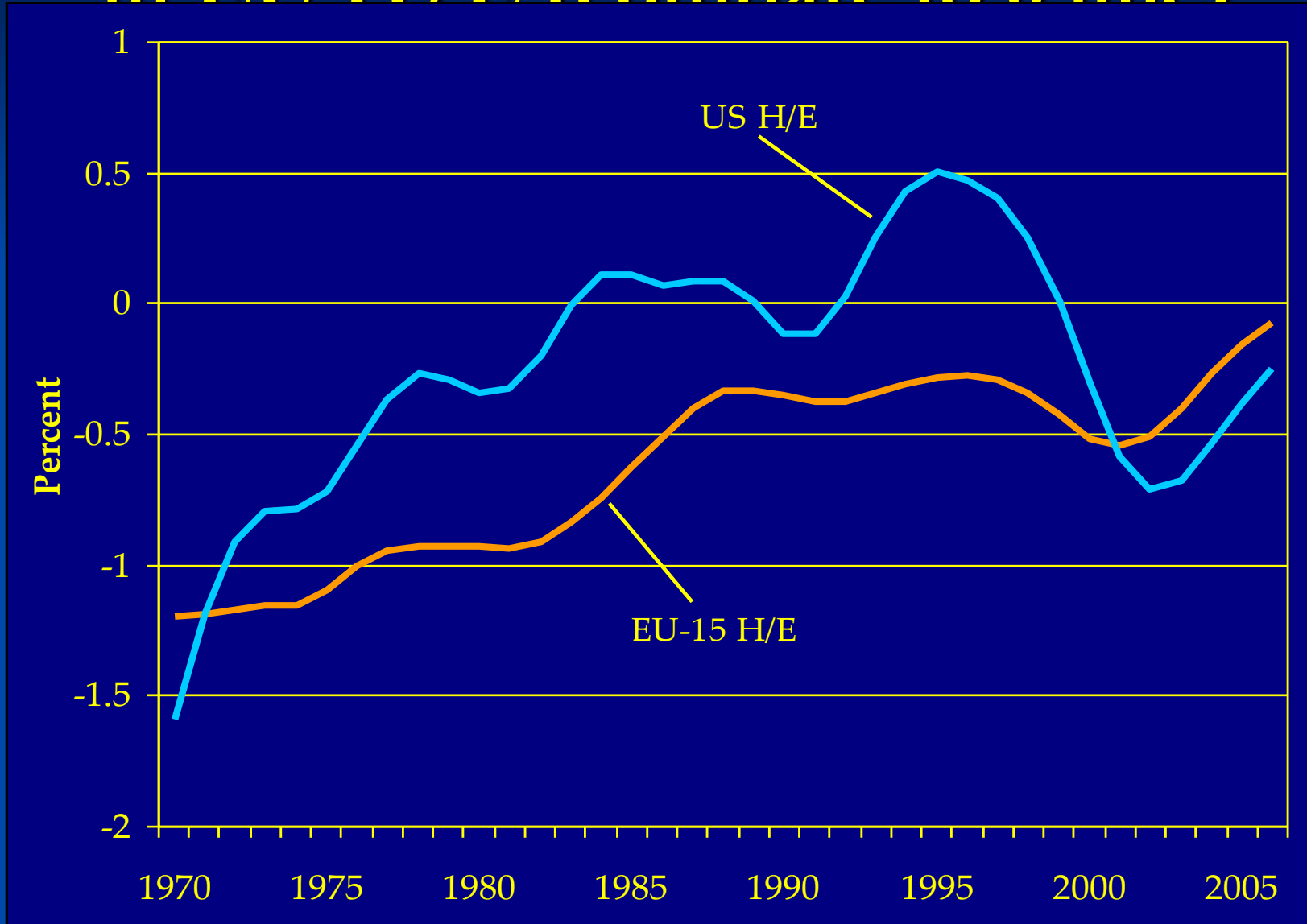
# Comments about H/N and Y/N

- Importance of expressing everything per capita
  - Average EU population growth 0.7 percent per year slower than US
- EU Growth in H/N strongly negative pre-1995, US strongly positive
- Falling level of H/N in Europe is what Prescott and others have been trying to explain
- Productivity and employment turnarounds cancel out. Growth in Y/N almost equal 1980-2005
  - EU 1.92 percent per year, US 1.97 percent per year
- But EU is at only 70-75 percent of US level and is not catching up

# Yes, H/N Growth Turnaround, but most of this was E/N not H/E



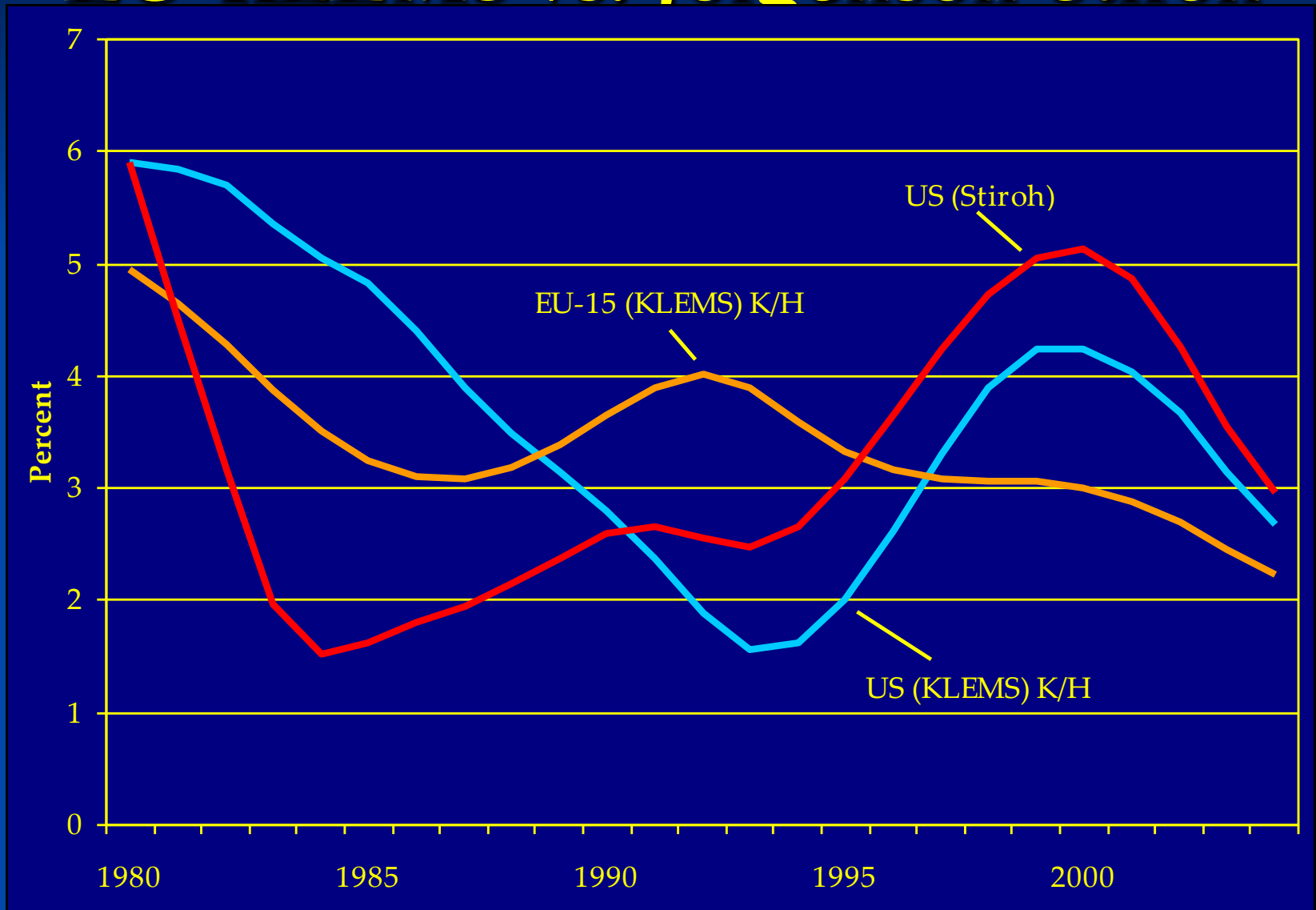
# Contrast the Lack of Turnaround in EU H/E. (compare to 0 line)



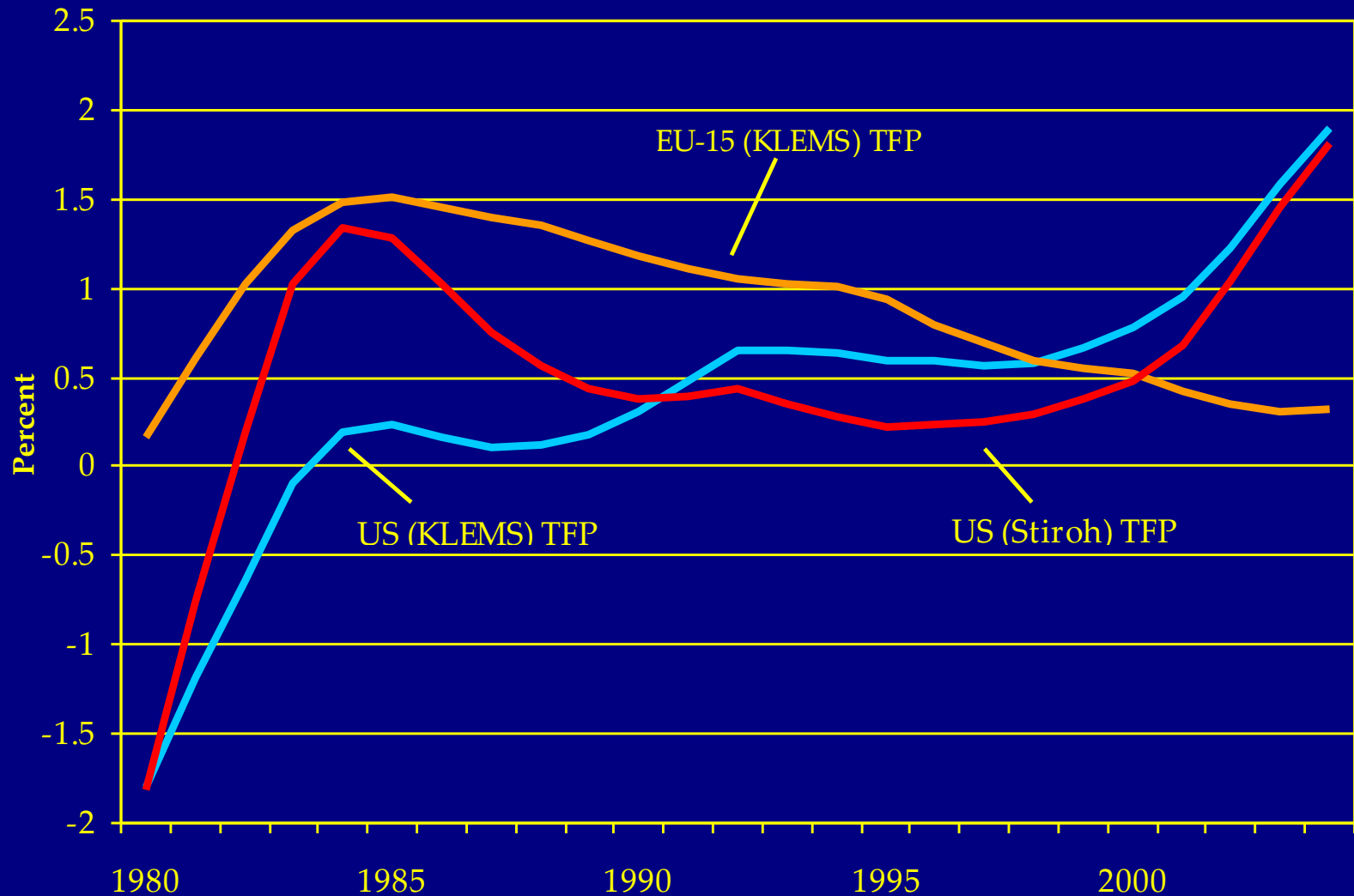
# Implications of E/N Turnaround and Lack of H/E Turnaround

- The regression analysis relates Y/H growth to E/N, not H/N
- This fits together with the previous econometric literature in which the dependent variable tends to be unemployment or employment, not hours
- Focus on E/N makes it easy to disaggregate by age-sex groups

# Data Problem: Capital input growth, EU-KLEMS vs. Jorgenson-Stiroh



# Counterpart is a Different Story about US TFP Growth in 1980s





# Turn to Table 1, the basic Turnaround Story

- Turnaround difference
  - 1995-2006 growth minus 1970-95 growth
  - EU growth minus US growth
- Turnarounds in opposite directions
  - EU-US -2.20 for Y/H
  - EU-US +1.99 for H/N
  - EU-US -0.19 for Y/N
- Disproportionate role of Med countries
  - All turnarounds fall by  $\frac{1}{4}$  when Meds excluded

# Increased Post-1995 Heterogeneity

- Standard deviations rise post 1995
  - Y/H from 0.63 to 1.00
  - H/N more than doubles 0.46 to 1.02
  - Y/N more than doubles 0.55 to 1.27
- Range of Y/N growth post 1995
  - Italy 1.18 to Ireland 6.17
  - Greece and Spain #2 and #3
  - Sharp contrast Spain vs. Italy
- Surprise: Three of four EU groups have faster Y/N growth than US post-1995
- Population shares 5, 17, 49, and 29

# Table 2, add capital and TFP

- Shorter period, 1980-2004
- Identity:  $Y/H$  growth  $\equiv$  capital deepening + TFP growth
- US no turnaround CD so  $Y/H = TFP$
- EU  $K/H$  turnaround almost as negative as  $E/N$  turnaround is positive. Sliding down the LD curve

# Table 2 for the Four Country Groups

- Key question. Did capital growth respond to faster employment growth?
  - Compare turnaround in  $K/N$  to  $E/N$
- Nordic, strong employment, relatively strong  $Y/H$ , but weak capital
- Anglo-Saxon (94% UK). Strong  $K/N$  response to  $E/N$ , no turnaround capital deepening
- Continental (49% of EU).  $K/N$  response 1/3 of  $E/N$  turnaround.

# Core of the Turnaround: the Meds

- Biggest turnarounds for  $Y/H$ ,  $E/N$ ,  $K/H$ , capital deepening and TFP
- Virtually  $K/N$  response to big  $E/N$  turnaround
- Overall, Meds shared with Nordic a disappointing investment performance
- Anglo-Saxon and Continental had substantial positive  $K/N$  response to  $E/N$  turnaround
- Later we compare capital response to predictions of a calibrate model

# Regression Analysis of E/N

- Here we inherit a large literature
- Ratio of EU/US H/N declined by 48 percent from 1960-95.
- For Prescott, it is all the tax wedge
- For others, it is a varying mix of taxes, regulations, politics, unions
- There is plenty of data and regression specifications to choose from
- But so far nobody has *used* the regression coefficients to interpret the post-1995 E/N



# What tax wedge elasticity should we expect?

- Prescott's calibrated elasticity is -0.92
  - Alesina *et al.* argue *a priori* not  $> -0.4$  to  $-0.45$
- Econometric estimates
  - Davis-Henrekson -0.22 (only four years ending in 1995)
  - Bassanini-Duval, best data, best specification
    - -0.30 for males, -0.50 for females
    - No regressions for both sexes together, which we need

# Results in Table 3

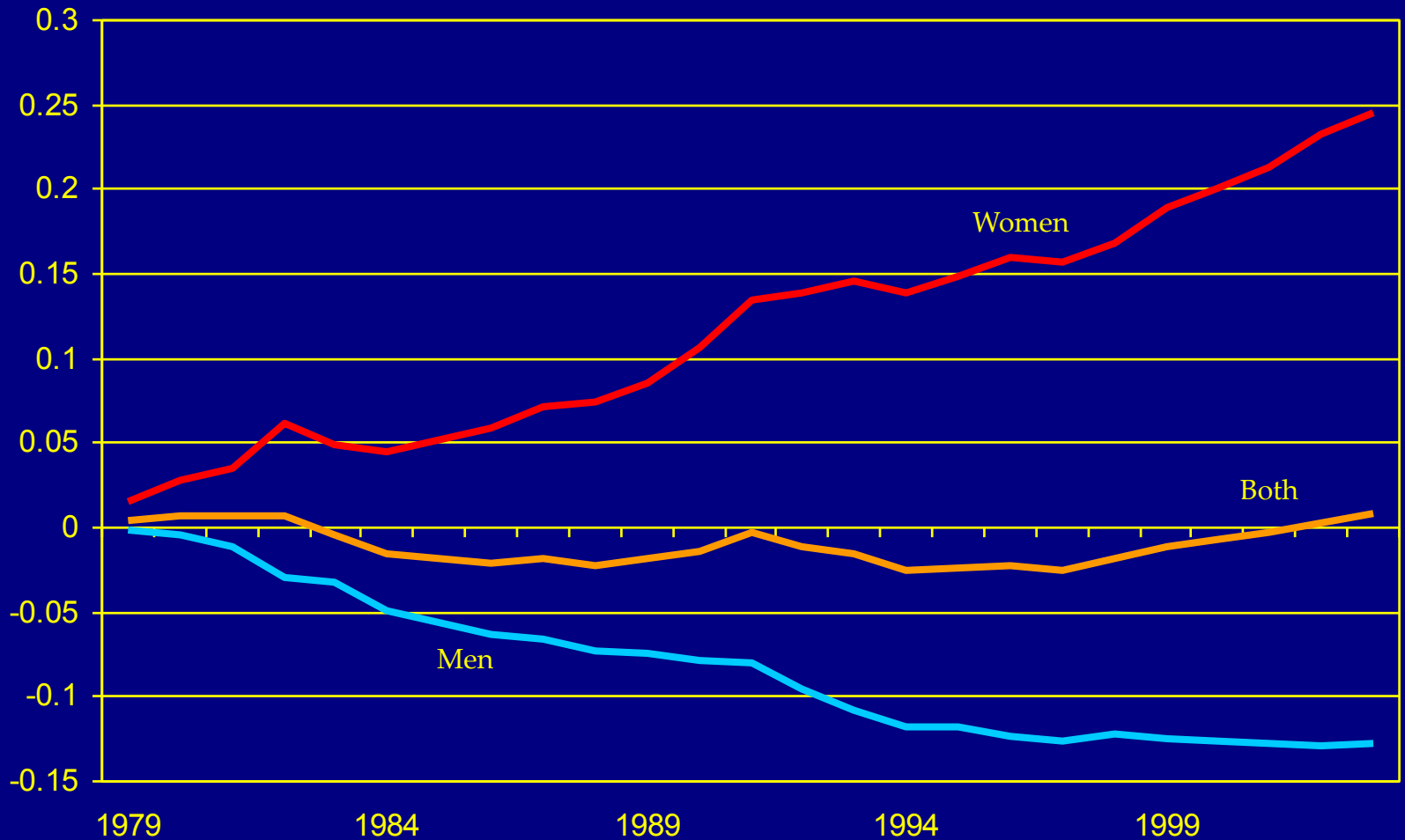
## ■ Changes from B-D

- They include 20 countries, with US, Canada, Japan, whereas we want just EU-15
- We include ages 15-64, they did prime-age, youth, and elderly separately (we do separate age-sex regressions later)
- We weight the regressions by population (to do otherwise gives Luxembourg the same importance as Germany)
- Run regressions separately for both sexes, males, females
- We fill in some missing data to extend the sample period back from 1982 to 1978

# What to Notice in Table 3

- Three columns for both and females, two for males
- Cols (1) and (6) have numerous other controls that are not computed for men
- Then come results without the other controls, and with and without time effects. All results have country fixed effects
- Big impact of omitting time effects. Why?

# Big Time Effects



# Interpretation of Results

- The time-trend-like pattern of the female time coefficients suggests a cultural shift favoring more employment of females
  - Same thing happened in the US between 1965 and 1980
- Our baseline results are those with the time effects, columns (2), (4), and (7)
- Tax wedge coefficients close to those of B-D, higher than those of Davis-Henrekson

# Interpretation of Other Coefficients

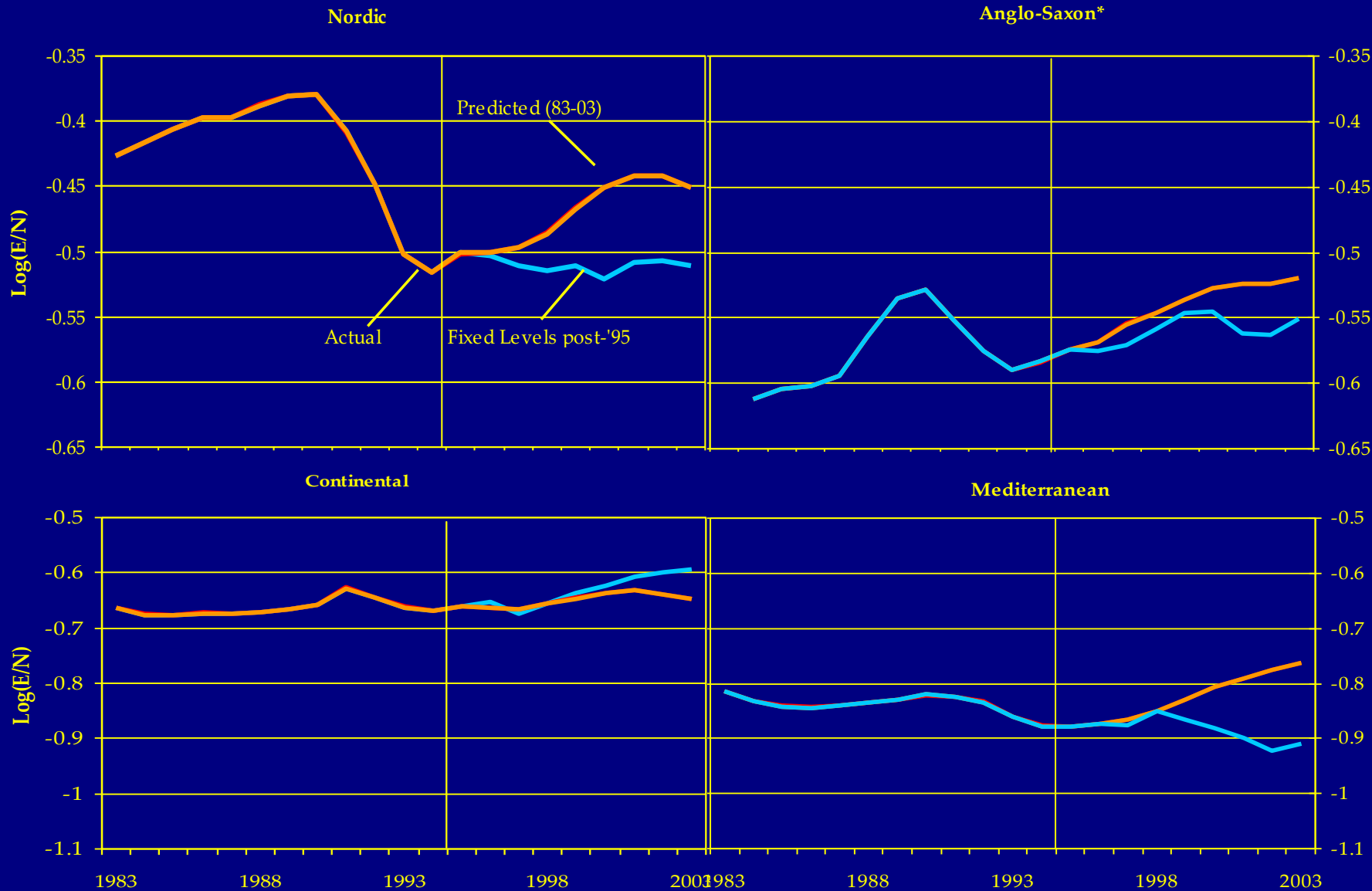
- Output gap should have a positive coefficient, others should have a negative coefficient
- For both, only tax wedge and ARR are significant
- For men, same, plus PMR with wrong sign
- For women, tax wedge, EPL, and ARR are significant with correct signs



# How Much of the Post-1995 E/N Turnaround can we explain?

- Figure 4 plots the actual values and two predicted values
  - The equation's predicted value with the actual values of the explanatory variables
  - The counterfactual prediction that holds constant at 1995 levels the tax wedge, EPL, ARR, PMR, and union density variables
  - Separately for four country groups, both sexes taken together

# Figure 4, Four Country Groups



# Interpretation of Figure 4

- Predicted lies on top of actuals, reflecting  $R^2=1.0$ 
  - Same for B-D, 0.99 to 1.0
- Most important result is that policy/institutional variables can explain the post-1995 turnaround everywhere but in Cont group
- Which variables contribute the explanation in each country group? (not shown in tables)

# Contributions by Country Group

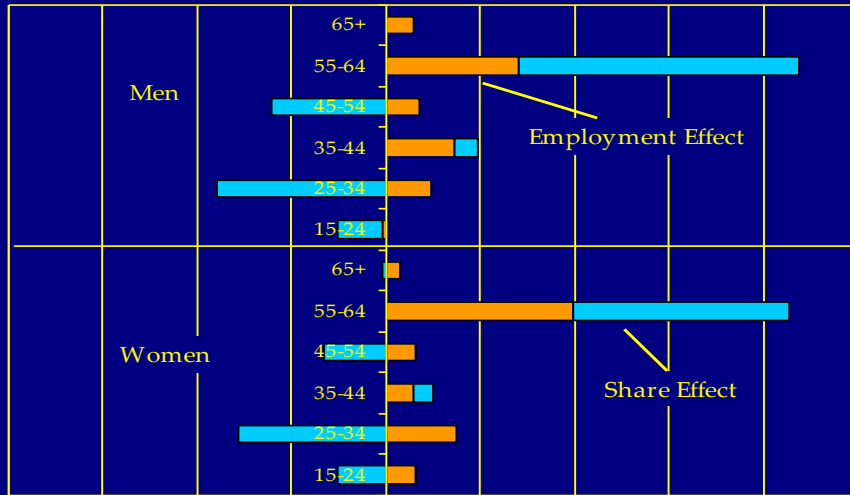
- Nordic: decline in PMR and union density
- Anglo-Saxon: decline in tax wedge and union density (Thatcherism?)
- Continental: decline in EPL and PMR
- Mediterranean: Mainly PMR, some EPL
- Tax wedge
  - Mattered only for Anglo-Saxon
  - Other groups, taxes didn't change, Med countries tax coefficient close to zero

# Demographics of Employment

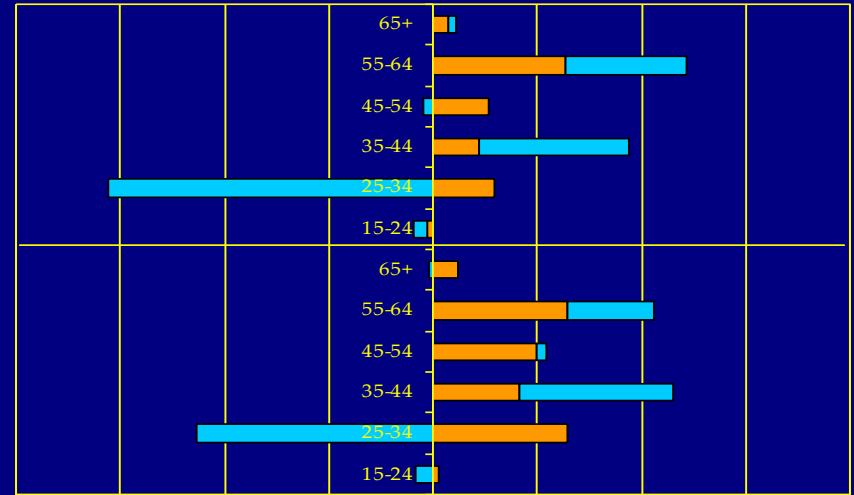
- First, a shift-share analysis of E/N turnaround
  - Was the increase in E/N in each age-sex group
  - Or did E/N composition move toward groups with already-high E/N?
  - Employment and share effects sum to the total change in E/N over a time period
- Figure 5 shows the results by the four country groups

# 12 Age-Sex, 4 Country Groups

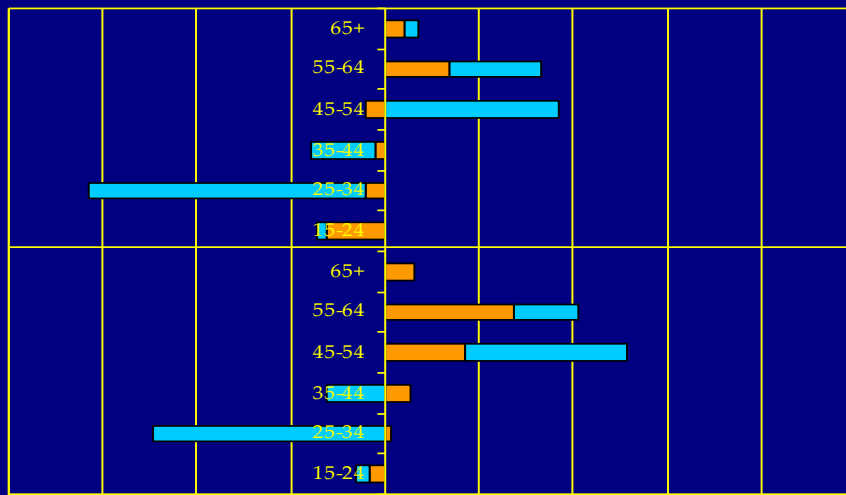
Nordic



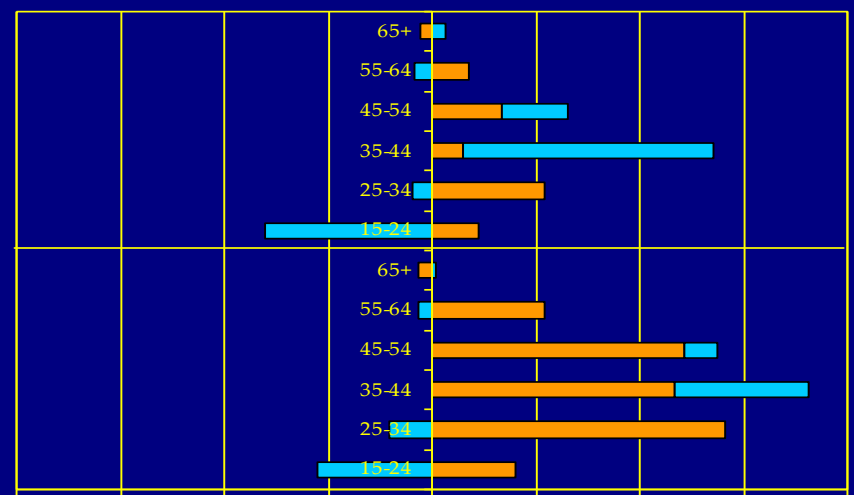
Anglo-Saxon



Continental



Mediterranean



-0.02 -0.015 -0.01 -0.005 0 0.005 0.01 0.015 0.02 0.025 -0.02 -0.015 -0.01 -0.005 0 0.005 0.01 0.015 0.02



# Interpretation of Figure 5

- Nordic and Anglo-Saxon share effects reflect aging of the population
- Increase in 55-64 could also result from higher retirement ages
- Employment effects in Cont group were smaller than in Nordic and A-S
- Employment effects are substantially larger for Med group, especially for prime-age females
  - Empl effect 90%, female empl effect 70% of total

# E/N Regressions for Age-Sex Groups in Table 4

- Tax wedge effects are larger for females than males in all age groups except youth
- Output gap coefficients are much larger for youth
- EPL has large negative effects for youth and elderly
- ARR has significant negative coefficients, large for several groups
- Alternating signs for PMR
- Strong union effects above age 45

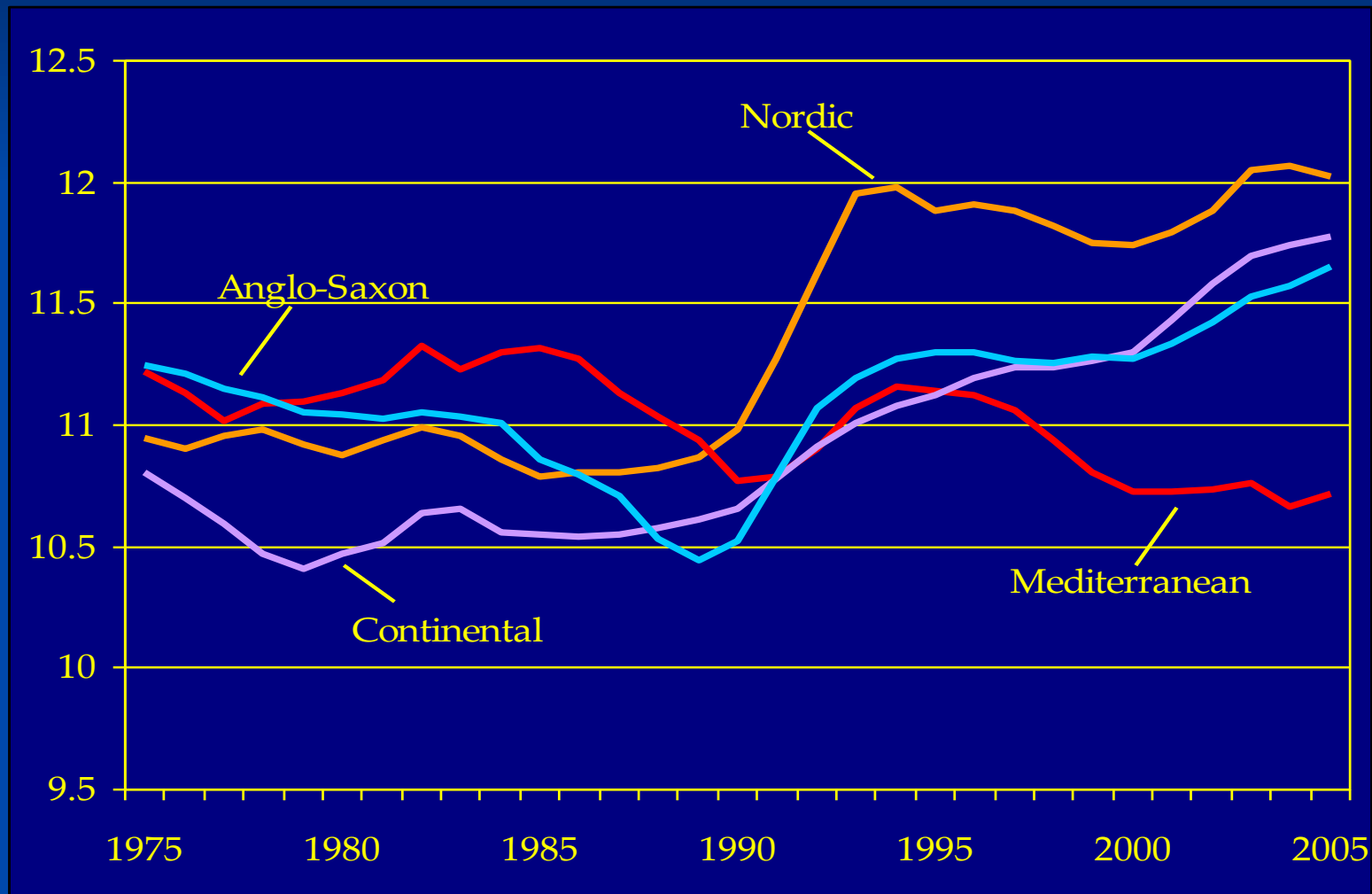
# Changes in Aggregate Experience, a Channel from Employment to Productivity

- No direct data on experience
- Standard approach, “potential experience”
  - Age – years of education – 5
- But this misses inflow of inexperienced workers in a country like Spain
- We build on Wasmer (2001), who assumes workers are a random sample from the population each year

# Our Alternative Approach

- Wasmer's randomness is implausible
- We assume instead that new entrants have no previous work experience.
- See the example of how we calculate experience in Box A on p. 41
  - 100 people born 1970
  - E/N jumps from 40 to 80 percent on 1/1/95
  - On that date, half have 10 years experience, the other half have zero
- Equation (3) on p. 18 takes into account depreciation, increases of employment, and the retirement of the most experienced workers

# Figure 6: Calculated Experience by Country Group

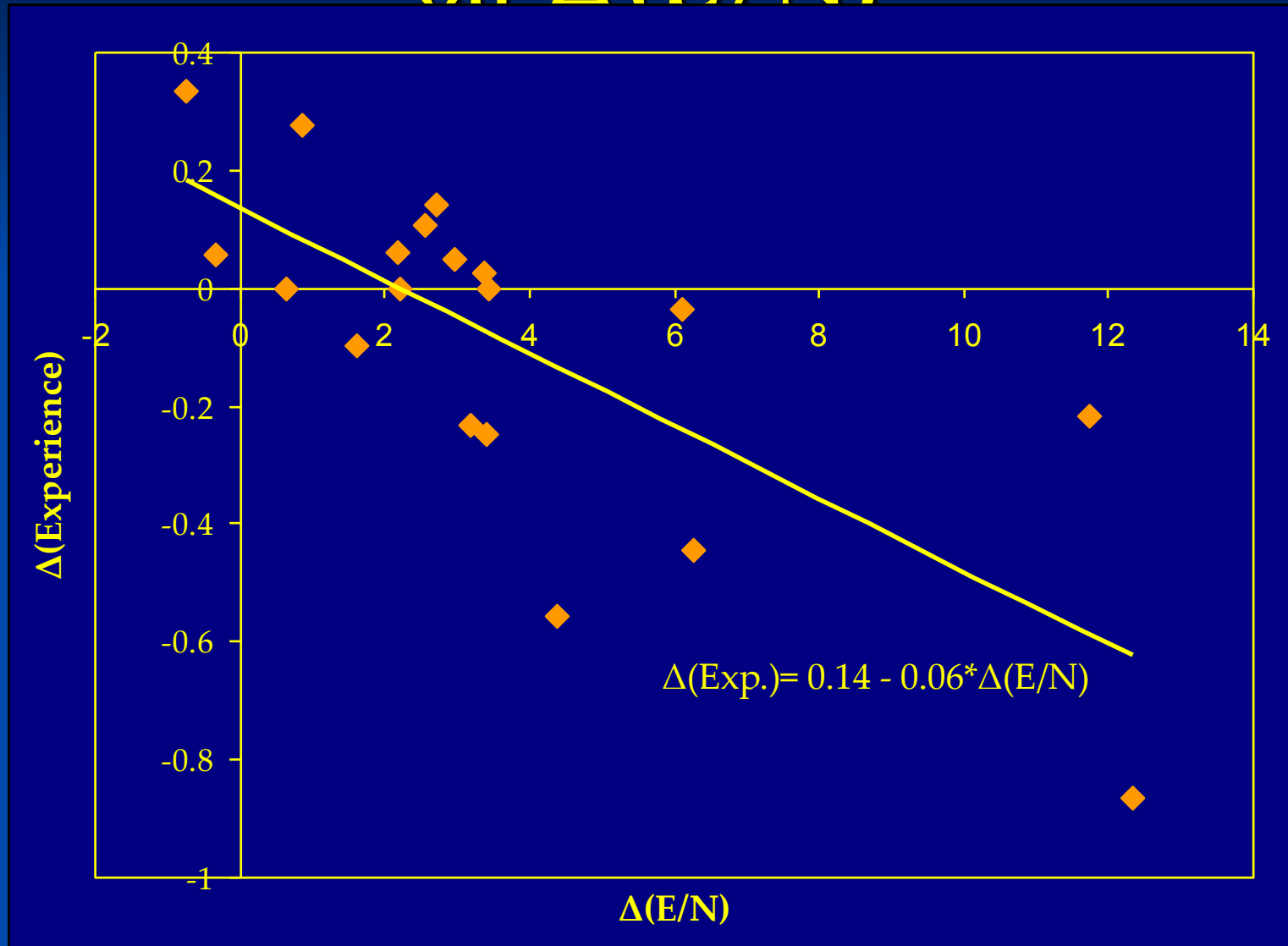


# Interpretation of Figure 6

- Experience increased in all groups but Meds, reflecting their influx of new workers starting in late 1980s
  - Experience growth gap between Cont and Meds can explain 0.5 percent per year of productivity growth gap post-1995
- Rise in experience goes in opposite direction from slowdown in productivity growth
- Table 5 reports details
  - Germany-Spain experience gap can explain  $\frac{3}{4}$  of actual Germany-Spain productivity gap



# Figure 7: Scatter of $\Delta$ Exp on $\Delta(E/N)$



# Another Counterfactual Exercise Regarding post-1995 Turnaround

- Table 6 reports calculated post-1995 change in experience on two assumptions
  - Actual employment growth
  - No employment growth
- Look at Meds, esp. Spain: big negative employment effects on experience
  - Paper, p. 20. Experience can explain 2/3 of Spain vs. Italy productivity growth difference
- Otherwise, effects are small, with neg effects in IRE and LUX, positive in DNK

# Part 5, Two Approaches to Link Productivity Growth to E/N Growth

- A calibrated structural model
  - Given the behavior of employment, what are the implications for productivity growth and investment?
  - As interesting for its errors as for its predictions: which aspects of European outcomes are surprising?
- Reduced form regressions of productivity change on employment change, using IV to control for simultaneity

# The Structural Model

- Described in words in Box B on pp. 42-43
- Described in equations in Technical Appendix
- Two changes to the basic Ramsey model
  - Two types of agents (men and women) differentiated by skill and taste for market work.
    - Allows us to trace effects of societal changes favoring more market work by women
  - Novelty: introduce experience into a DSGE model
- Lump all policy/institutional changes into a single parameter, the distaste for work

# Effects of a Change in Distaste for Work

## ■ Short-run Effects

- Decline in  $K/H$  ratio
- Decline in productivity
- Output rises
- Investment rises

## ■ Long-run effects

- $K/H$  rises back toward its initial level
- Experience rises
- These two channels allow productivity to recover after its initial decline

# Results in Table 7

- Take  $E/N$  as given, calculate implied turnarounds in growth of  $Y/H$  and  $K/N$
- Note: actual values are slightly different than in Table 2, since this starts in 1985 rather than 1980
- Any effects of a turnaround in technical progress will not be reflected in the predicted, rather in the errors

# Important Results in Table 7

- LP turnaround:
  - All predicted values have correct sign
  - Big shortfalls in actual vs. predicted for Cont & Med
- K/N turnaround
  - Med shortfall in K/N explains a further 0.14 of their Y/H shortfall ( $0.33 * -0.42$ )
  - Col (7) shows total predicted Y/H turnaround
  - Overall, K/N helps slightly to improve RMSE of predictions, substantially for Meds, wrong direction for A-S
  - Note overall prediction nails the Nordics almost exactly



# RHS of Table 7: Predictions

- Prediction of Y/H and K/N 2005-2010 if employment level remains constant at 2005
- Intuition: if Med E/N stops growing, it will stop pushing down on Y/H growth so their Y/H growth should be faster
- That's what Table 7 shows – major future improvement for Meds, smaller for Nordic and A-S
  - Implies a future convergence in EU productivity growth
- But this could be an implausible prediction for employment. Why should Med E/N stop growing?

# Reduced-form Regressions

## Explaining Productivity Growth

- We merge two strands of literature
  - Employment explained by policy/institutional variables
  - Productivity growth explained by employment growth: tracing the labor demand curve
- The model showed two elements to the  $Y/H$  vs.  $E/N$  tradeoff
  - The effect on  $K/H$
  - The effect through experience

# Turn to Table 8 for the Results

- Table 8 starts with naive regressions and gradually becomes more sophisticated
- Column (1) includes only E/N growth and the change in the output gap
  - Coefficient on E/N -0.79
  - No difference made by fixed effects in col. (2) except better fit
- McGuckin-van Ark claim tradeoff is temporary, they add longer lags to show turnaround
  - Not true in col. (3)

# How to control for simultaneity?

- A technology shock could cause a negative correlation between productivity and employment
- We follow Bourles and Cette (2005) by using IV
  - List of instruments bottom Table 8
- Column (4), E/N coeff drops from -0.84 to -0.64 and -0.62 with country fixed effects col (5)

# Effects of the Policy Variables

- Add in the policy variables
  - You would expect coeff on E/N to become smaller because previously policy effects were working through E/N
  - You would expect positive coefficients on policy variables
- Final results in column (7)
  - E/N coeff drops to -0.42
  - ARR, EPL strong effects, PMR marginal effect
  - Note: Three-year changes in policy variables are included in list of instruments in columns (6) and (7), see Table 10 below

# Accuracy of Predicted post-1995 Productivity Growth Turnarounds

- Nordic, big miss
  - Intuitively, they managed big employment gains which would be predicted to reduce productivity growth, but they had a minimal turnaround
- A-S, dominated by UK. Big miss for Ireland
- Continental, quite close, better than model
- Mediterranean residuals are same as the model
- Country group predictions RMSE of 0.54, compared to 0.41 for model



# The Combined Effects of Policy and Institutions on Productivity Growth

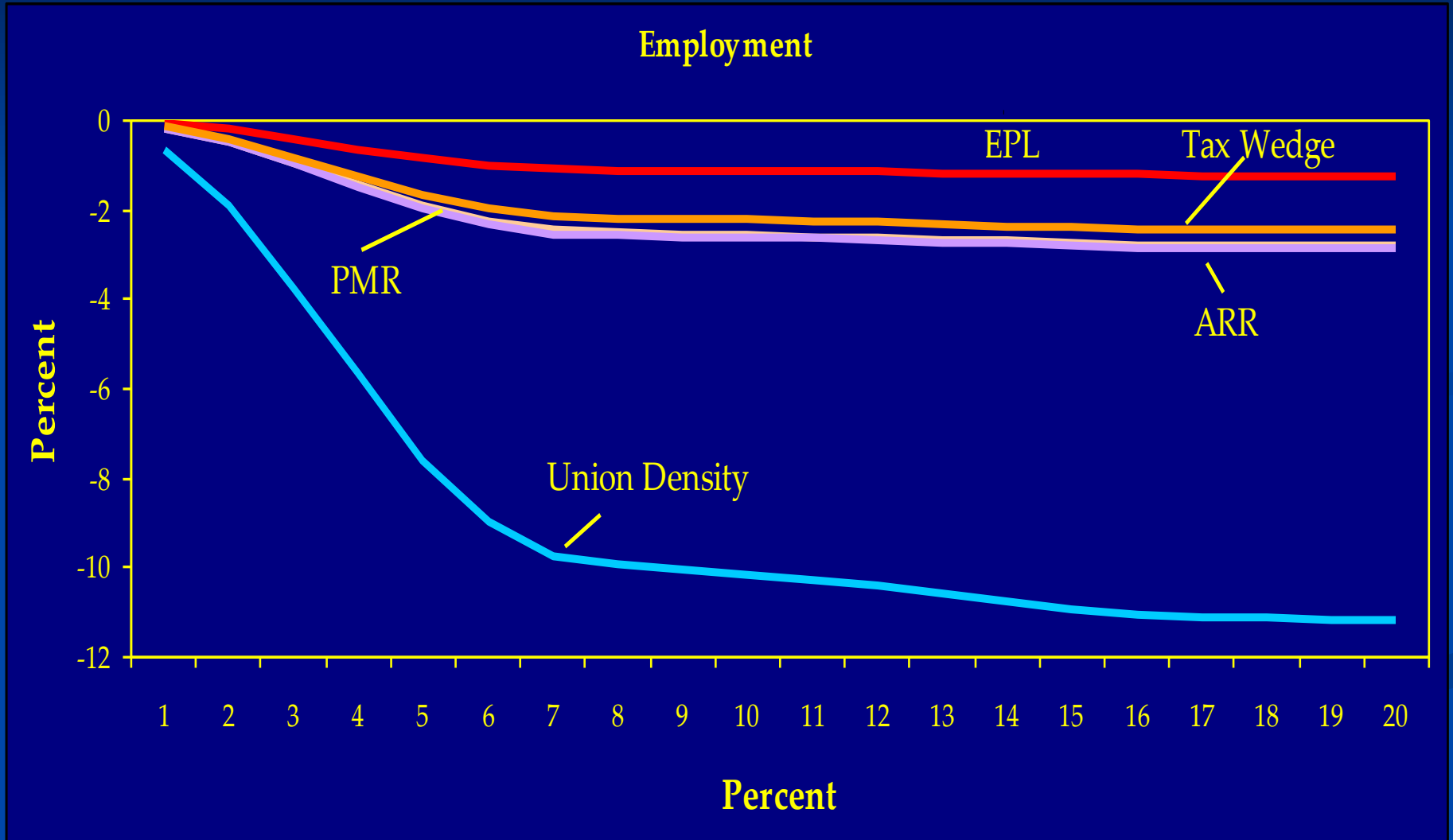
- We have seen some policies push employment down and productivity up
- Table 10 shows the first-stage coefficients in the productivity regressions
  - The policy variables are entered as three-year changes
  - All policy variables have the correct sign, all but EPL are highly significant



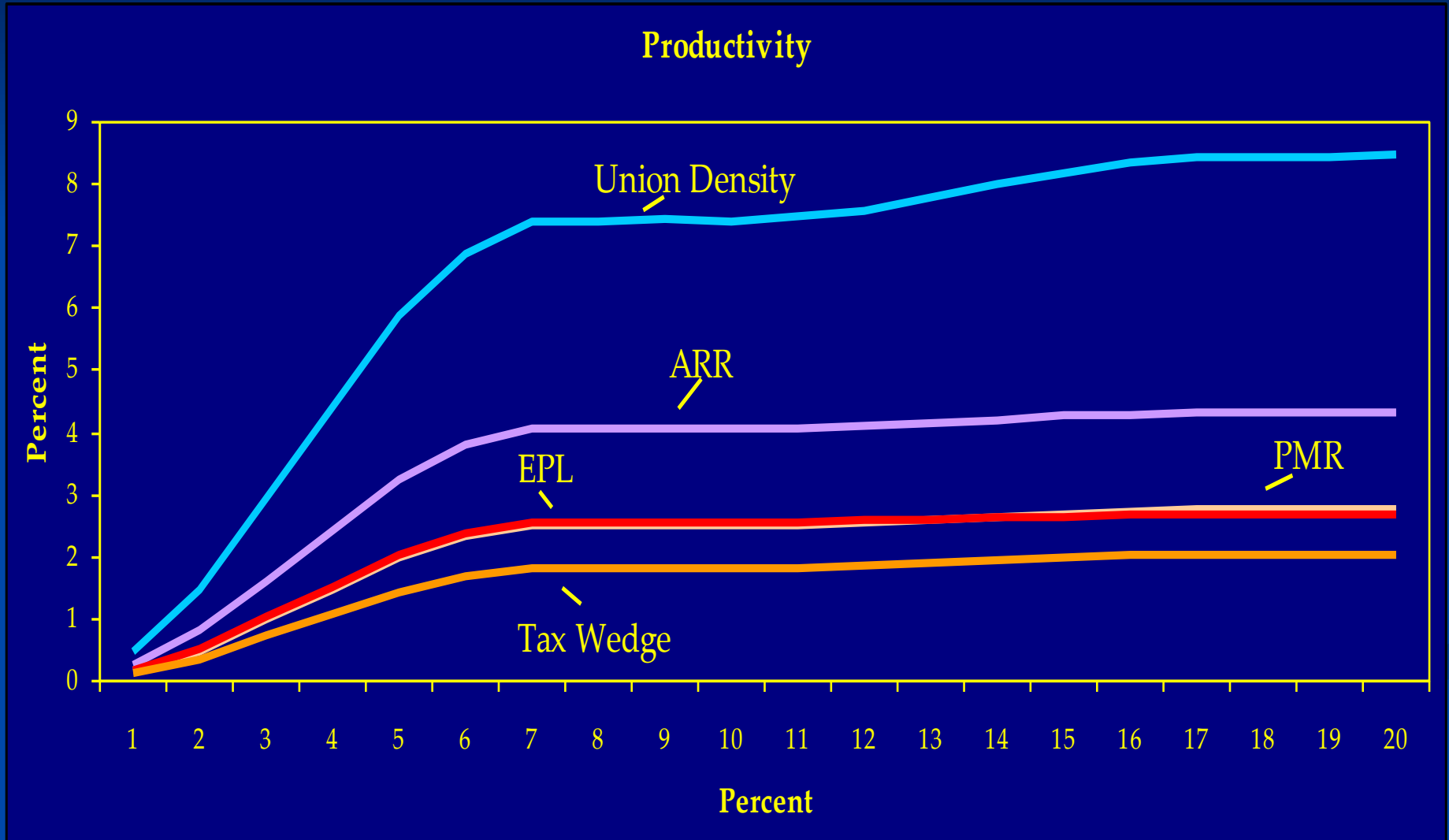
# Direct and Indirect Effects

- Policy variables have two effects on productivity
  - Direct effect through coefficients in Table 8
  - Indirect effect in reducing employment in Table 10, which in turn raises productivity in Table 8
- If a policy raises  $Y/H$  and reduces  $E/N$ , it may have little or no impact on  $Y/N$
- Simulations of a unit standard deviation shock that occurs over a five-year period
  - For instance, One stdev shock to union density is 15.6 percentage points
  - Coefficients on these variables have no direct economic meaning because they are index numbers

# Simulated Effects on E/N



# Simulated Effects on Productivity





# Summary of Simulations on $Y/N$

- What Figure 8 shows:
  - ARR and EPL provide a free lunch. Boost productivity more than employment declines, resulting in a rise in  $Y/N$
  - Union density is unambiguously bad
  - Taxes and PMR don't seem to matter much
- Surprises
  - That all five policy/inst variables matter for  $Y/H$
  - There is no long-run bounce-back effect

# The Y/H and E/N Turnarounds at the Industry Level

- This is the first paper to produce these data
- The EU-KLEMS data base only became available in March 2007
- Double-aggregation by industry and country group
- Table 11 presents the results for the US, the EU excluding the Meds, and the Meds
- Top half the raw growth rates, bottom the contributions (nominal output shares)

# US vs EU, Groningen has Emphasized Trade and Finance

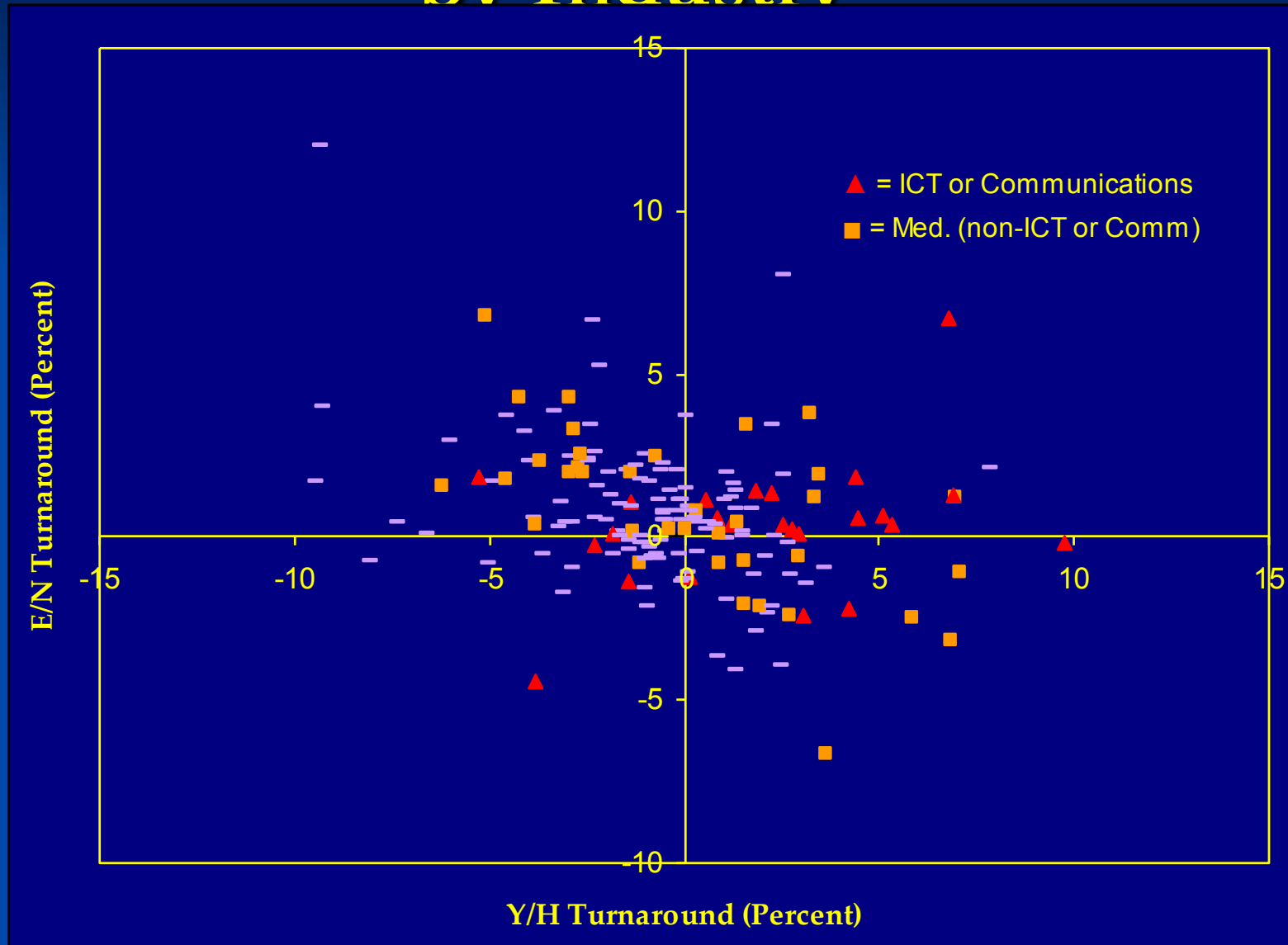
- In Table 11 these account for roughly half of the US-EU difference. Adding business services brings the amount explained to 95 percent
  - Large literature on US retailing, big boxes, EU land-use regulations
- Difference between EUxMed and Med lies elsewhere
  - About 70 percent in manufacturing, rest in construction and utilities



# Is There a Tradeoff at the Industry Level

- There is no reason to think so
- Changes in policies and attitudes of women toward work should influence all industries, not the pattern across industries
- Nevertheless, we find a negative correlation of  $Y/H$  and  $E/N$  across industries
  - We did this for country groups
  - Here we display scatter and regressions for all countries

# Figure 9: The Turnaround by Industry



# Table 12: Regressions of LP Turnaround\* on E/N Turnaround\*

Countries	Exclude ICT and Comm.	Coefficient	T-Statistic	N	R2	RMSE
All	No	-0.45	-4.35	179	0.10	3.000
All	Yes	-0.54	-5.94	149	0.19	2.495
Mediterranean Only	No	-0.82	-4.19	36	0.34	2.920
Mediterranean Only	Yes	-0.83	-5.60	30	0.53	2.140

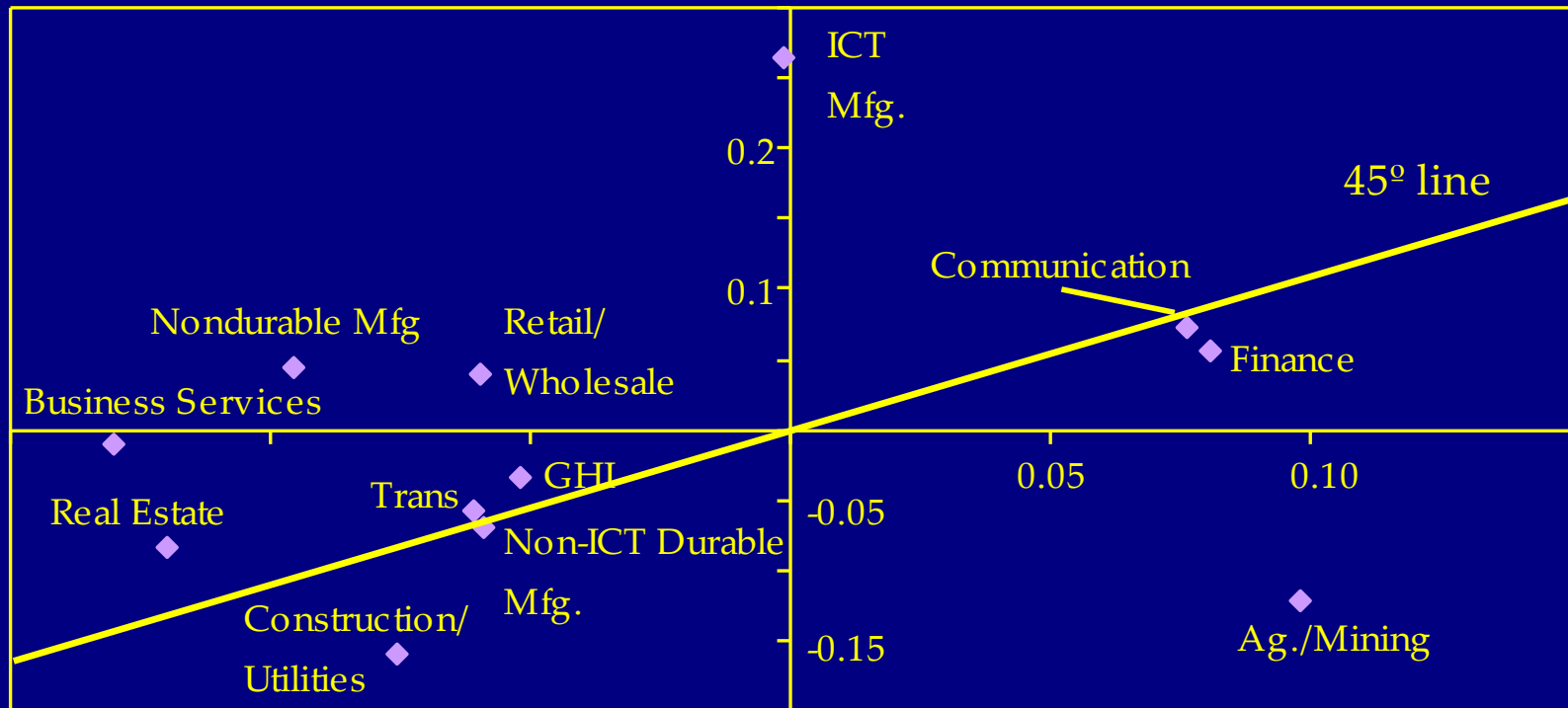
\* Turnaround equals 1995-2004 average growth minus 1980-1995 average growth

# Which Industries were the Heroes and Culprits in TFP Growth?

- Figure 10 shows post-1995 TFP turnaround in each country group on the vertical axis vs. EU total on the horizontal
- Horizontal shows largely negative turnarounds for EU
- Nordic: strong in ICT manufacturing
- A-S: strong in finance, business services, weak in ICT manufacturing

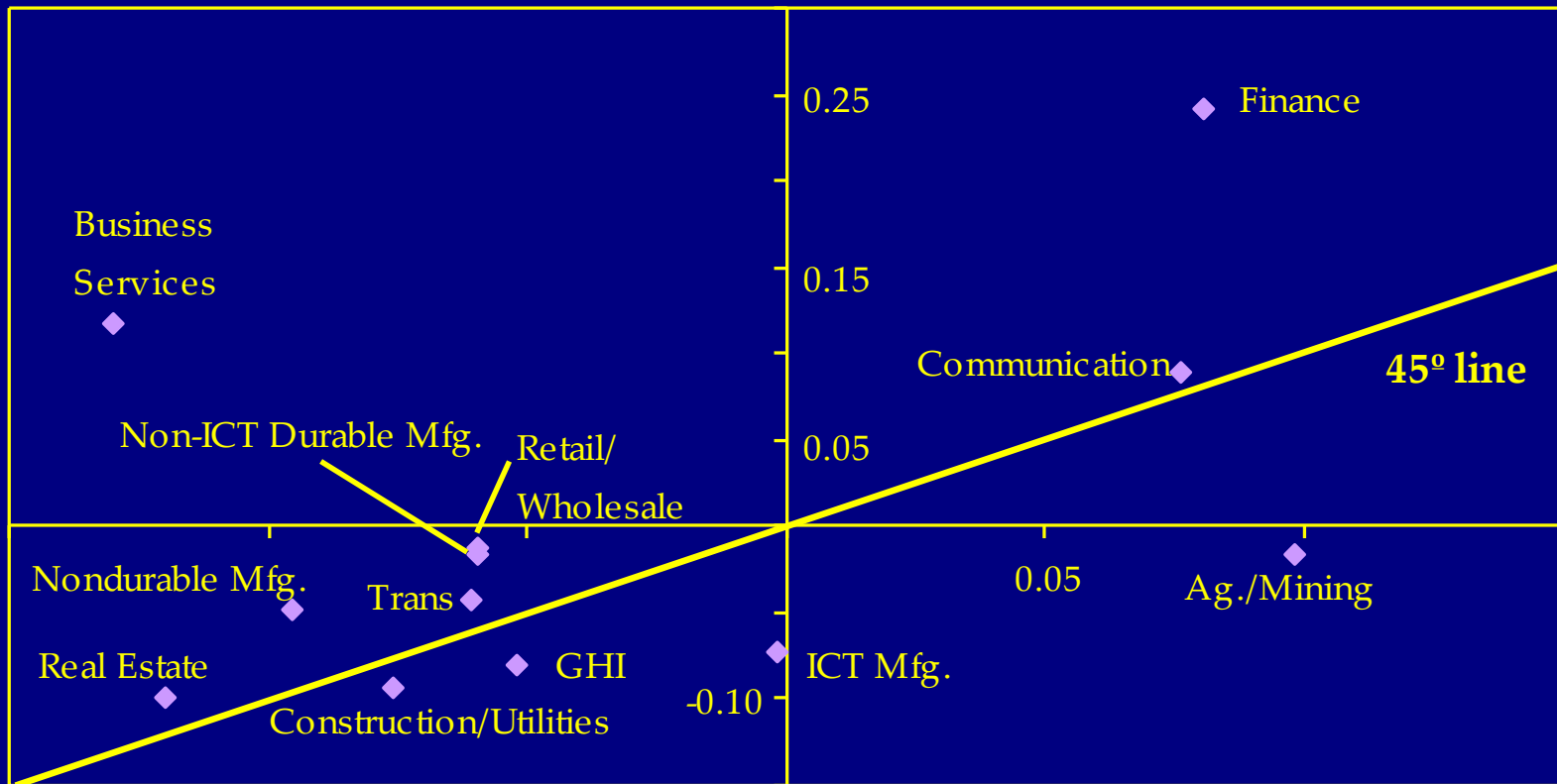
# Fig 10a

Nordic



# Fig 10b

## Anglo-Saxon



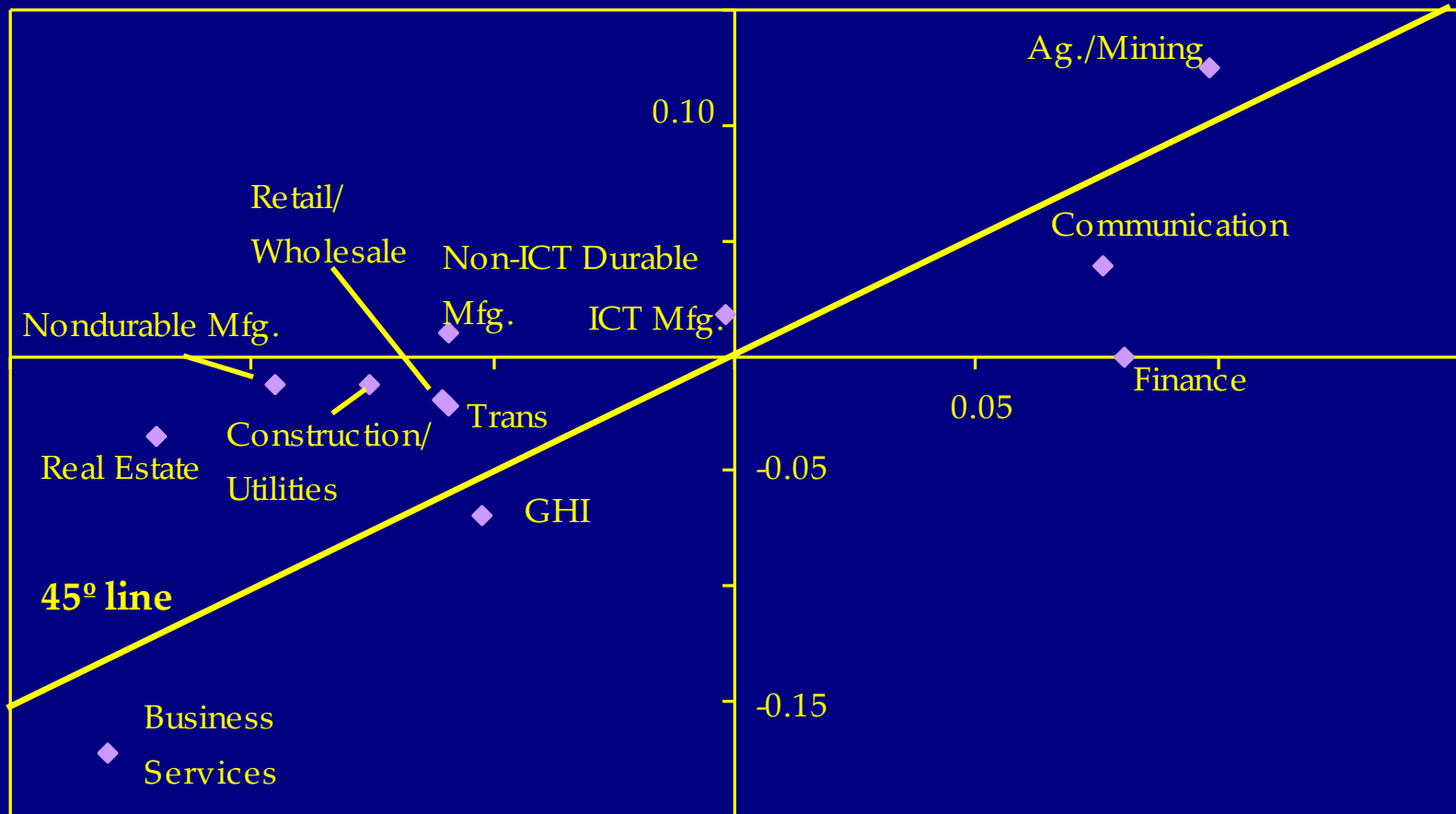
# Continental and Med

- Continental look like EU (49% pop share)
  - Weak in finance and bus services
  - (Finance people want to live in London not Frankfurt)
- Meds
  - All but three industries underperform
  - Particularly bad in all three parts of manufacturing



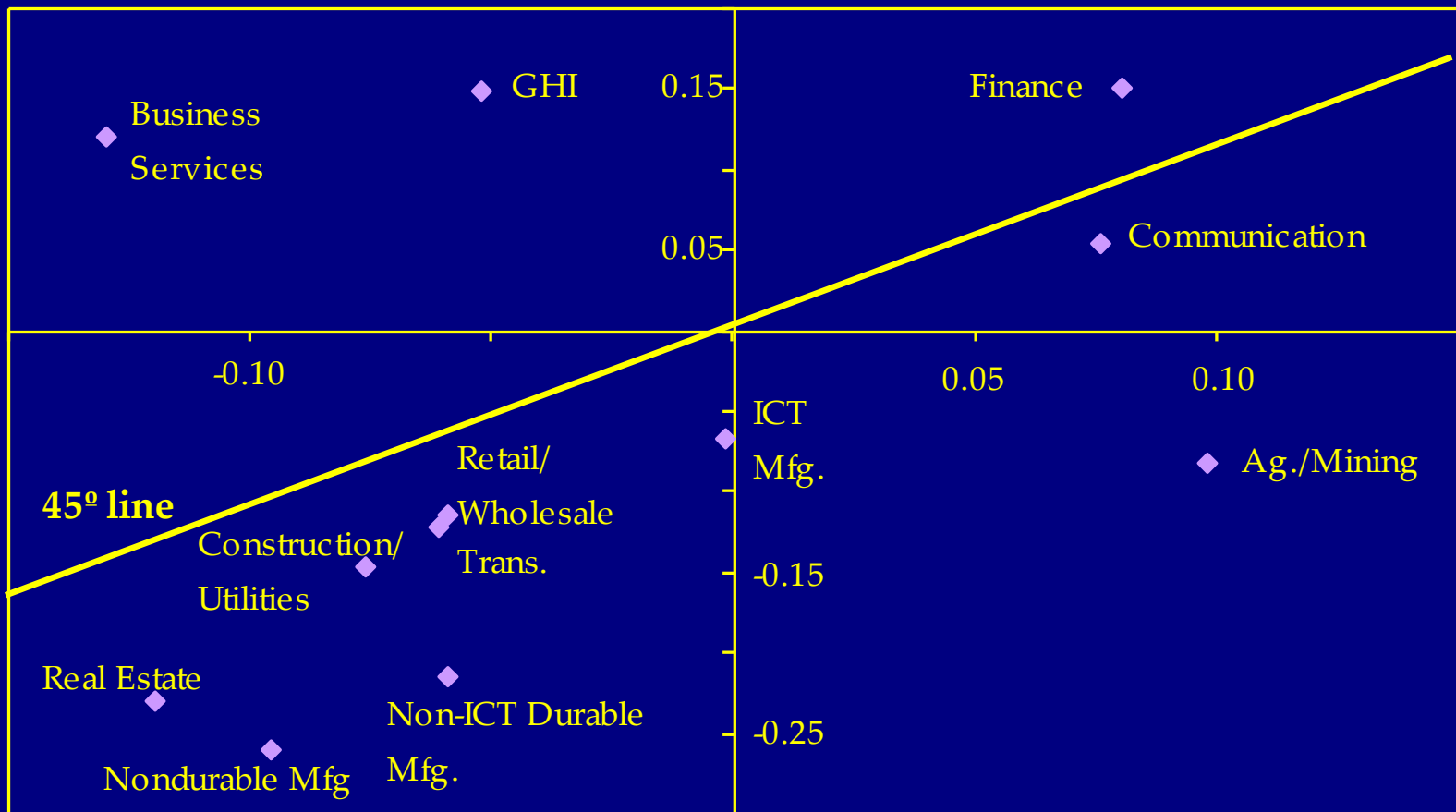
# Fig 10c

Continental



# Fig 10d

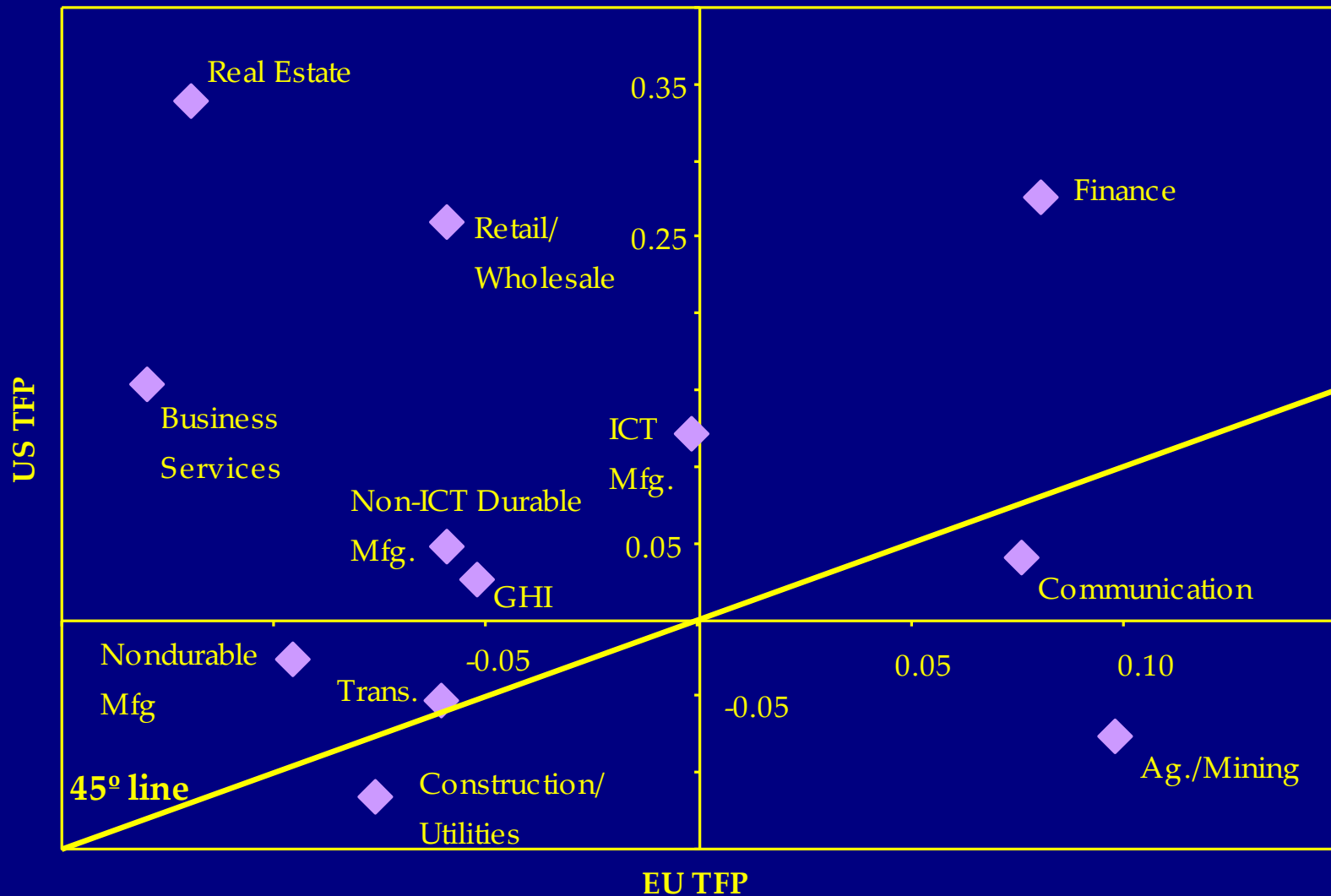
## Mediterranean



# Finally, look at US vs EU

- Trade, finance, business services stand out
- EU does better in comm, constr & ut, ag & mining
- One common element, US does better in using computers
- Heterogeneity within EU not surprising
  - SF, Boston, Austin TX have outperformed in US as Ireland & Finland & London have outperformed in EU

# Figure 11: US vs. EU



# Conclusions and Policy Implications

- Using country groups brings coherence to complex patterns across 15 EU countries
- Big increase in heterogeneity after 1995
- Negative correlation between employment and productivity
- Two channels between policy variables and productivity – direct and indirect through employment
- Negative correlation not only across countries and time but also across industries

# Thinking about Policy via the Tradeoff

- Some policies improve  $Y/N$ , some have little effect
- An added consideration is in policy effects on the government budget
  - Consider EPL vs. ARR. Raising ARR raises govt expenditure, EPL does not
  - Raising taxes raises government revenue with little effect on  $Y/N$
  - An anti George Bush message