A Tale of Two Countries: A Story of the French and US Polarization

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The objective of the paper

- Identifying **the main driving forces** underlying job polarization in France and in the US
- Job polarization is usually defined as a growing proportion of jobs concentrated at **the tails** of the skill or wage distribution
- Change in the **shares** of three types of tasks
  1. decreasing share of routine tasks (blue-collar and clerk workers...),
  2. increasing share of abstract, cognitive jobs (engineers, lawyers, professionals ....)
  3. increasing share of manual services (health care, household and housework services, ...)

  Due to Task-Biased Technological Change (TBTC hypothesis), and not Skill-Biased TC.

The objective of the paper

Apparently the same polarization in France and in the US, already documented by Goos, Manning, Salomons (2009).

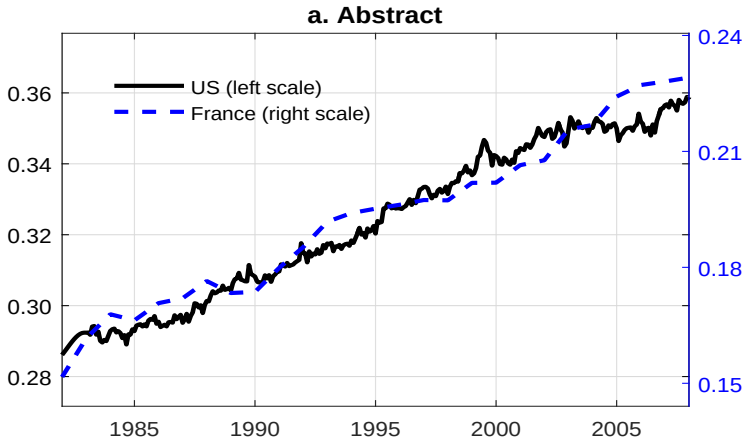
- But actually **not driven by the same forces**

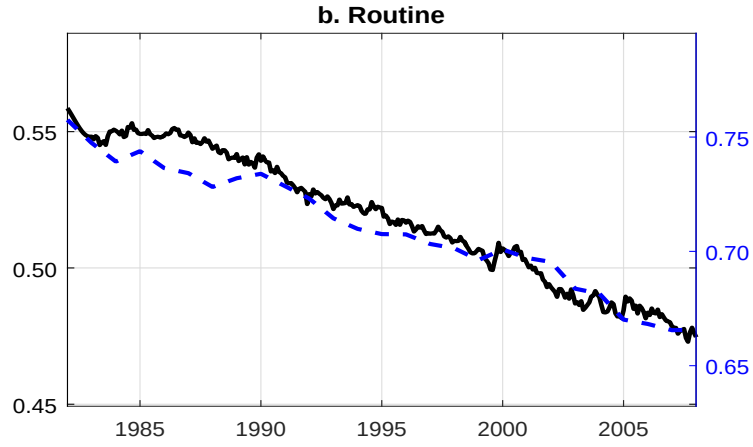
  1. Labor Market Institutions (LMI) in France
  2. TBTC in the US

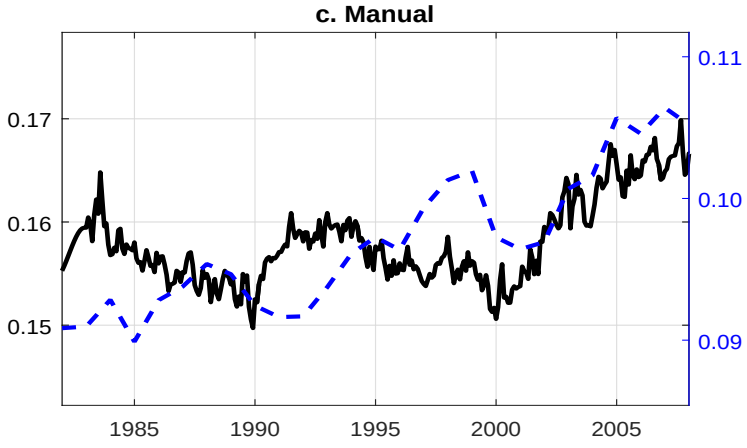
  Leading to very different aggregate outcome in terms of **employment rate** and **wage inequality**

- The **same** polarization in the data is actually **very** different in terms of employment and welfare performance.

Job polarization captured by trends in employment shares



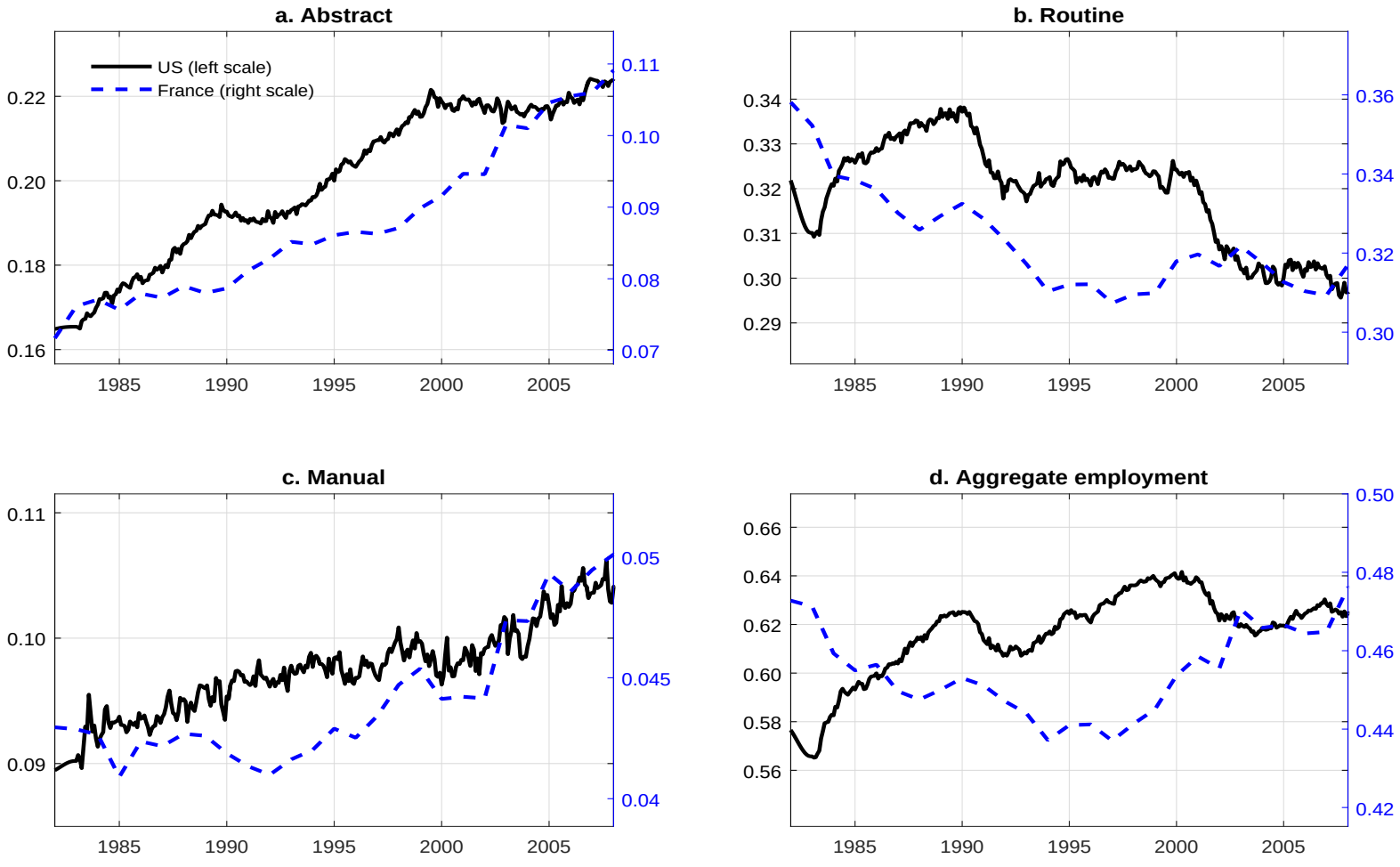




Authors' calculations. Based on BLS and French LFS.

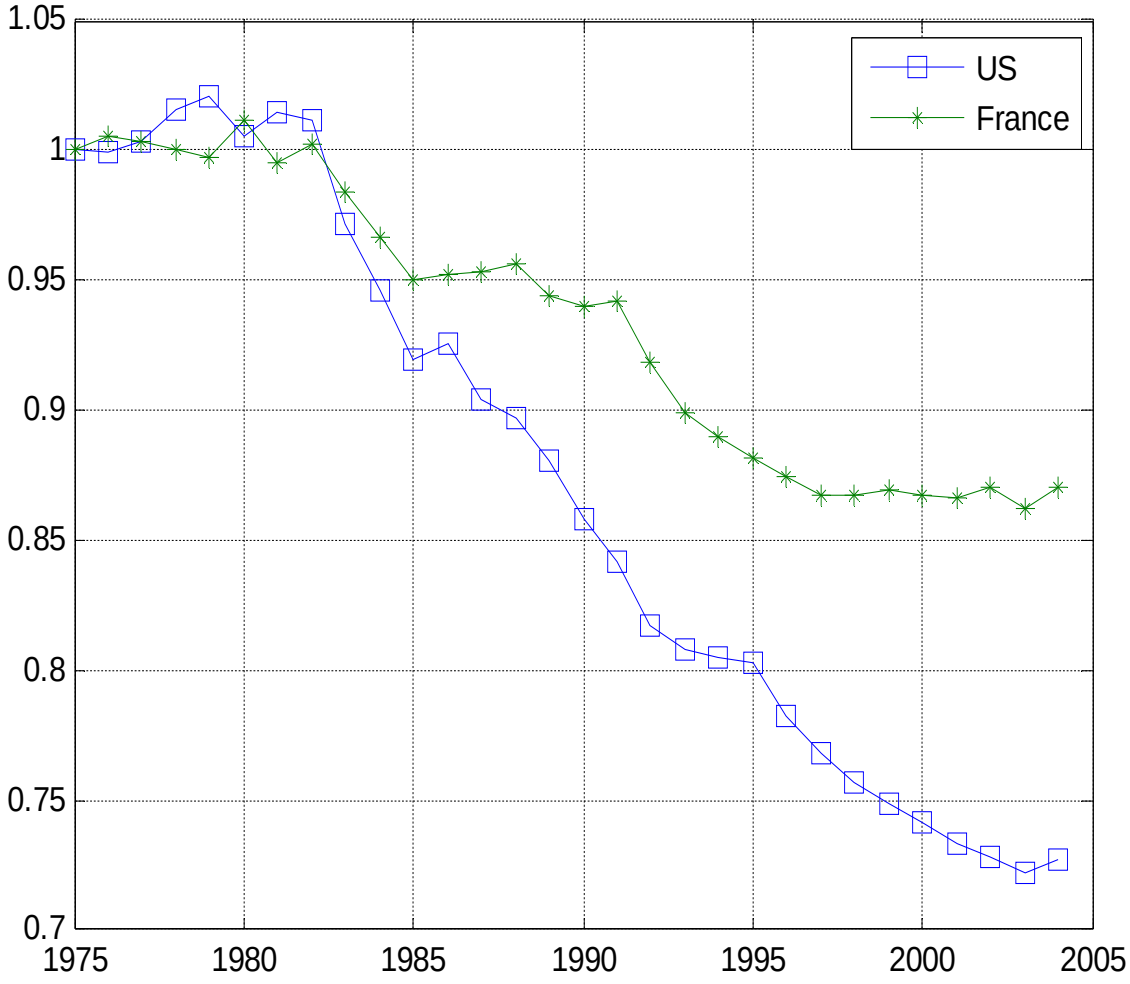
▸ US data ▸ French data

Employment per capita in the US and France



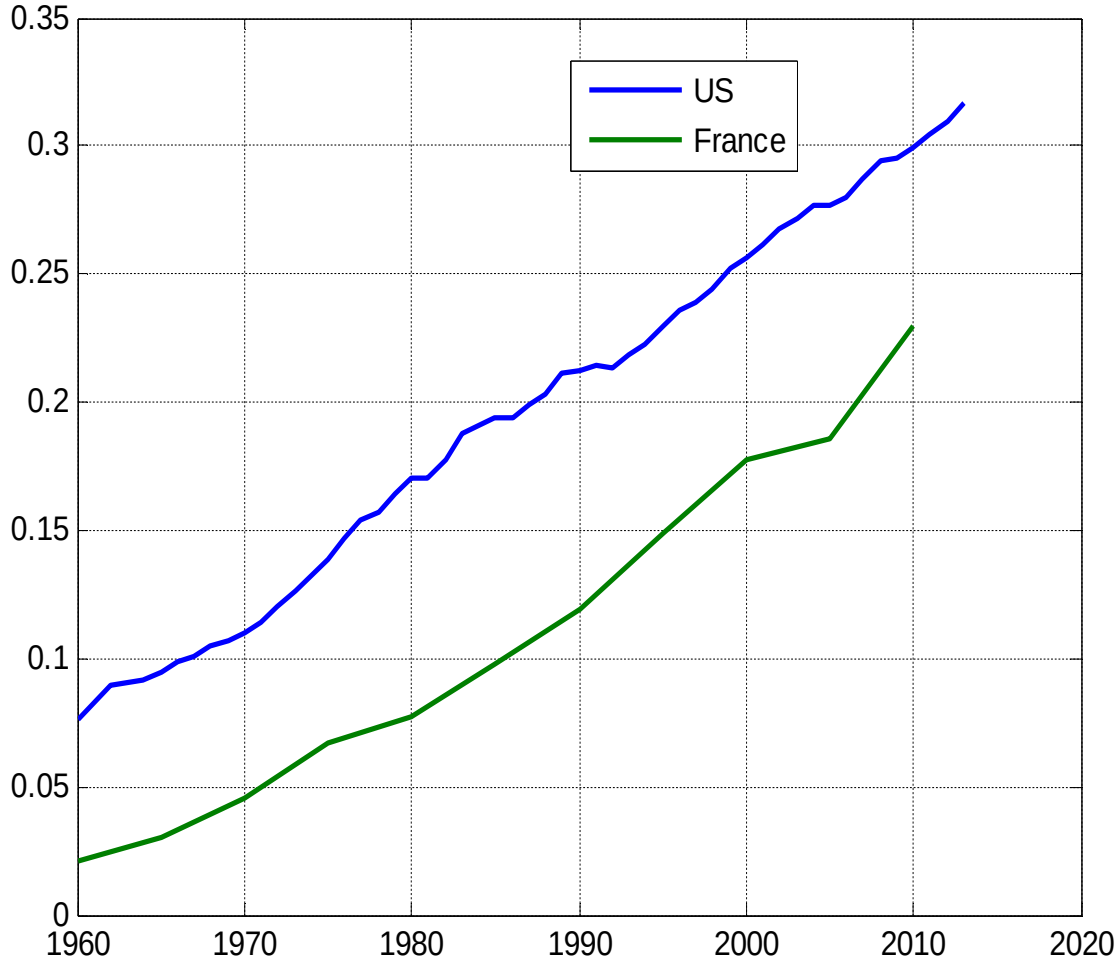
OECD Employment outlook. Employment/Population

Structural changes over the period : Technology



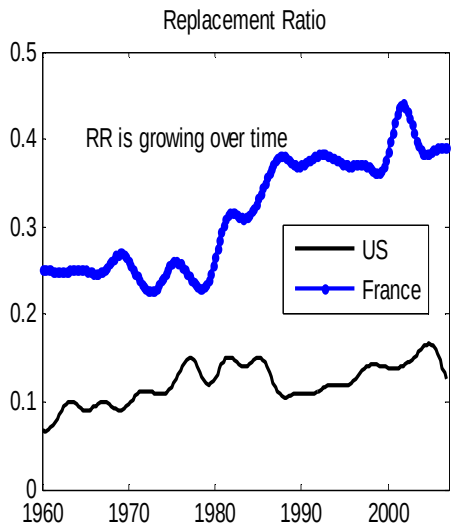
Source: Investment Price (relative to consumption price). World Development Indicators. The relative price is normalized to one in 1980.Source : Data from Karabarbounis Neiman (QJE 2014).

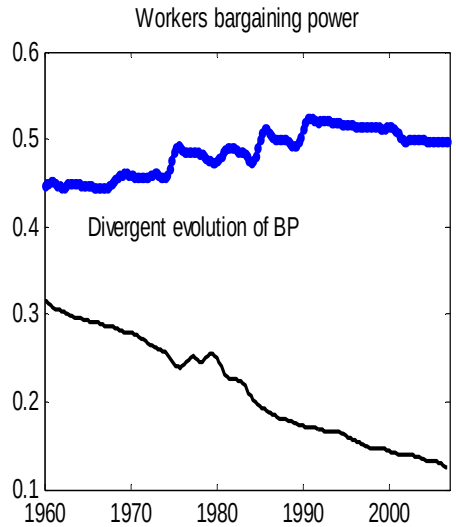
Structural changes over the period : Education

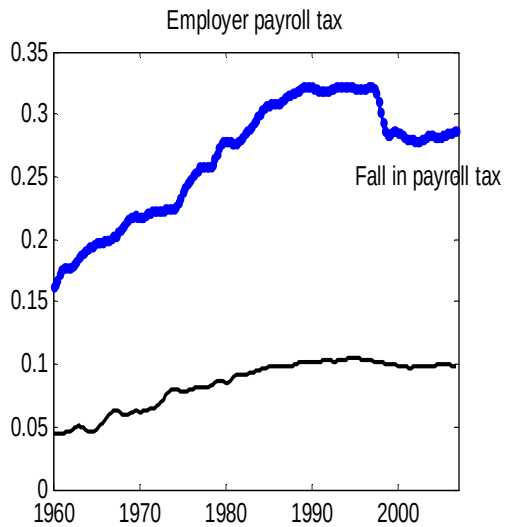


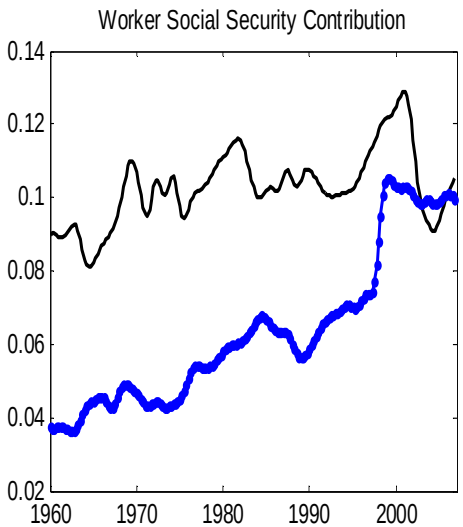
Source: French census. Diplôme universitaire 1er, 2ème ou 3ème cycle, BTS-DUT. US Census (Years of School Completed) College 4 years and more

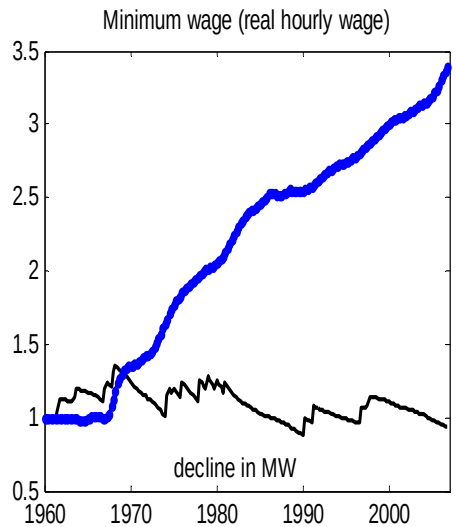
Structural changes over the period : Labor Market Institutions (LMI)











Structural changes over the period : Labor Market Institutions (LMI)

- "usual suspects" : Minimum wage ; UB's replacement rate ; workers' bargaining power
- **Industry-specific wage floor** : a wage floor is set for every position and workers cannot be paid below the industry-specific wage floor associated with their job position (Fougere, Gautier and Roux (2008)).
- At the firm level, employers and unions bargain on wage increases provided that wages are set **above the industry wage floors.**
- On average, a 1% increase of the real MW raises wage floors by about 0.3 pp and wage floor adjustments are much more responsive to MW variations when wage floors are close to the MW.

The objective of the model

- To quantify the contribution of each trend in the polarization process.
- To compare France and the US
- To assess the impact of each trend on wage inequality

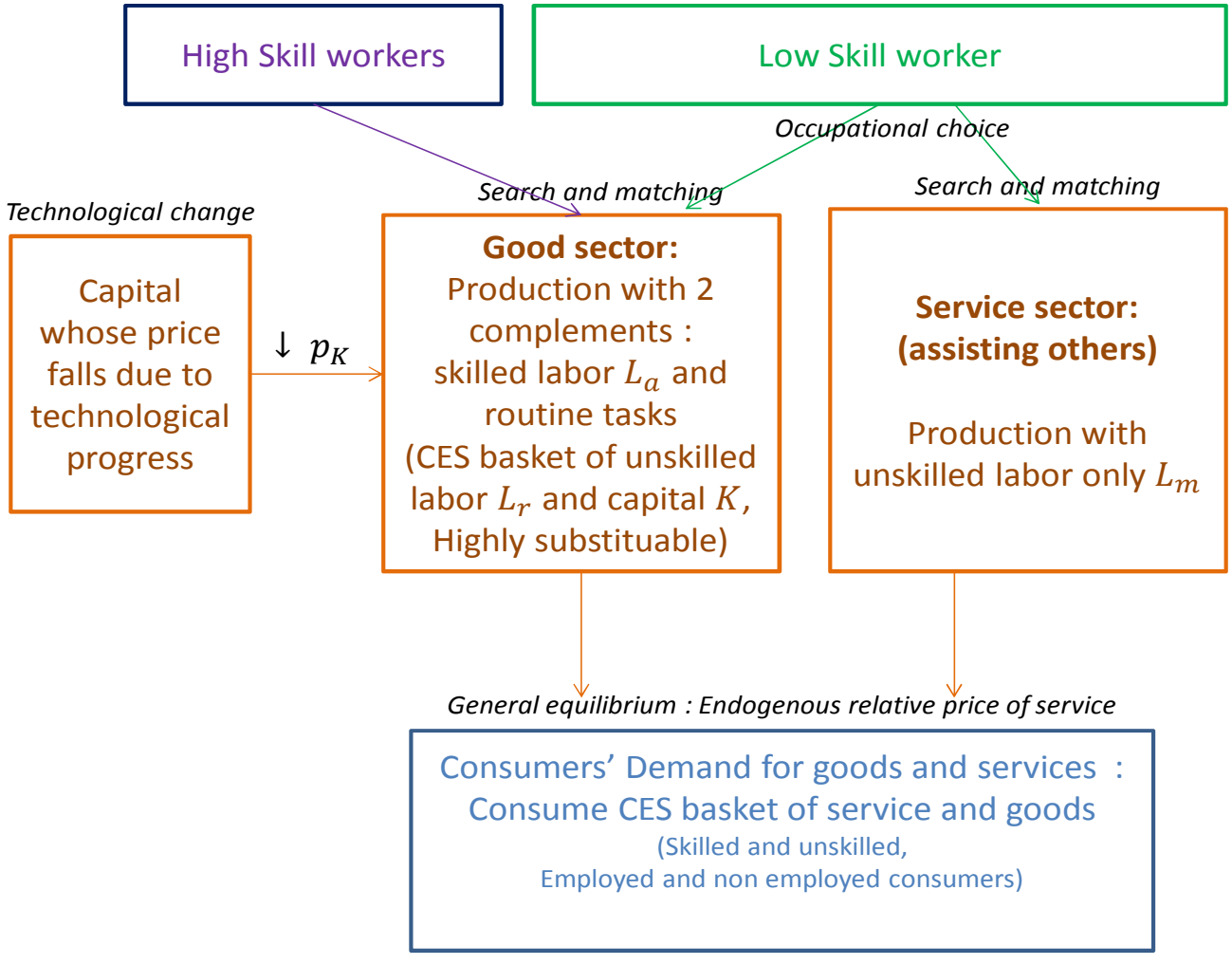
A structural approach

- **Model :** Autor and Dorn meet DMP
  Multi-sectorial search and matching model with occupational choice and 3 exogenous trends
  - Task-Biased Tech. Change (TBTC), Autor and Dorn, 2013
    - Fall in price of IT capital
  - Growth in supply of skilled labor
    - the share of skilled workers rise
  - Evolution of Labor Market Institutions :
    - LMIs more or less generous
- **Structural estimation :** using a just-identified system,
  - elasticity of substitution between goods in preferences, AND between inputs in production,
  - trends in IT prices, and educational attainments.

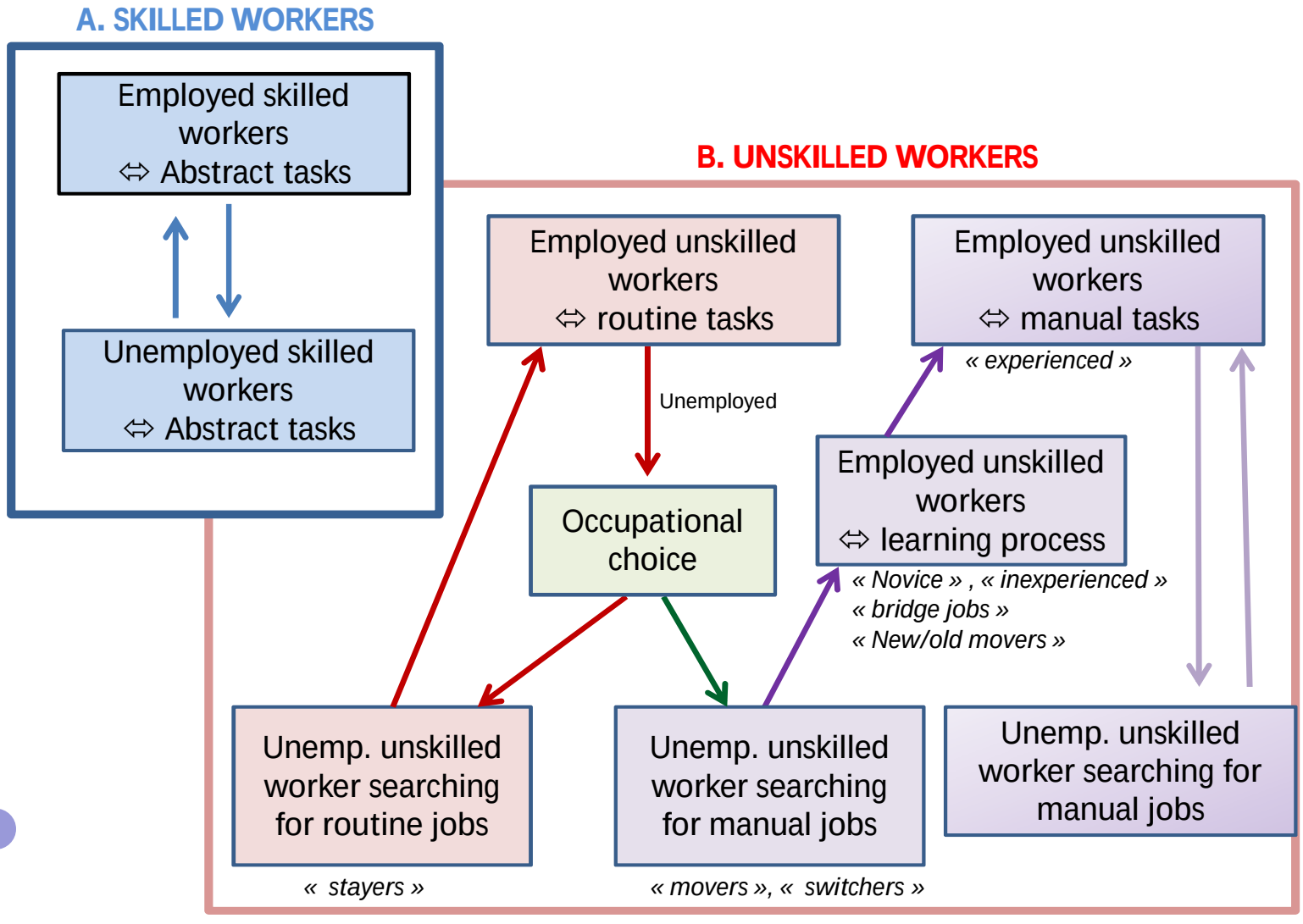
Contribution to the literature

- **SaM with technological change**
  - Ljungqvist and Sargent (1998, 2008), Mortensen and Pissarides (1998), Hornstein et al. (2007)
  - Analysis that compare two steady state equilibria without worker mobility choices between occupations.
- **SaM with occupational choices**
  - Alvarez and Shimer (2011) ; Carrillo-Tudela and Visschers (2014)
  - Analysis that focuses on mobility choices over the business cycle
- **Our paper :**
  - Transitional dynamics : structural change (technological, education and institutions gradually change) with irreversibility.
  - General equilibrium analysis : the demand shifts toward services come from higher incomes of the skilled workers $\Leftrightarrow$ The diffusion process of the structural change depends on substitutability between consumption goods and between production factors.

Building blocks of the model



Occupational mobility



▸ Mobility

Firms : Goods sector

The problem of a representative firm in the goods sector is :

$$\Pi^g = \max \left\{ \begin{array}{l} Y^g - p_k K - \sum_{\eta^s}^{\overline{\eta}} w_r(\eta)\eta L_r(\eta) - w_a L_a \\ -cV_a - c\sum_{\eta^s}^{\overline{\eta}} V_r(\eta) + \beta \Pi^g_{+1} \end{array} \right\}$$

$$\begin{aligned} \text{s.t.} \quad Y^g &\geq AL_a^{\alpha} \left[\left((1-\mu) \sum_{\eta^s}^{\overline{\eta}} \eta L_r(\eta) \right)^{\sigma} + (\mu K)^{\sigma} \right]^{\frac{1-\alpha}{\sigma}} \\ L_{r,+1}(\eta) &= (1-s)L_r(\eta) + q_r(\eta)V_r(\eta) \\ L_{a,+1} &= (1-s)L_a + q_a V_a \\ L_r(\eta) &\geq 0 \end{aligned}$$

The last equation determines the endogenous separations.

Firms : Service sector

The problem of a representative firm in the service sector is :

$$\Pi^s = \max \left\{ \begin{array}{l} p_s Y^s - w_m L_m - \sum_\eta w_m^n(\eta) L_m^n(\eta) - w_m^o L_m^o \\ -cV_m - c\sum_\eta V_m^n(\eta) - cV_m^o + \beta \Pi_{+1}^s \end{array} \right\}$$

$$\begin{aligned} \text{s.t.} \quad Y^s &\geq A_s \left(L_s + \delta \sum_\eta L_m^n(\eta) + \delta L_m^o \right) \\ L_{m,+1} &= (1-s)L_m + q_m V_m + (1-s)\lambda \sum_\eta L_m^n(\eta) + (1-s)\lambda L_m^o \\ L_{m,+1}^o &= (1-s)(1-\lambda)L_m^o + q_m^o V_m^o \\ L_{m,+1}^n(\eta) &= (1-s)(1-\lambda)L_m^n(\eta) + q_m^n(\eta) V_m^n(\eta) \\ L_s &\geq 0 \end{aligned}$$

$\delta \in (0,1)$ the loss of efficiency due to the learning process.
The last equation determines the endogenous separations.

Occupational choice : $U_{t+1} = \max\{U_{r,t+1}, U^n_{m,t+1}\}$

Employed : for each ability level η

$$
\begin{aligned}
W_{r,t} &= w_{r,t}(1-\tau^w_t) + \beta\Big[\mathbb{I}_F U_{t+1} + (1-\mathbb{I}_F)[(1-s)W_{r,t+1} + sU_{t+1}]\Big] \\
W^n_{m,t} &= w^n_{m,t}(1-\tau^w_t) + \lambda[(1-s)\beta W_{m,t+1} + s\beta U_{m,t+1}] \\
&\quad +(1-\lambda)[(1-s)\beta W^n_{m,t+1} + s\beta U^o_{m,t+1}]
\end{aligned}
$$

Unemployed : for each ability level η

$$
\begin{aligned}
U_{r,t} &= z_r + \beta\Big[(1-f_{r,t})U_{t+1} + f_{r,t}W_{r,t+1}\Big] \\
U^n_{m,t} &= z_r + \beta\Big[(1-f^n_{m,t})U^n_{m,t+1} + f^n_{m,t}W^n_{m,t+1}\Big]
\end{aligned}
$$

f_i : job finding rate, s : separation rate, λ : learning parameter, and z_r the unemployment benefits.

Value functions : ▸ Employees ▸ Unemployed workers

Occupational choices and LMIs

If LMI push up the reservation wage, these bridge jobs, poorly productive, can not be open by firms. Why ?

- UB (z_r) are determined by workers' past earnings (LS, 1998, 2008)
  - When they switch, workers are eligible to an UB indexed on their previous routine job wage (new mover/switcher), which can be higher than their wage on a bridge job.
  - After a long unemployment spell, or if they are fire from their bridge jobs, they lose their eligibility on the routine UB.
- LMIs can lead to non-existence of these bridge jobs
  - through a strong indexation of the UB on past wages,
  - or through a high MW,

  hence stalling labor reallocation

Wage setting

- Nash bargaining
  - the wage w_{Nash} is highly flexible and follows both productivity and labor market tightness.
  - wage bargaining takes into account occupational switch and changes in taxation over time ▸ More
- Wage floor : real wage rigidities : the WS curve is (for each ability level η)

$$w_t = \max\{(1+x)^{\vartheta} mw_t, w_t^{Nash}\} \quad \text{if} \quad mw_0 < w_0^{Nash}$$

with w_0 and wm_0 is the initial wage and MW, $x = \frac{w_0^{Nash}}{mw_0} - 1$ and ϑ accounts for the indexation of the wage floor on the MW.

General equilibrium setting

- **Demand for goods and services** from household $i = a, r, m$ in the economy. They are complements in households' preferences

$$C_i = \left[\nu C_{g,i}^{\rho} + (1-\nu) C_{s,i}^{\rho}\right]^{\frac{1}{\rho}}$$

$\Rightarrow$ **endogenous relative price of services (p_s) :** "General Equilibrium effect"
$\Rightarrow$ rising p_s drives surplus of manual jobs upward
$\Rightarrow$ more manual jobs are open
$\Rightarrow$ a signal to switch occupation to manual jobs

- **General equilibrium :**

$$\begin{aligned} Y^g &= C_g + p_k K + cV_a + c\sum_{\eta^S}^{\overline{\eta}} V_r(\eta) \\ Y^s &= C_s + cV_m + c\sum_{\eta} V_m^n(\eta) + cV_m^o \end{aligned}$$

Quantitative analysis : Accounting for job polarization in the US and in France

Identification of the structural parameters (1)

- The calibration is quarterly.
- Common to both countries Φ_1, with $dim(\Phi_1) = 12$

$$\Phi_1 = \{\beta, \rho, \nu, \sigma, \mu, \alpha, \underline{\eta}, \overline{\eta}, A, A_s, \delta, \psi\}$$

- For the labor market, the parameters Φ_2 are country-specific, with $dim(\Phi_2) = 24$

$$\Phi_2 = \{\Upsilon_a, \Upsilon_r, \Upsilon_m, s_a, s_r, s_m, c_a, c, \xi_a, \xi_r, \xi_m, \lambda\}_{US,F}$$

- Country-specific technological change and the drift in the supply of skilled labor :

$$\Phi_3 = \{p_k(0), \vartheta_{pk}, p_k(T), L_a(0), \vartheta_{La}, L_a(T)\}_{US,F} \quad dim(\Phi_3) = 12,$$

where $x = p_k, L_a$ evolve as follows :

$$x(t) = \begin{cases} x(0) & \text{if } \; t < t_{x0} \\ x(T) + (x(0) - x(T)) \exp(-\vartheta_x (t - t_{x0})^2) & \text{Otherwise} \end{cases}$$

- **The total number of parameters is** $dim(\Phi) = 48$**.**

Identification of the structural parameters (2)

- Empirical target : Ψ_T, for $i = US, F$, with $dim(\Psi_T) = 28$

$$\Psi_T = \left\{ \begin{array}{l} N_{a,i}(0), N_{r,i}(0), N_{m,i}(0), N_{a,i}(T), N_{r,i}(T), N_{m,i}(T) \\ E_i[N_a], E_i[N_r], E_i[N_m], \\ D_{5,i}(0)/D_{1,i}(0), D_{9,i}(T)/D_{5,i}(T) \\ E_i[D_{5,i}/D_{1,i}], E_i[D_{9,i}/D_{5,i}] \end{array} \right\}$$

- In order to identify the unknown parameters, it is necessary to introduce

$$\underbrace{48}_{dim(\Phi)} - \underbrace{28}_{dim(\Psi)} = 20 \quad \text{restrictions}$$

Identification of the structural parameters (2)

- External information : we calibrate $\Phi_i^c \in \Phi_i$ (18 restrictions)

$$\begin{aligned}
\Phi_1^c &= \{\beta, \mu, \nu, \psi\} \quad \text{with } dim(\Phi_1^c) = 4 \\
\Phi_2^c &= \{s_a, s_r, s_m, c_a, c\}_{US,F} \quad \text{with } dim(\Phi_2^c) = 10 \\
\Phi_3^c &= \{L_a(0), L_a(T)\}_{US,F} \quad \text{with } dim(\Phi_3^c) = 4
\end{aligned}$$

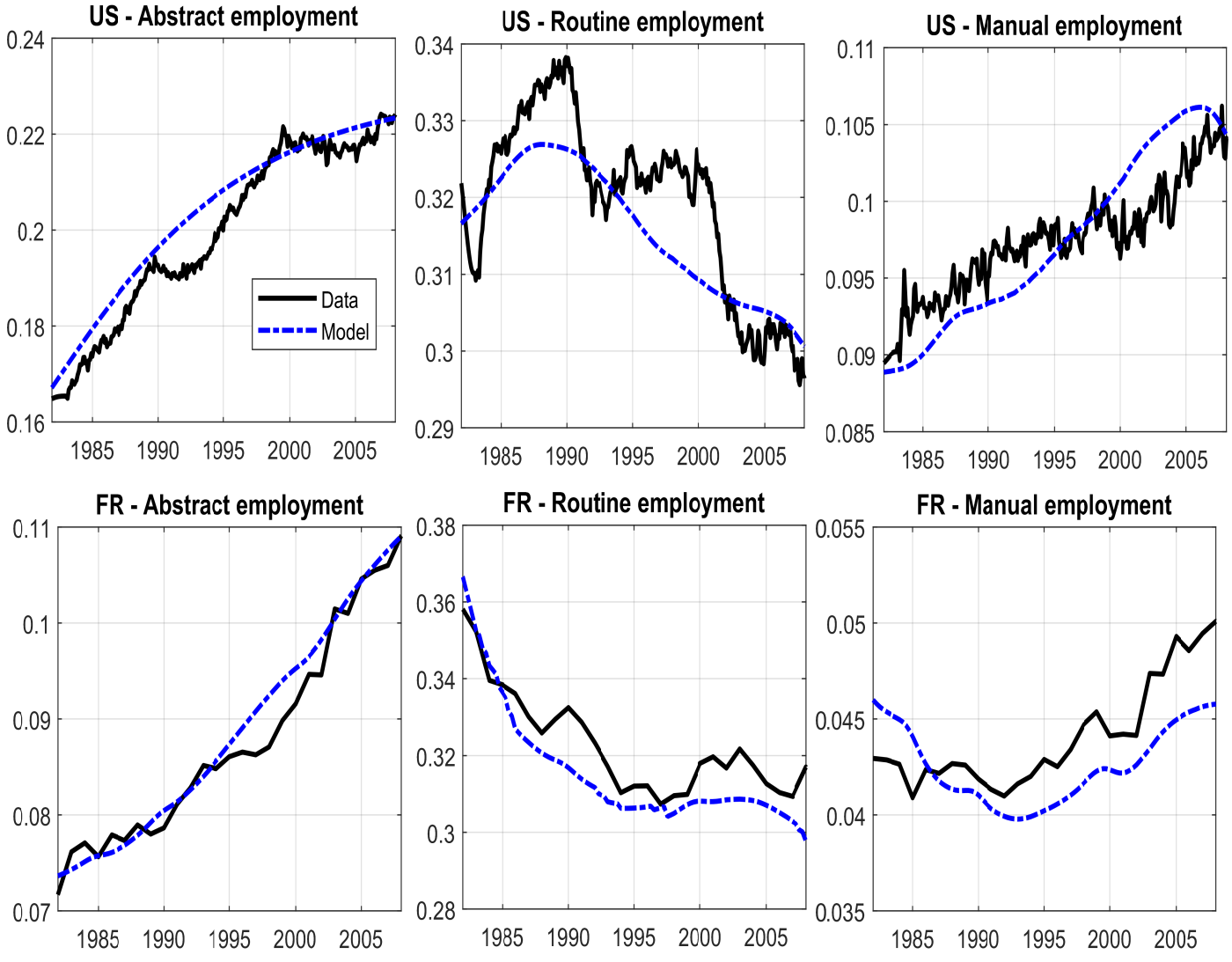
- Assumptions (2 restrictions)

$$p_{k,US}(0) = p_{k,F}(0) \quad p_{k,US}(T) = p_{k,F}(T)$$

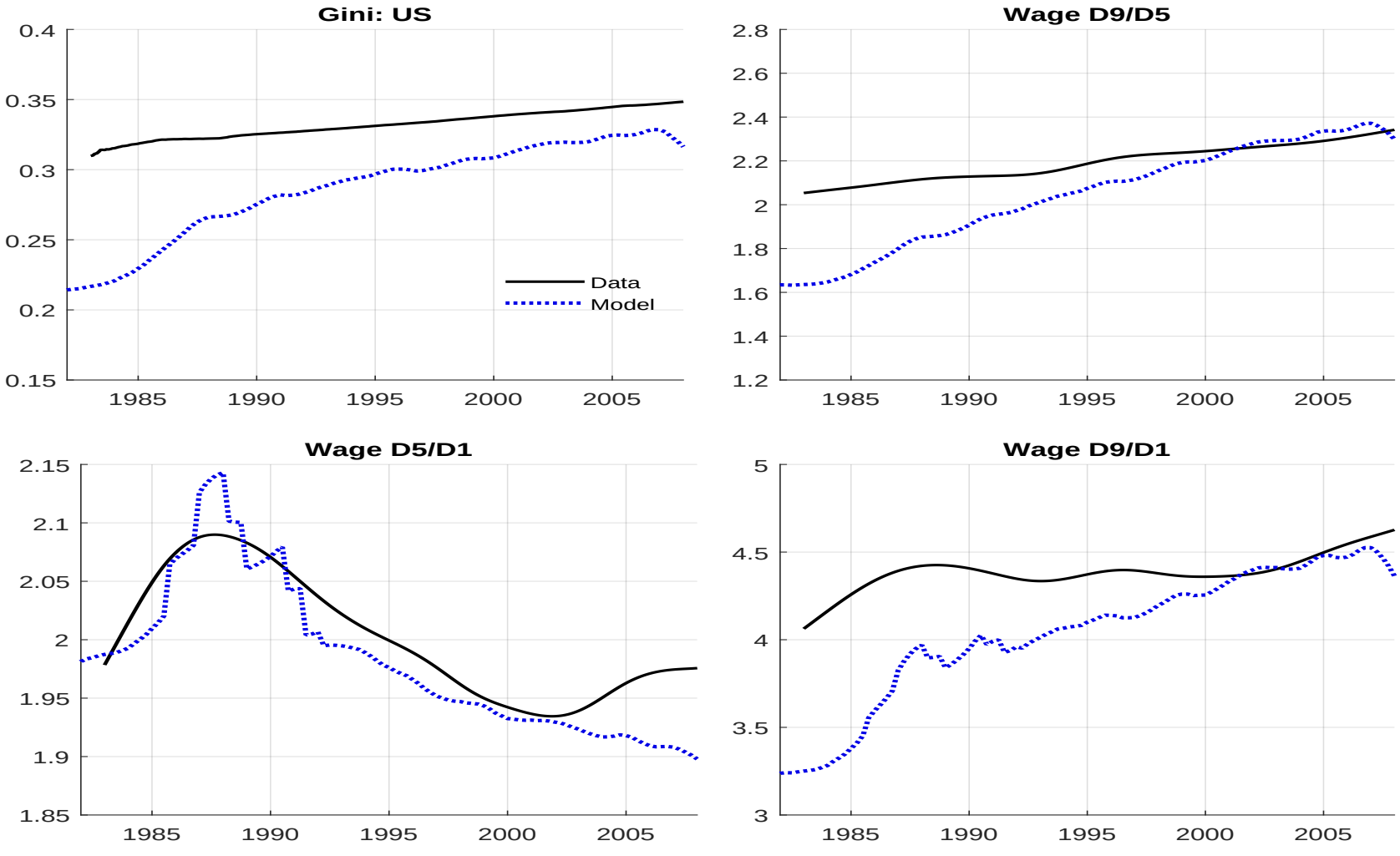
$\Rightarrow$ 20 restrictions : **Just-identified system**

- Over-identifying test :
  - Does the model generate the hump shaped patterns of the employment dynamics by occupation ?
  - Does it match the dynamics of wage inequalities ?

Model versus data : Fitting non-linear changes in per capita employment

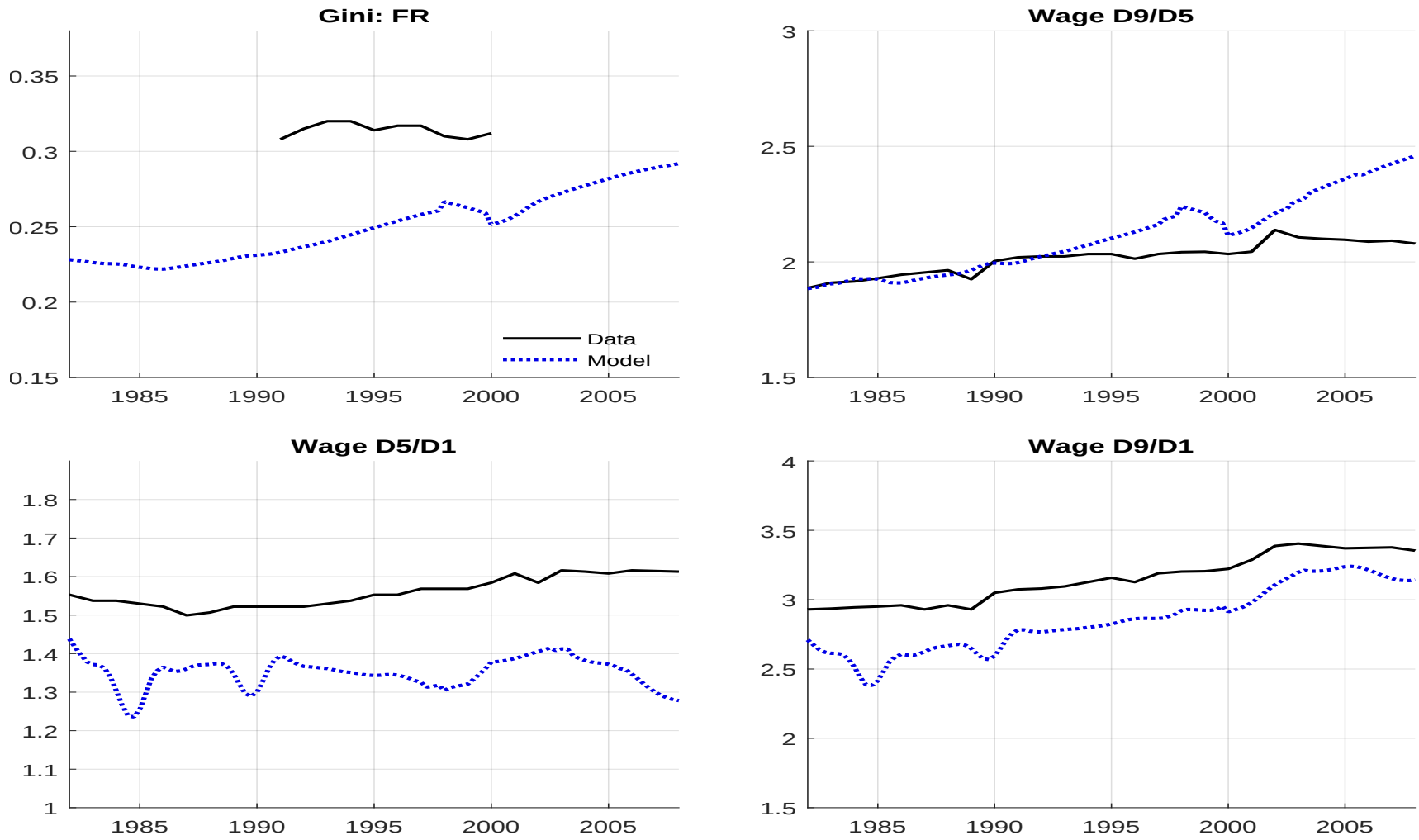


Model versus data : US wage inequality



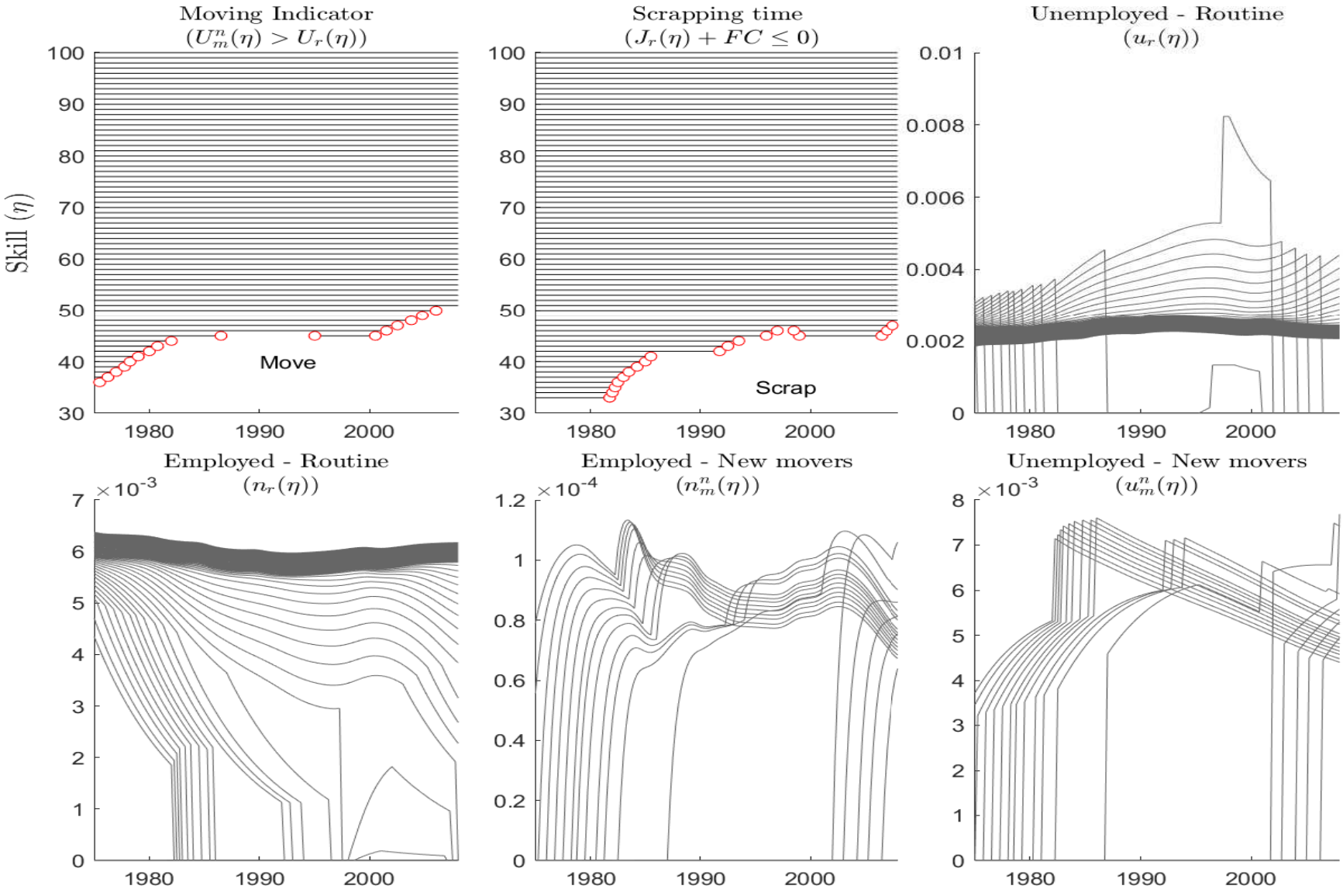
Data : CPS-MORG. Authors' calculations.

Model versus data : FR wage inequality

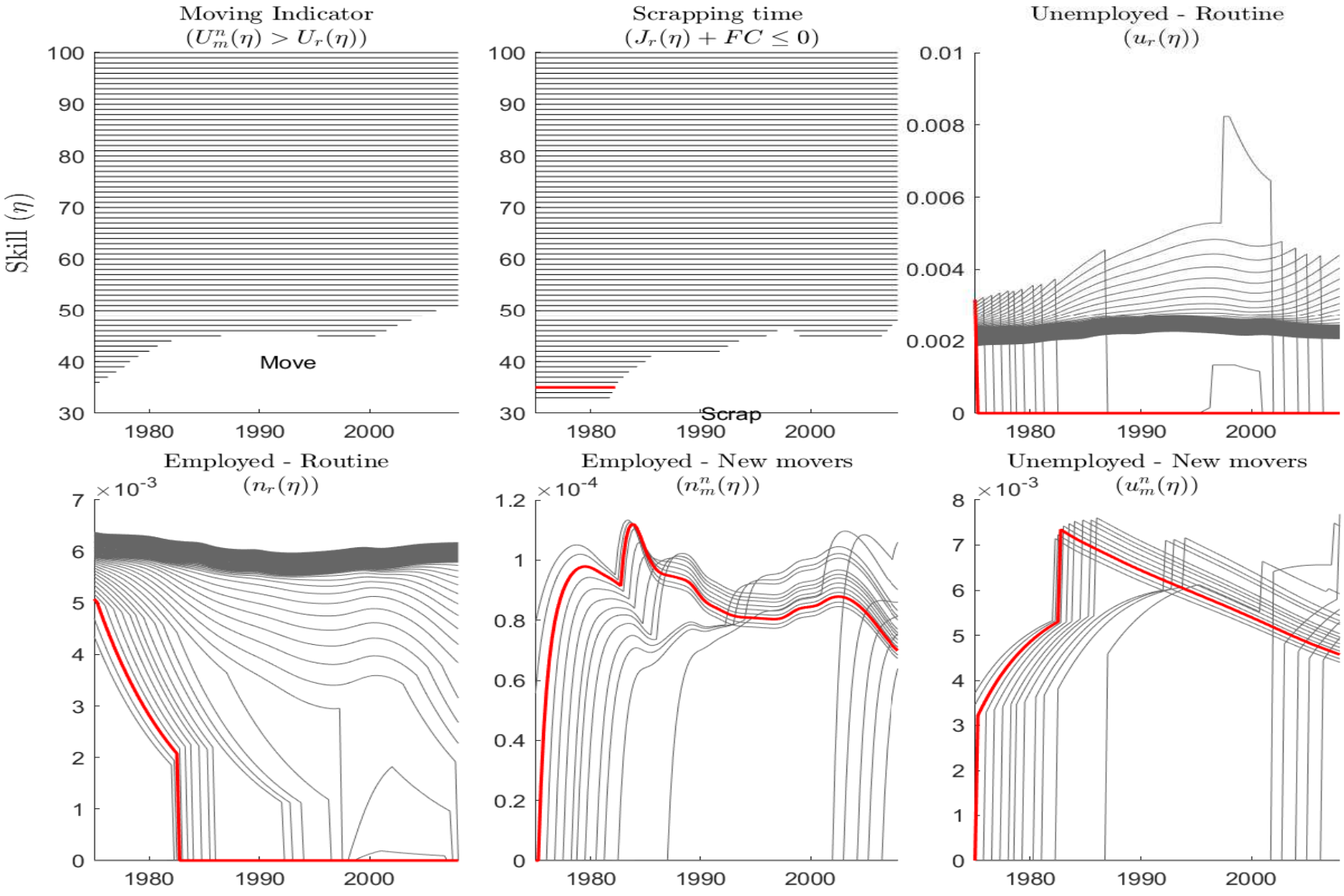


Data : Breda et al. (2016). Gini from Piketty (2001)

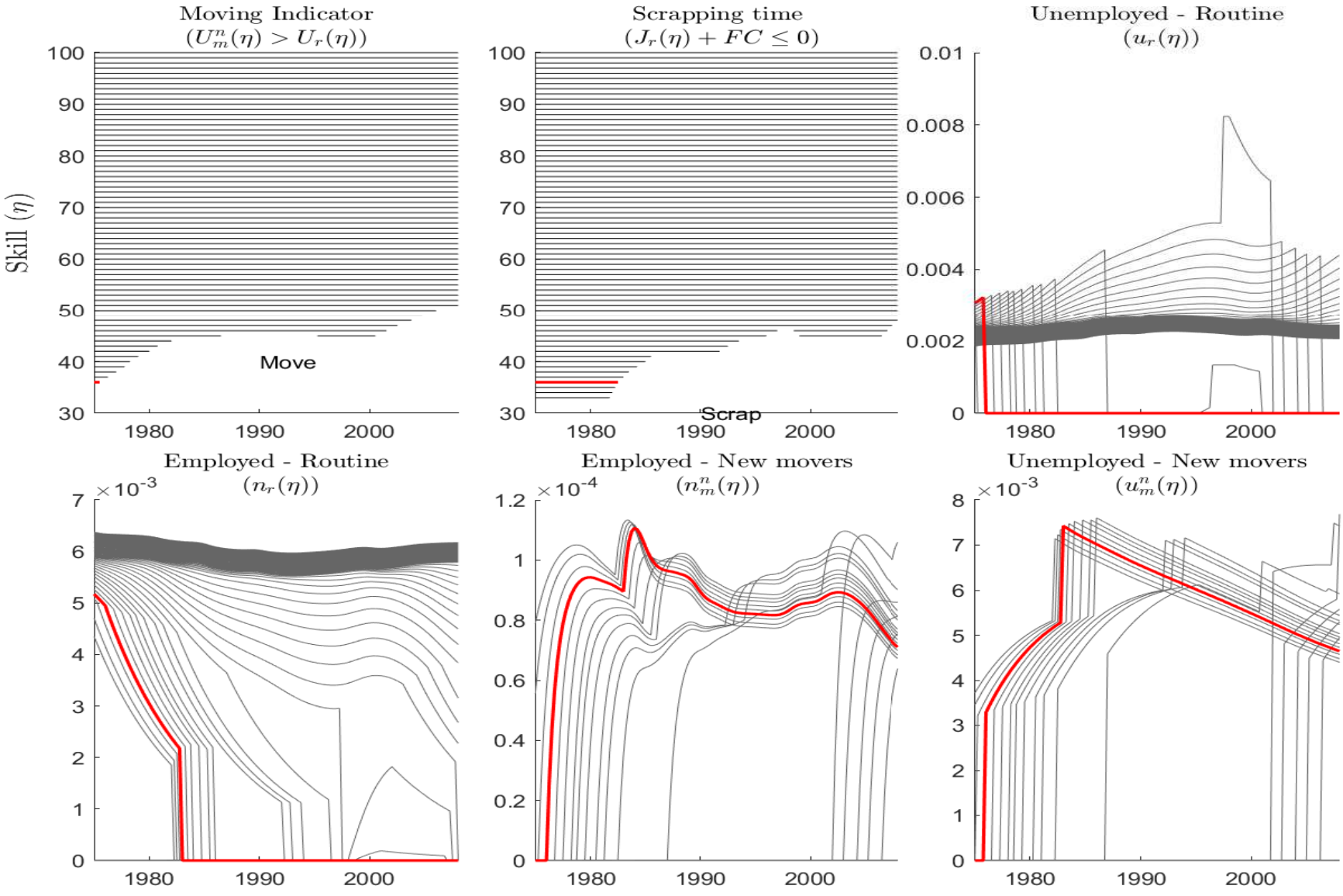
Date of moving and scrapping



$\eta = 35$


Moving Indicator
$(U_m^n(\eta) > U_r(\eta))$
Move
Scrapping time
$(J_r(\eta) + FC \leq 0)$
Scrap
Unemployed - Routine
$(u_r(\eta))$
Skill (η)
Employed - Routine
$(n_r(\eta))$
$\times 10^{-3}$
Employed - New movers
$(n_m^n(\eta))$
$\times 10^{-4}$
Unemployed - New movers
$(u_m^n(\eta))$
$\times 10^{-3}$
1980
1990
2000

$\eta = 36$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Skill (η)
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$(n_m^n(\eta))$
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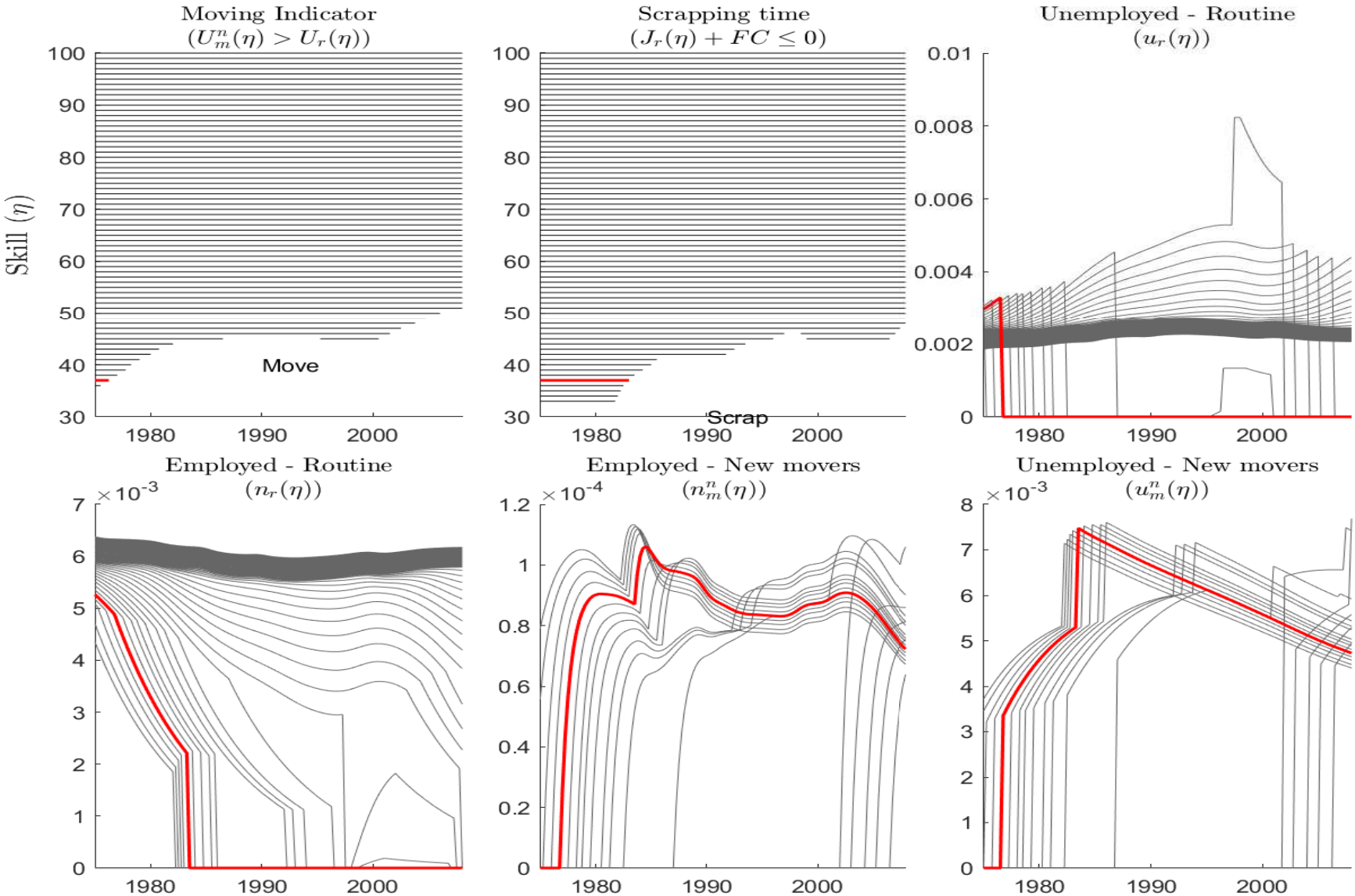
Unemployed - New movers
$(u_m^n(\eta))$
$\times 10^{-3}$
1980
1990
2000

$\eta = 37$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Scrap
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Skill (η)
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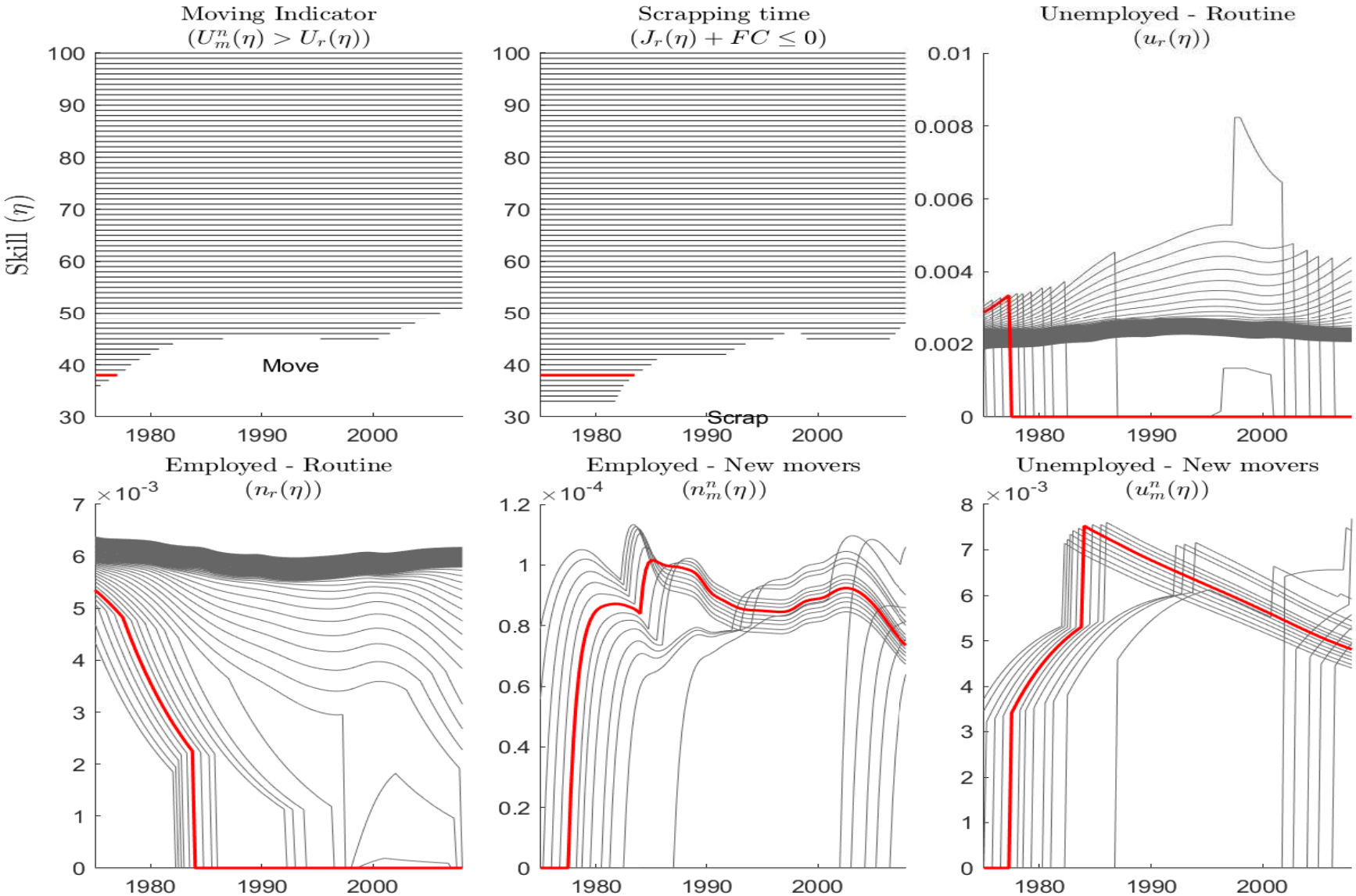
$(n_r(\eta))$
Employed - New movers
$(n_m^n(\eta))$
Unemployed - New movers
$(u_m^n(\eta))$
1980
1990
2000

$\eta = 38$


Moving Indicator
$(U_m^n(\eta) > U_r(\eta))$
Move
Scrapping time
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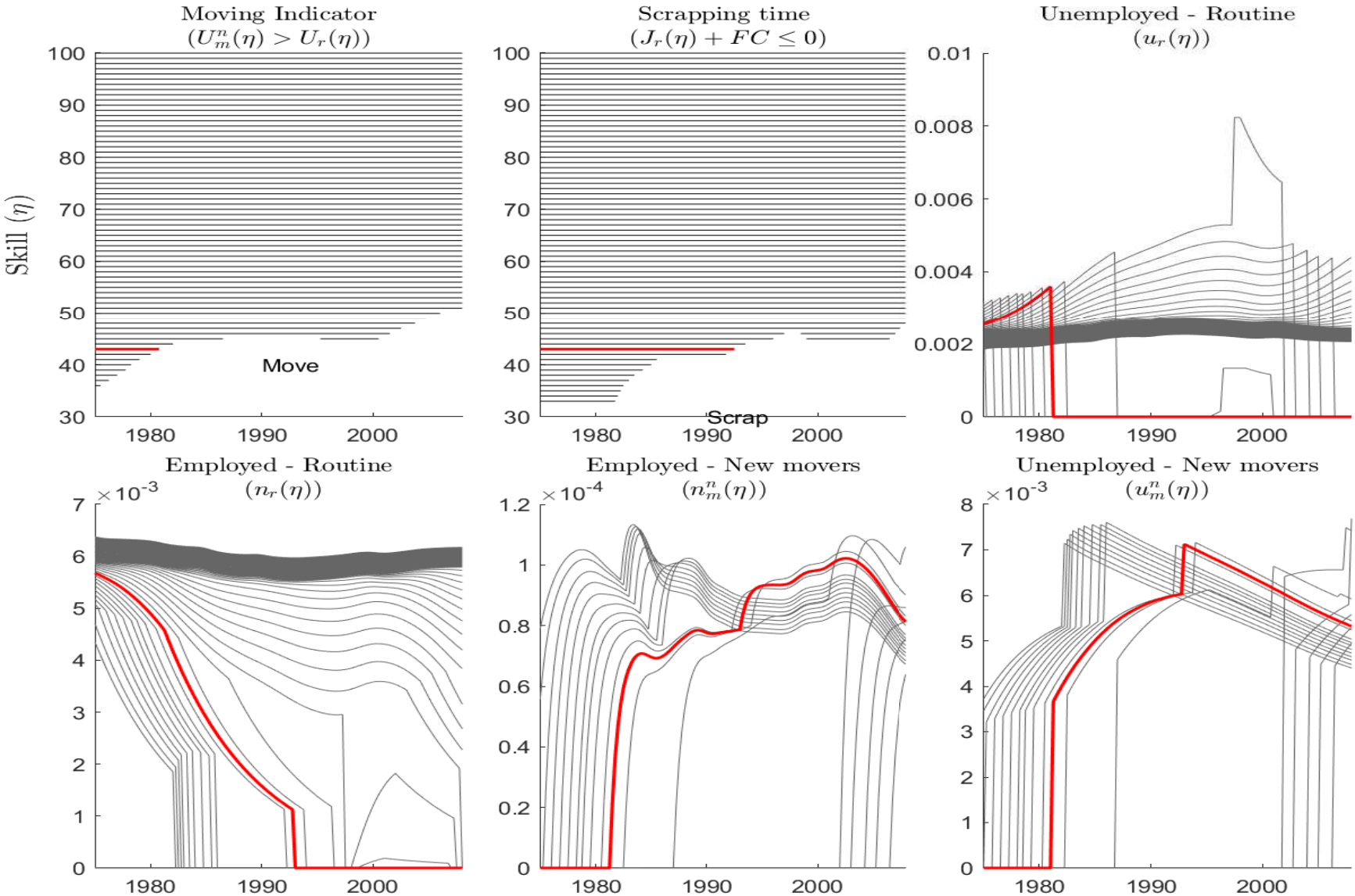
Scrap
Unemployed - Routine
$(u_r(\eta))$
Employed - Routine
$(n_r(\eta))$
Employed - New movers
$(n_m^n(\eta))$
Unemployed - New movers
$(u_m^n(\eta))$
Skill (η)
$\times 10^{-3}$
$\times 10^{-4}$
1980
1990
2000

$\eta = 43$


Moving Indicator
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Move
Scrapping time
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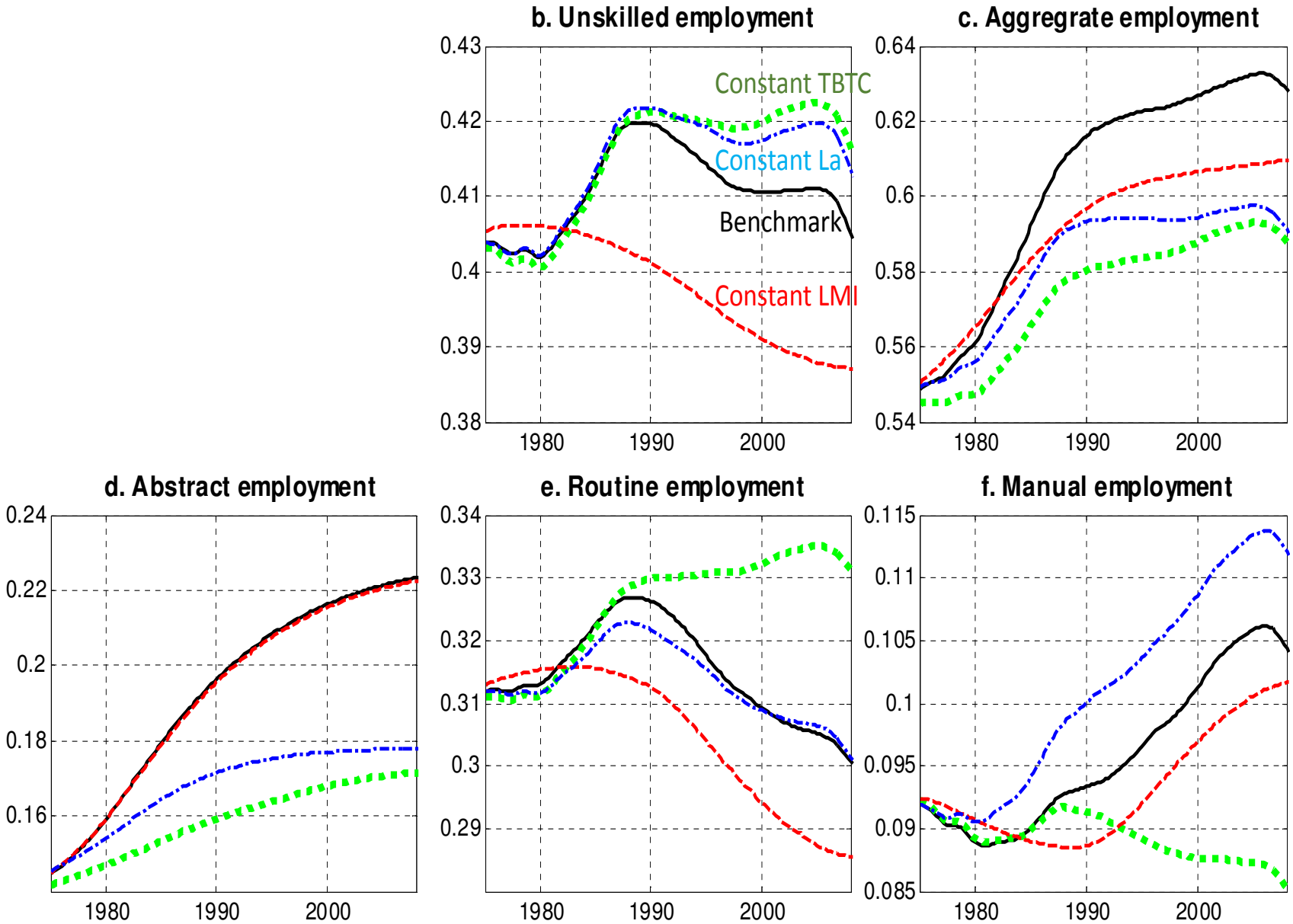
1980
1990
2000

Counterfactuals

- **Objective :** Assessing the role of each exogenous trend (TBTC, supply of skilled workers, LMI) in accounting for the job polarization process.
- **Benchmark model :** with TBTC, LMI and educational attainment.
- **Counterfactual experiments :** Cancel the evolution of 1 exogenous trend (set at 1975 and constant)
  - 2 other trends are at work

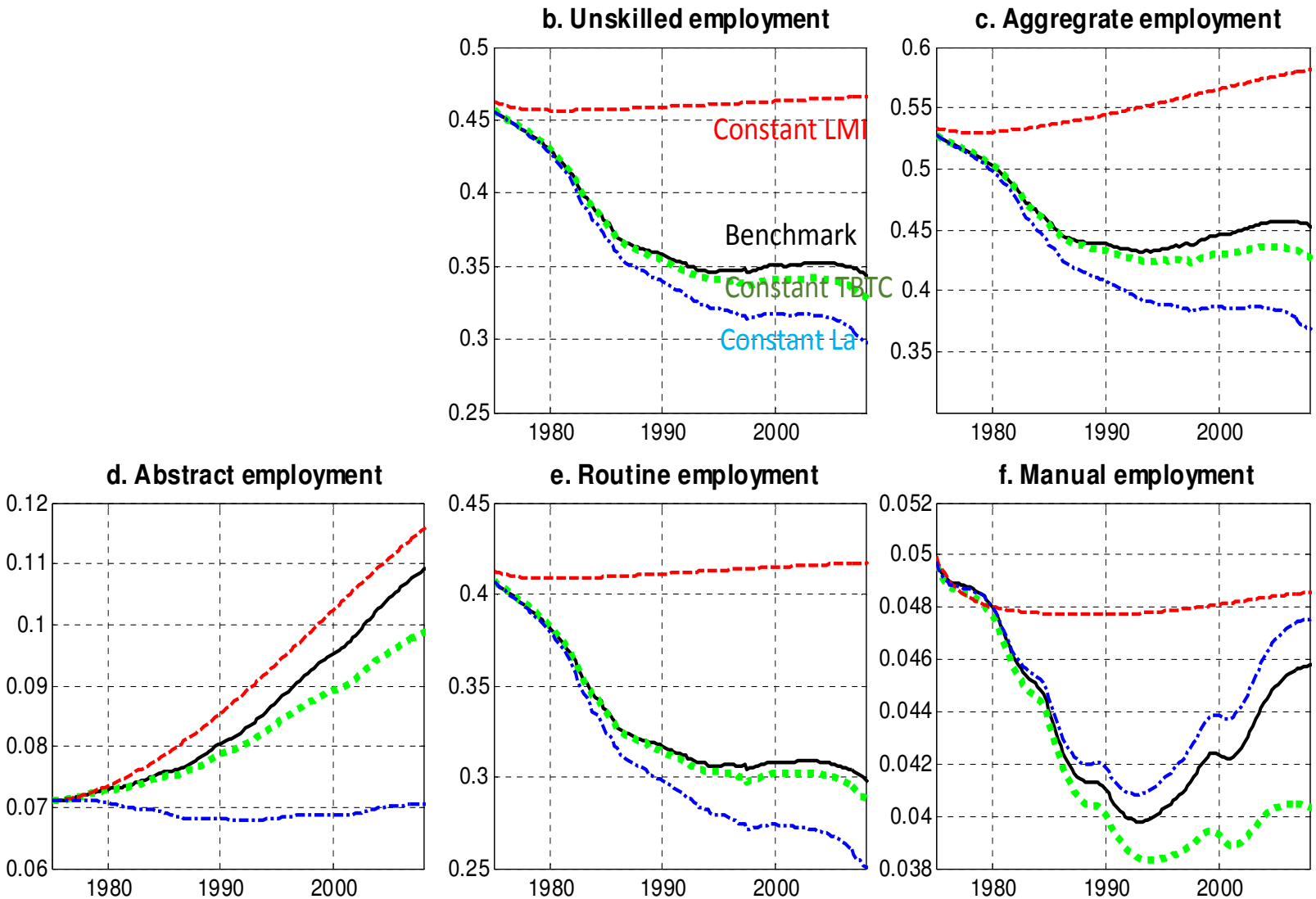
US

TBTC is driving job polarization, fostered by flexible LMI.

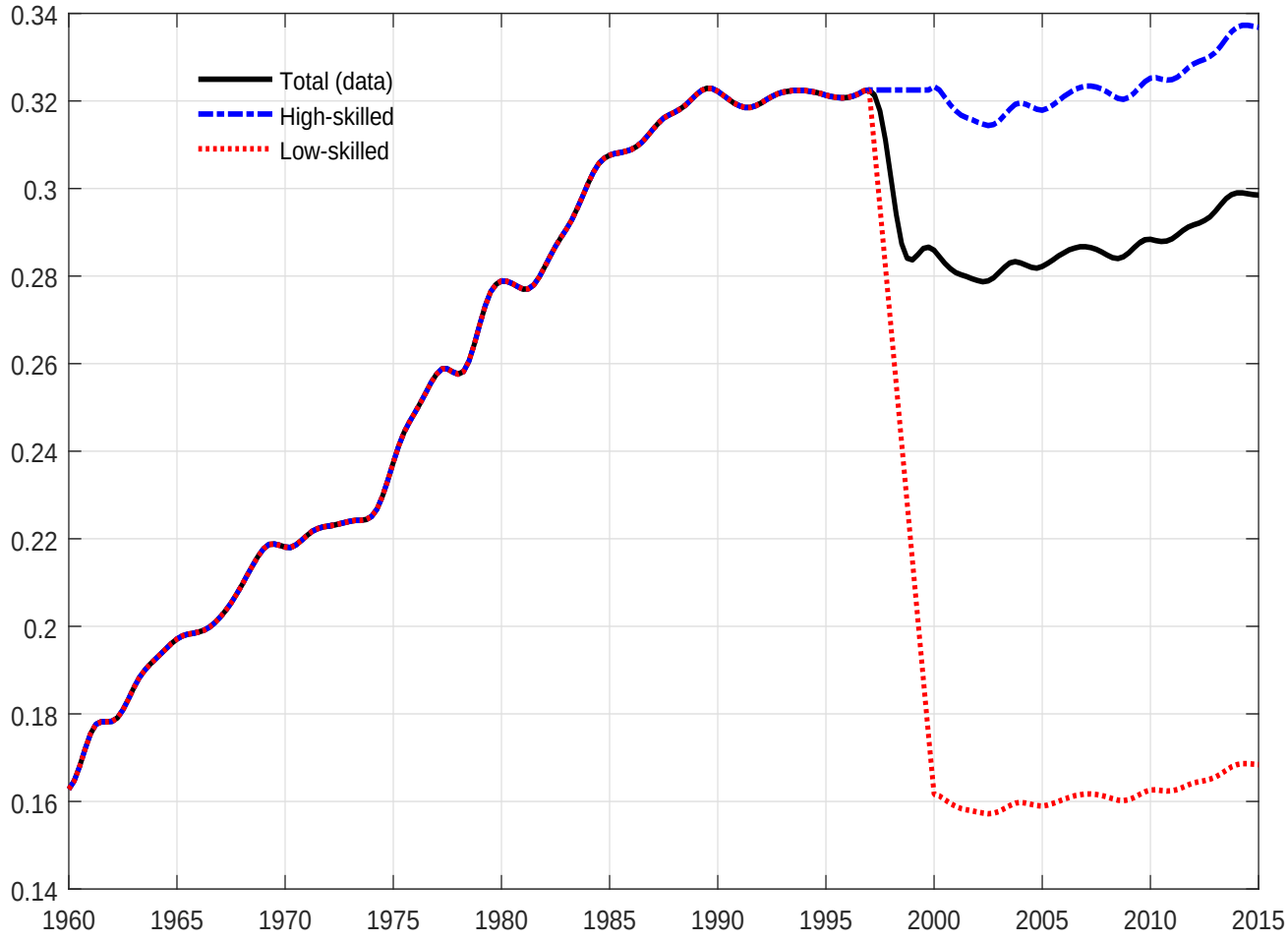


France

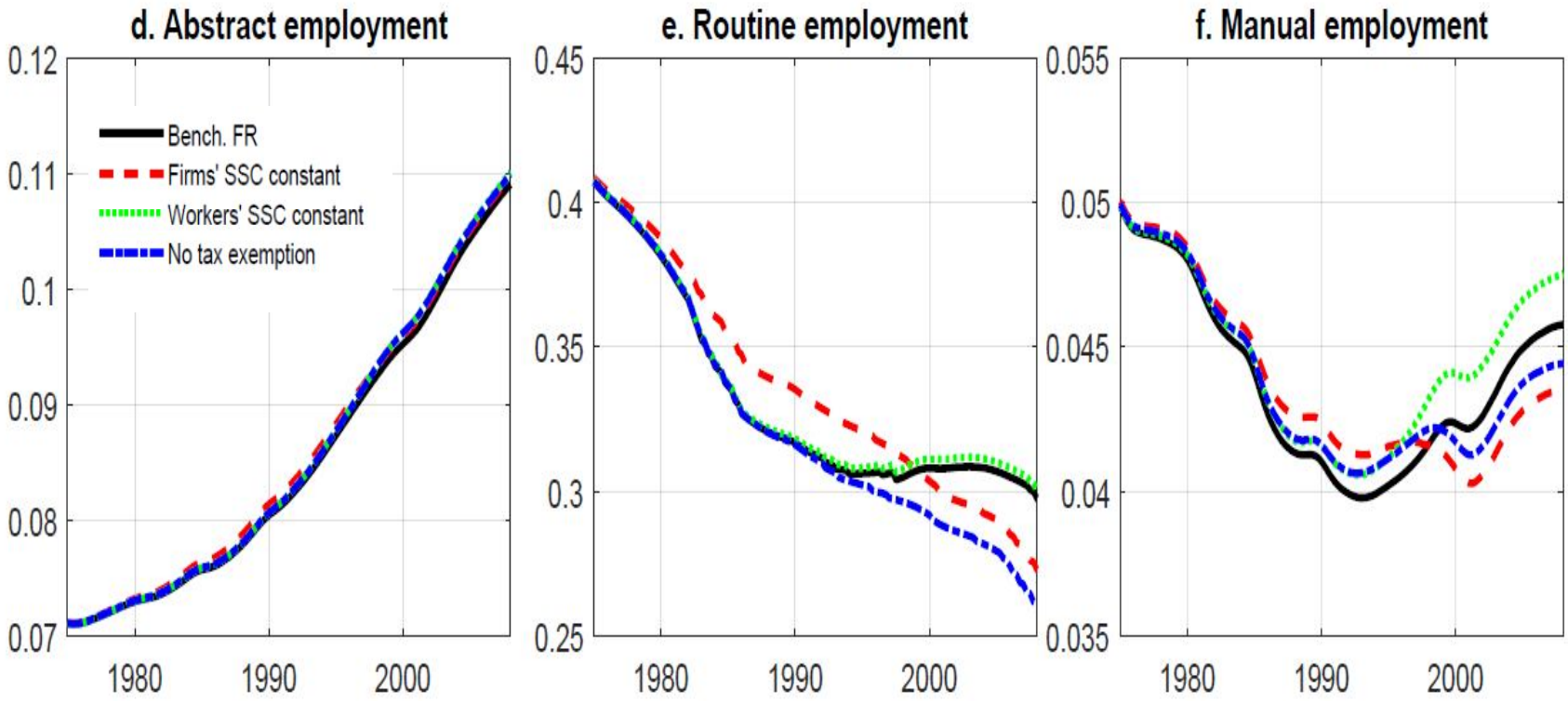
Major impact of LMI on unskilled workers, such that TBTC cannot affect employment. Larger role for education.



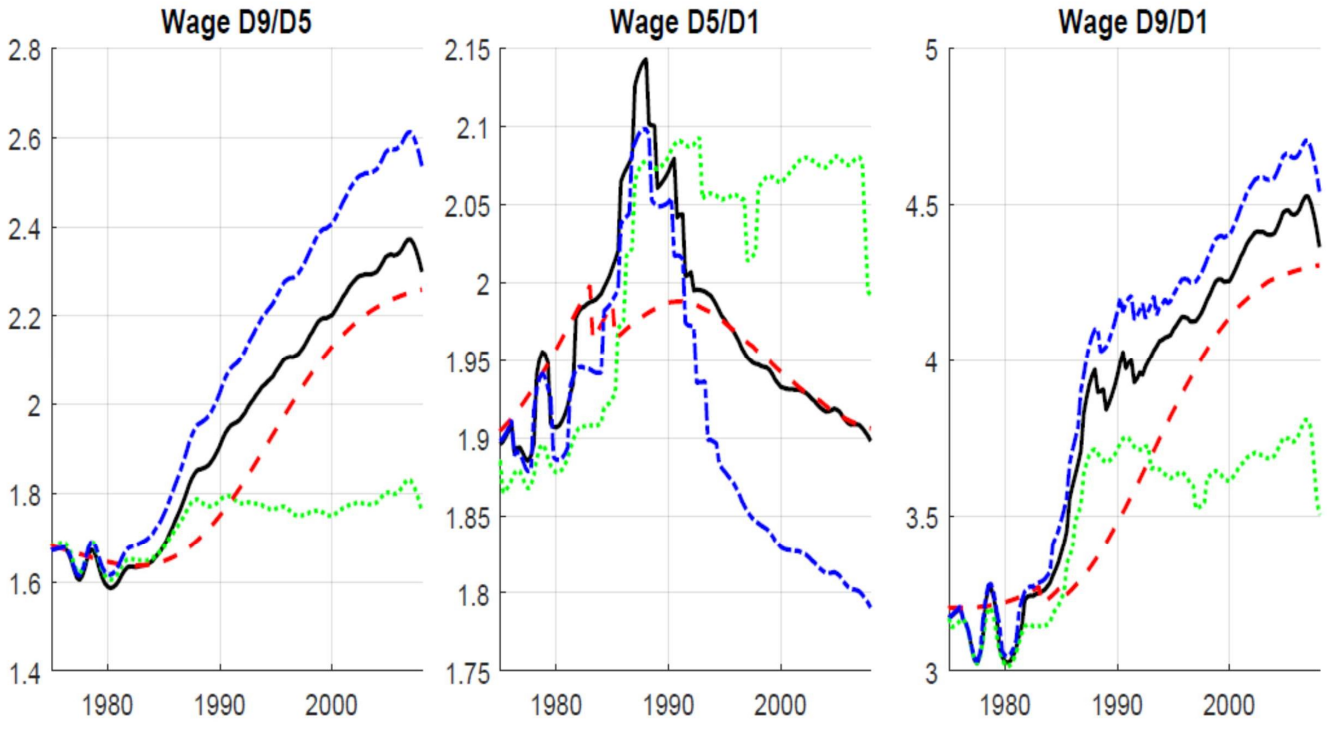
France : Payroll tax



France : The rebound of routine jobs in the late 1990s due to tax exemption

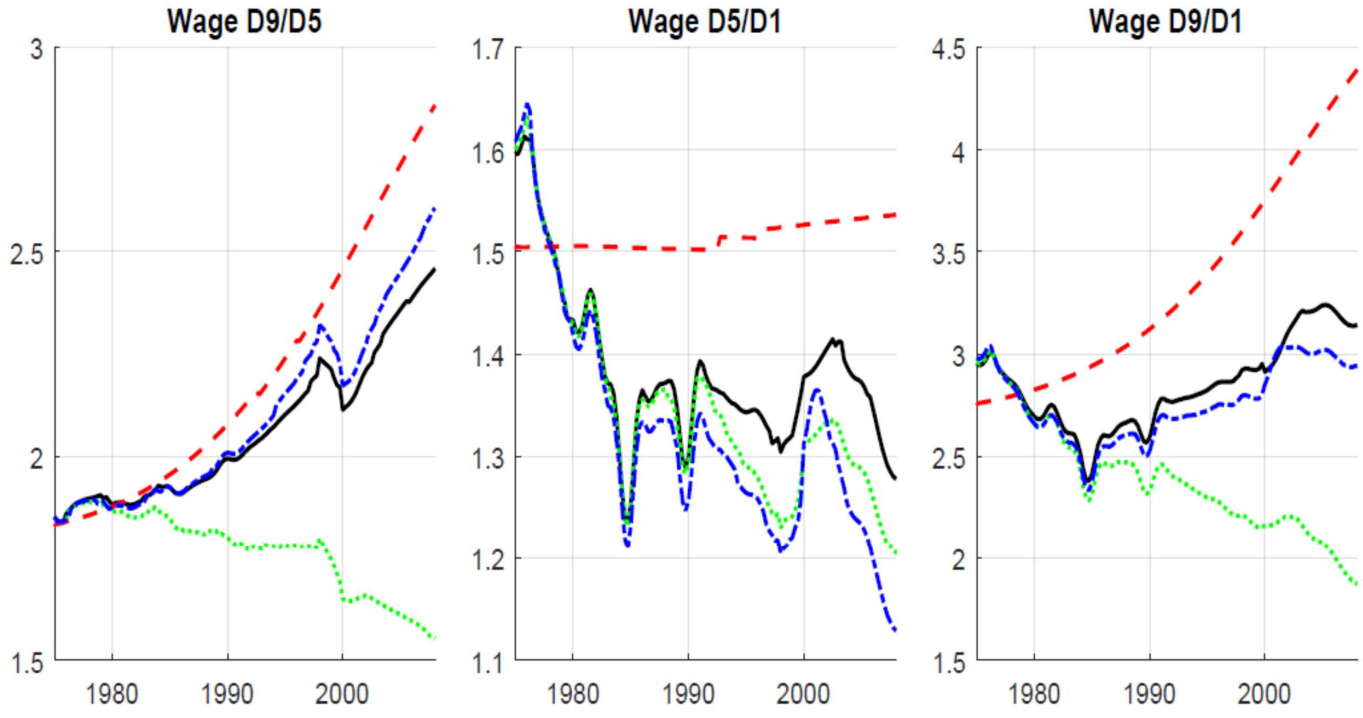


Counterfactual : Wage inequality in the US



- TBTC increases the top-wages (large gains for abstract), but reduces the inequalities at the bottom (catch-up of the manual jobs)
- LMI changes magnify the rise in wage inequality during the 80s.

Counterfactual : Wage inequality in France



- TBTC increases the top-wages (abstract jobs), but does not affect the bottom of the wage distribution
- LMI changes compress the wage distribution at the bottom.

Conclusion

The impact of task biased technological change, labor market institutions, and rising educational attainment on job polarization

- US : *gains* in aggregate employment.
  - TBTC accounts for 50% of rise in aggregate employment
  - fostered by de-unionization
- France : *Losses* in aggregate employment
  - Without changes in LMI, aggregate employment would have risen
  - In this context, TBTC cannot boost employment
- Inequality :
  - US : TBTC accounts for 2/3 of the rise in wage inequality
  - French LMI dampens the rise in wage inequality (the reverse in the US)

Appendix

US : CPS monthly, 1982m01-2017m08

- Abstract $\rightarrow$ Abstract : 95.6%
- J2J : $\left\{ \begin{array}{lcl} \text{Abstract} \rightarrow \text{Routine} & = & 1.4\% \\ \text{Abstract} \rightarrow \text{Manual} & = & 0.3\% \end{array} \right\} = 38\%$ of turnover
- Abstract $\rightarrow$ Unemployment + Out of LF : 2.7%

- Routine $\rightarrow$ Routine : 93.6%
- J2J : $\left\{ \begin{array}{lcl} \text{Routine} \rightarrow \text{Abstract} & = & 1\% \\ \text{Routine} \rightarrow \text{Manual} & = & 0.6\% \end{array} \right\} = 25\%$ of turnover
- Routine $\rightarrow$ Unemployment + Out of LF : 4.8%

- Manual $\rightarrow$ Manual : 89.8%
- J2J : $\left\{ \begin{array}{lcl} \text{Manual} \rightarrow \text{Abstract} & = & 0.9\% \\ \text{Manual} \rightarrow \text{Routine} & = & 2.0\% \end{array} \right\} =28\%$ of turnover.
- Manual $\rightarrow$ Unemployment + Out of LF : 7.3%

French LFS quarterly, 2003Q1-2016Q4

- Abstract $\rightarrow$ Abstract : 97.2%
- J2J : $\left\{ \begin{array}{lcl} \text{Abstract} \rightarrow \text{Routine} & = & 0.2\% \\ \text{Abstract} \rightarrow \text{Manual} & = & 0\% \end{array} \right\} = 7\%$ of turnover
- Abstract $\rightarrow$ Unemployment + Out of LF : 2.6%

- Routine $\rightarrow$ Routine : 95%
- J2J : $\left\{ \begin{array}{lcl} \text{Routine} \rightarrow \text{Abstract} & = & 0.2\% \\ \text{Routine} \rightarrow \text{Manual} & = & 0.1\% \end{array} \right\} = 6\%$ of turnover
- Routine $\rightarrow$ Unemployment + Out of LF : 4.8%

- Manual $\rightarrow$ Manual : 93.7%
- J2J : $\left\{ \begin{array}{lcl} \text{Manual} \rightarrow \text{Abstract} & = & 0.2\% \\ \text{Manual} \rightarrow \text{Routine} & = & 0.6\% \end{array} \right\} =12\%$ of turnover.
- Manual $\rightarrow$ Unemployment + Out of LF : 5.5%

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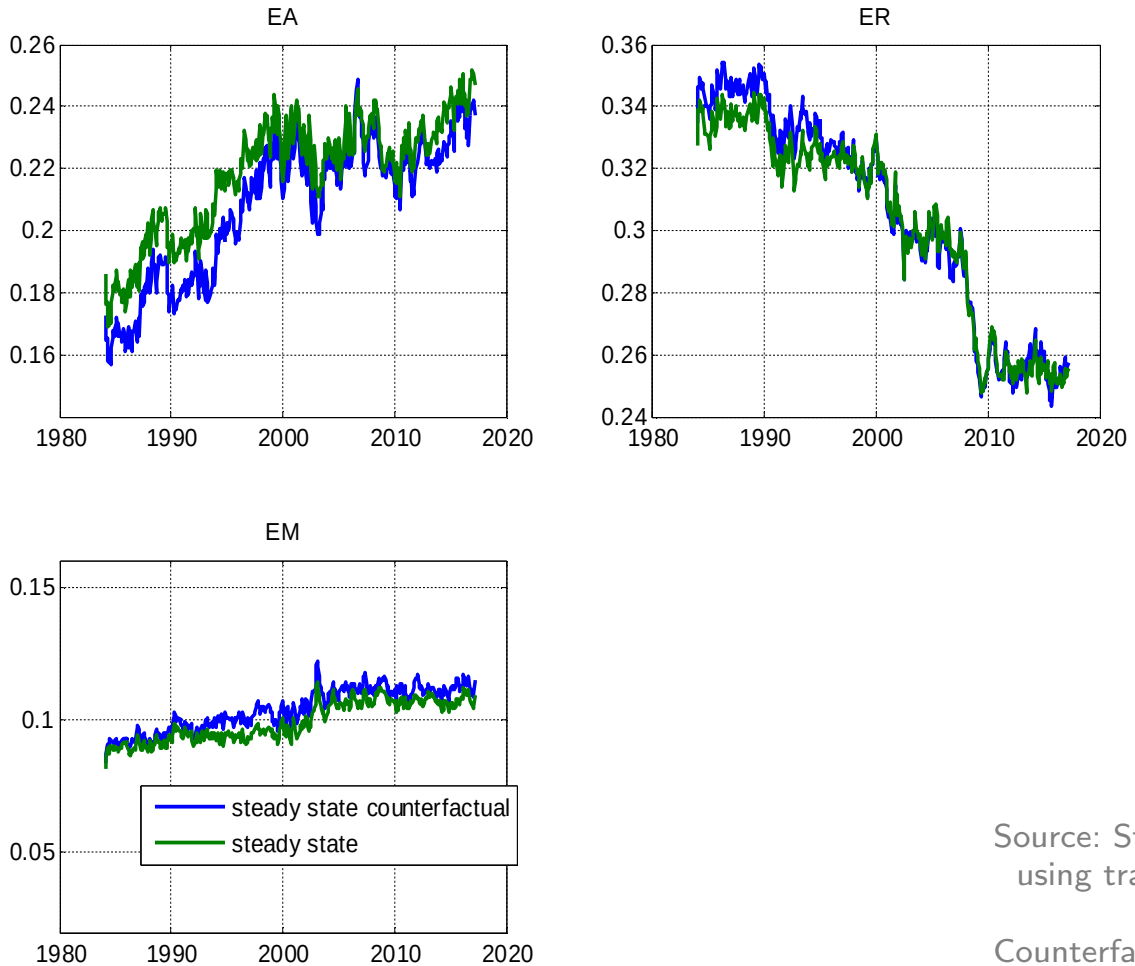
FIGURE – Omitting transitions in the US



Source: Steady state employment stocks using transition matrices from monthly CPS.
Counterfactual steady state stocks when the following transitions are set to zero : AR, AM, RA,RM,MR,MA.
Source : Charlot, Fontaine, Sopraseuth (2018)

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Polarization in the US : Autor & Dorn (2013)

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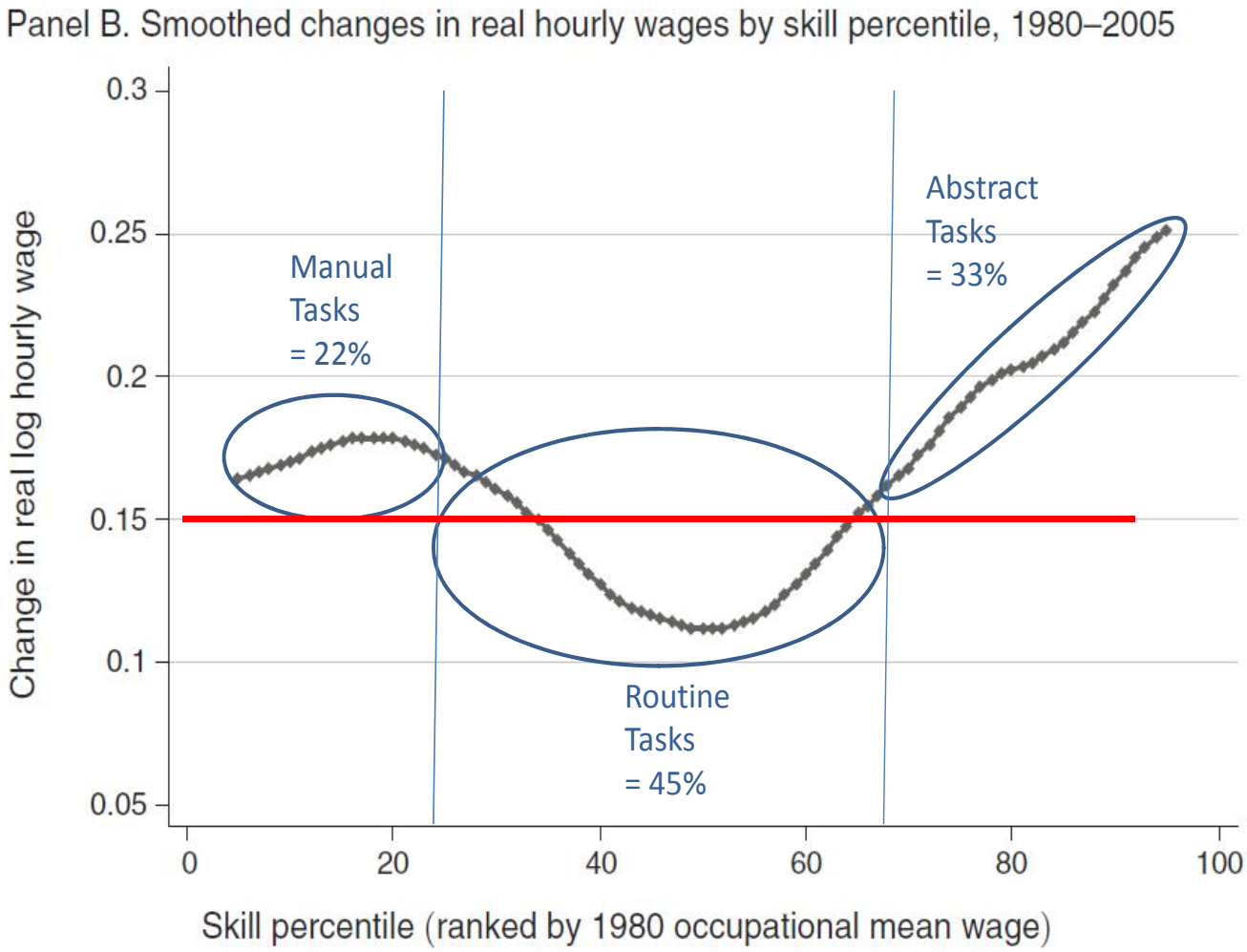

Related literature

Our contribution : labor reallocation with occupational changes in a non-stationary environment, within unskilled workers (from the middle towards the bottom of the wage distribution), outside steady state

- Job polarization as an outcome of the structural change : Autor and Dorn (2013)
- Search and matching, technological changes : Mortensen and Pissarides (1998,1999), Horstein and al. (2004)
- Occupational choice - search vs rest unemployment : Alvarez and Shimer (2011)
- "European employment problem" and the interaction between structural change and LMI : Ljungqvist and Sargent (1998, 2008), Blanchard and Wolfers (1999)

Links with the "TC-LMI interaction" literature

Ljungqvist and Sargent (1998 & 2008), Mortensen and Pissarides (1999), Hornstein, Krussel & Violante (2007). Originality of our paper w.r.t this literature :

- Perfect mobility versus mobility costs $\rightarrow$ LMI
- Steady-state versus transitional dynamics (the *path* of LMI matters)
- In our paper,
  - Mobility towards less productive jobs (job polarization)
  - A more comprehensive view on labor market dynamics : aggregate employment, employment by task, wage dynamics and inequalities
  - Understanding employment growth by *quantifying* the relative contribution of LMI, TC and Labor supply of skilled labor
  - Reform packages : stress on interaction between LMI

US Data, as in Jaimovich and Siu (2015)

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- Employment Data by Occupation from BLS
- Abstract : Non-routine cognitive workers. Management, business, and financial operations occupations. Professional and related occupations.
- Routine : sales and related occupations. office and administrative support occupations. production occupations, transportation and material moving occupations, construction and extraction occupations, and installation, maintenance, and repair occupations.
- Manual : service occupations : ... Ushers, Lobby Attendants, and Ticket Takers ; Amusement and Recreation Attendants ; Embalmers ; Funeral Attendants ; Morticians, Undertakers, and Funeral Directors ; Barbers ; Hairdressers, Hairstylists, and Cosmetologists ; Makeup Artists, Theatrical and Performance ; Manicurists and Pedicurists ; Shampooers ; Skincare Specialists ; Baggage Porters and Bellhops ; Concierges ; Travel Guides ; Childcare Workers ; Personal Care Aides ; Fitness Trainers and Aerobics Instructors ; Recreation Workers ; Residential Advisors ; Personal Care and Service Workers, All Other

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US Data, as in Jaimovich and Siu (2015)

- Consistent with Autor and Dorn's classification
- Consistent with Routine-Task Intensity index based on DOT

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French data :

- Annual French Labor surveys (1983-2014)
- Compute employment by occupation
- Abstract, Routine and Manual workers are identified in the same way as in Jaimovich and Siu (2015)
- classification using wages is not possible in the early 1980s (wage is not a continuous variable in the early 1980s)

Back to slides Goods sector : Complementarity and substitutability

Model : details Goods

$$Y^g \geq AL_a^{\alpha} \left[\left((1-\mu) \sum_{\eta^S}^{\overline{\eta}} \eta L_r(\eta) \right)^{\sigma} + (\mu K)^{\sigma} \right]^{\frac{1-\alpha}{\sigma}}$$

Service sector Model : details Services

$$Y^s \geq A_s \left(L_s + \delta \sum_{\eta} L_m^n(\eta) + \delta L_m^o \right)$$

Preferences : complementarities Model : details Households

$$C = \left[\nu C_g^{\rho} + (1-\nu) C_s^{\rho} \right]^{\frac{1}{\rho}}$$

Firms : Goods sector

The representative firm's problem

$$\Pi^g = \max \left\{ \begin{array}{l} Y^g - p_k K - \sum_{\eta^s}^{\overline{\eta}} w_r(\eta)\eta L_r(\eta) - w_a L_a \\ -cV_a - c\sum_{\eta^s}^{\overline{\eta}} V_r(\eta) + \beta \Pi^g_{+1} \end{array} \right\}$$

$$\begin{aligned} \text{s.t.} \quad Y^g &\geq AL_a^{\alpha} \left[\left((1-\mu) \sum_{\eta^s}^{\overline{\eta}} \eta L_r(\eta) \right)^{\sigma} + (\mu K)^{\sigma} \right]^{\frac{1-\alpha}{\sigma}} \\ L_{r,+1}(\eta) &= (1-s)L_r(\eta) + q_r(\eta)V_r(\eta) \\ L_{a,+1} &= (1-s)L_a + q_a V_a \\ \Pi^g &= \max \left\{ \Pi^g_{(L_r(\eta)>0)}, -FC \times L_r(\eta) + \Pi^g_{(L_r(\eta)=0)} \right\} \end{aligned}$$

▸ Back to slide model

Firms : Service sector

The representative firm's problem

$$\Pi^s = \max \left\{ \begin{array}{l} p_s Y^s - w_m L_m - \sum_\eta w_m^n(\eta) L_m^n(\eta) - w_m^o L_m^o \\ -cV_m - c\sum_\eta V_m^n(\eta) - cV_m^o + \beta \Pi_{+1}^s \end{array} \right\}$$

$$\begin{aligned} \text{s.t.} \quad Y^s &\geq A_s \left(L_s + \delta \sum_\eta L_m^n(\eta) + \delta L_m^o \right) \\ L_{m,+1} &= (1-s)L_m + q_m V_m + (1-s)\lambda \sum_\eta L_m^n(\eta) + (1-s)\lambda L_m^o \\ L_{m,+1}^o &= (1-s)(1-\lambda)L_m^o + q_m^o V_m^o \\ L_{m,+1}^n(\eta) &= (1-s)(1-\lambda)L_m^n(\eta) + q_m^n(\eta) V_m^n(\eta) \end{aligned}$$

with $\delta \in (0,1)$ the loss of efficiency due to the "movers"' learning process.

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Households : Demand

For each worker, the budgetary constraint is

$$PC = I \quad \text{with } I \in \{w_a, w_r(\eta), w_s, w_m, z_a, z_s, z_r\}$$

Given that all workers, we have

$$C = \left[\nu C_g^{\rho} + (1-\nu) C_s^{\rho}\right]^{\frac{1}{\rho}} \qquad P = \left[\nu^{\frac{1}{1-\rho}} + (1-\nu)^{\frac{1}{1-\rho}} p_s^{\frac{\rho}{\rho-1}}\right]^{\frac{\rho-1}{\rho}}$$

the optimal sharing of the basket good C is given by :

$$p_s = \frac{1-\nu}{\nu}\left(\frac{C_g}{C_s}\right)^{1-\rho}$$

$$\Rightarrow \begin{cases} C_g &= \nu^{\frac{1}{1-\rho}} \left(\frac{1}{P}\right)^{\frac{1}{\rho-1}} \frac{I}{P} \\ C_s &= (1-\nu)^{\frac{1}{1-\rho}} \left(\frac{p_s}{P}\right)^{\frac{1}{\rho-1}} \frac{I}{P} \end{cases}$$

which are the demand functions.

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Model Assumptions : labor reallocation across sectors

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- A mobility cost = a market for "movers/switcher" (s) :
  - Some l-skill workers, unemployed on a "routine" labor market, can choose to move to search for a "manual" job.
  - For them, the cost is the acceptance of a **bad job** in the "manual" sector
- Learning process : the duration of the transformation of a bad job into a good job in the manual sector is stochastic with a Poisson parameter λ.
- There is potentially 2 types of switchers :
  - The first are eligible to an UB indexed on their previous "routine" job wage : new mover/switcher.
  - The second have a longer experience on this segment of the labor market and have lost their eligibility on this UB.

Employees' Opportunities

The worker's value functions are

$$
\begin{aligned}
W_a &= w_a(1-\tau^{wa}) + (1-s)\beta W_{a,+1} + s\beta U_{a,+1} \\
W_m &= w_m(1-\tau^{w}) + (1-s)\beta W_{m,+1} + s\beta U_{m,+1} \\
W_r(\eta) &= \eta w_r(\eta) + (1-s)\beta W_{r,+1}(\eta) + s\beta \max\{U_{r,+1}(\eta), U^n_{m,+1}(\eta)\} \\
W^o_m &= w^o_m(1-\tau^{w}) + \lambda[(1-s)\beta W_{m,+1} + s\beta U_{m,+1}] \\
&\quad +(1-\lambda)[(1-s)\beta W^o_{m,+1} + s\beta U^o_{m,+1}] \\
W^n_m(\eta) &= w^n_m(\eta)(1-\tau^{w}) + \lambda[(1-s)\beta W_{m,+1} + s\beta U_{m,+1}] \\
&\quad +(1-\lambda)[(1-s)\beta W^n_{m,+1}(\eta) + s\beta U^o_{m,+1}]
\end{aligned}
$$

- "Movers" can obtain a good "manual" job with a $Proba = \lambda$
- For workers previously occupied on a "Routine" task, the reallocation is an option $\Leftrightarrow \max\{U_{r,+1}(\eta), U^n_{m,+1}(\eta)\}$.

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Unemployed workers Opportunities

For the unemployed worker,

$$
\begin{aligned}
U_a &= z_a + (1 - f_a)\beta U_{a,+1} + f_a \beta W_{a,+1} \\
U_m &= z_m + (1 - f_m)\beta U_{m,+1} + f_m \beta W_{m,+1} \\
U_r(\eta) &= z_r(\eta) + (1 - f_r(\eta))\beta \max\{U_{r,+1}(\eta), U^n_{m,+1}(\eta)\} \\
&\quad + f_r(\eta)\beta W_{r,+1}(\eta) \\
U^o_m &= z_m + (1 - \chi f^o_m)\beta U^o_{m,+1} + \chi f^o_m \beta W^o_{m,+1} \\
U^n_m(\eta) &= z_r(\eta) + (1 - \chi f^n_m(\eta))\beta U^n_{m,+1}(\eta) + \chi f^n_m(\eta)\beta W^n_{m,+1}(\eta)
\end{aligned}
$$

with $\chi \in (0; 1)$ the efficiency loss in the matching process when the worker chooses to change occupation. The UB, z_i, are indexed to the wage of the previous job i.

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Routine :

$$
\begin{aligned}
w^r(\eta) \quad = \quad & \frac{\gamma}{1+\tau^f}\left(y_r(\eta)+\Gamma(\tau^f_{+1},\tau^w_{+1})\frac{\phi_{+1}}{\phi}\left(c\theta_r(\eta)\right)\right) \\
& +\frac{\gamma}{1+\tau^f}\left(\frac{c}{q_r(\eta)}\right)(1-s_r)\left(1-\Gamma(\tau^f_{+1},\tau^w_{+1})\frac{\phi_{+1}}{\phi}\right) \\
& +\frac{1-\gamma}{1-\tau^w}\left(z_r(\eta)+(1-s-f_r)\beta\max\{0,U^n_{m,+1}(\eta)-U_{r,+1}(\eta)\}\right)
\end{aligned}
$$

Manual (new movers) :

$$
\begin{aligned}
w^n_m(\eta) \quad = \quad & \frac{\gamma}{1+\tau^f}\left[p_s\delta A_s+\Gamma(\tau^f_{+1},\tau^w_{+1})\frac{\phi_{+1}}{\phi}\left(c\theta^n_m(\eta)\right)\right] \\
& +\frac{\gamma}{1+\tau^f}\left(\frac{c(1-\lambda)}{q^n_m(\eta)}+\frac{c\lambda}{q_m}\right)(1-s_m)\left[1-\Gamma(\tau^f_{+1},\tau^w_{+1})\frac{\phi_{+1}}{\phi}\right] \\
& +\frac{1-\gamma}{1-\tau^w}\left[z_r(\eta)+\beta\left(\lambda(U^n_{m,+1}(\eta)-U_{m,+1})+s(1-\lambda)(U^n_{m,+1}(\eta)-U^o_{m,+1})\right)\right]
\end{aligned}
$$

with

$$
\phi \quad = \quad \frac{\gamma}{1-\gamma} \tag{1}
$$

$$
\Gamma(\tau^f_{+1},\tau^w_{+1}) \quad = \quad \frac{1+\tau^f}{1+\tau^f_{+1}}\frac{1-\tau^w_{+1}}{1-\tau^w} \tag{2}
$$

A complex numerical algorithm

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- A non-stationary problem : a structural change of the economy

  $\Rightarrow$ standard methods of approximation of the dynamics around a unique steady state are not implementable here.

- There are several regimes

  $\Rightarrow$ Even if we know the initial and the final steady states, the dynamics takes into account the transitional labor reallocations (non-linear problem of occupational choice) and the MW, which can binds or not, depending on the evolution of the economy.

- There are heterogeneous workers, and this heterogeneity matters or not depending on the occupation of the worker. $\Rightarrow$ The size of the model is very large (more than 1500 dynamic equations).

- General equilibrium model : labor re-allocation affects relative production, hence relative price of good, hence feed-back effects on labor re-allocation

- **A time-consuming process to solve this new type of problem**

The expected interest of the analysis at the GE

- Our contribution
  - There is an impact of the growth on aggregate employment
  - $\Rightarrow$ An unbalanced growth path leads to capitalization effects for the favored jobs (skilled workers) and to reallocation phenomena (unskilled workers)
  - $\Leftrightarrow$ First general equilibrium effect.
  - There are consumers, and thus interaction between worker groups through the utility function.
  - $\Rightarrow$ The values of the manual jobs dependent from the abstract and routine jobs
  - $\Leftrightarrow$ Second general equilibrium effect.
  - There is a combination, specific to each country, of the dynamics of the TBTC and LMI, affecting both the level and the structure of the employment.
  - $\Leftrightarrow$ Third general equilibrium effect.

Non-binding scrapping-time with flexible wage

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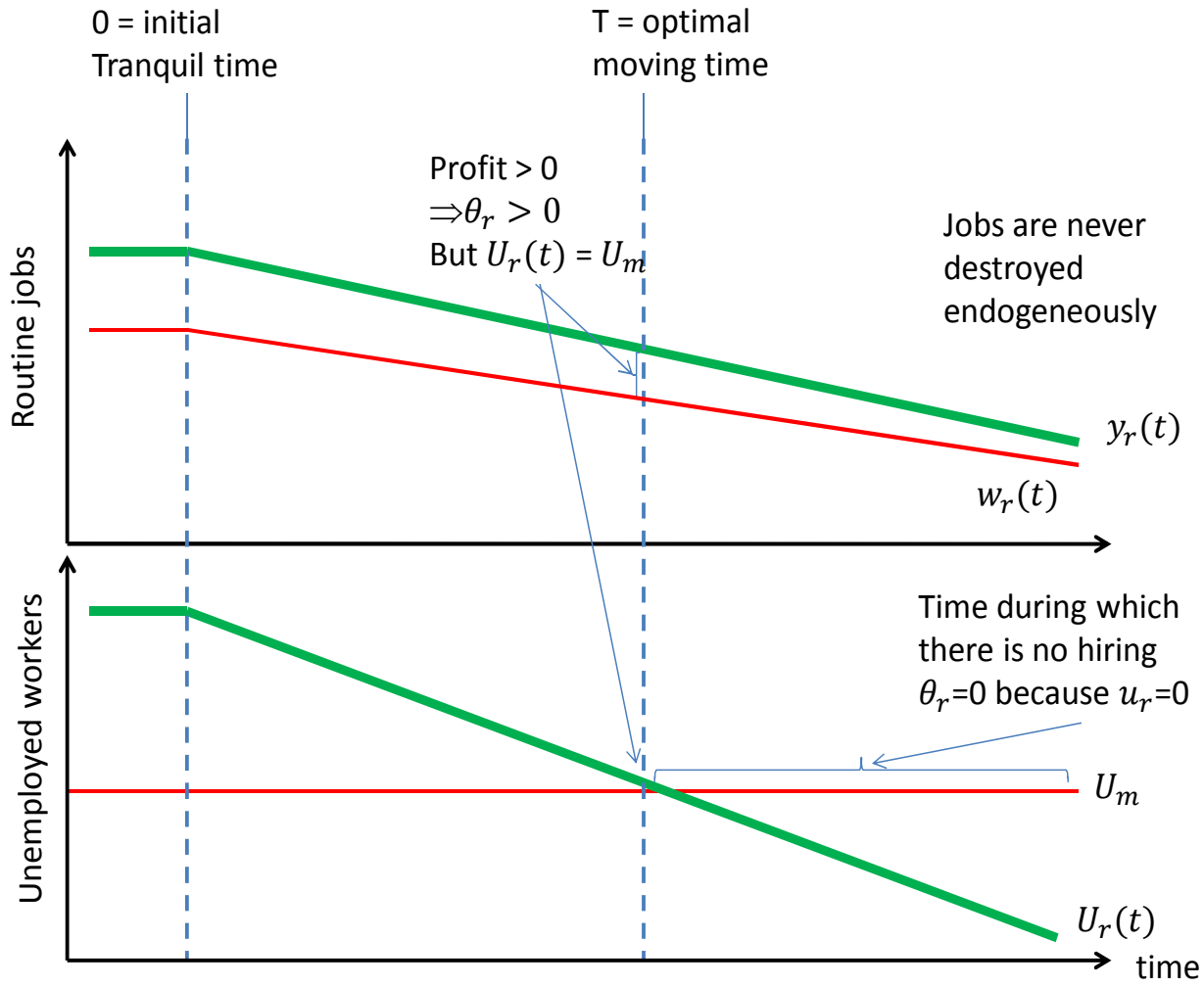

Binding scrapping-time with rigid wage

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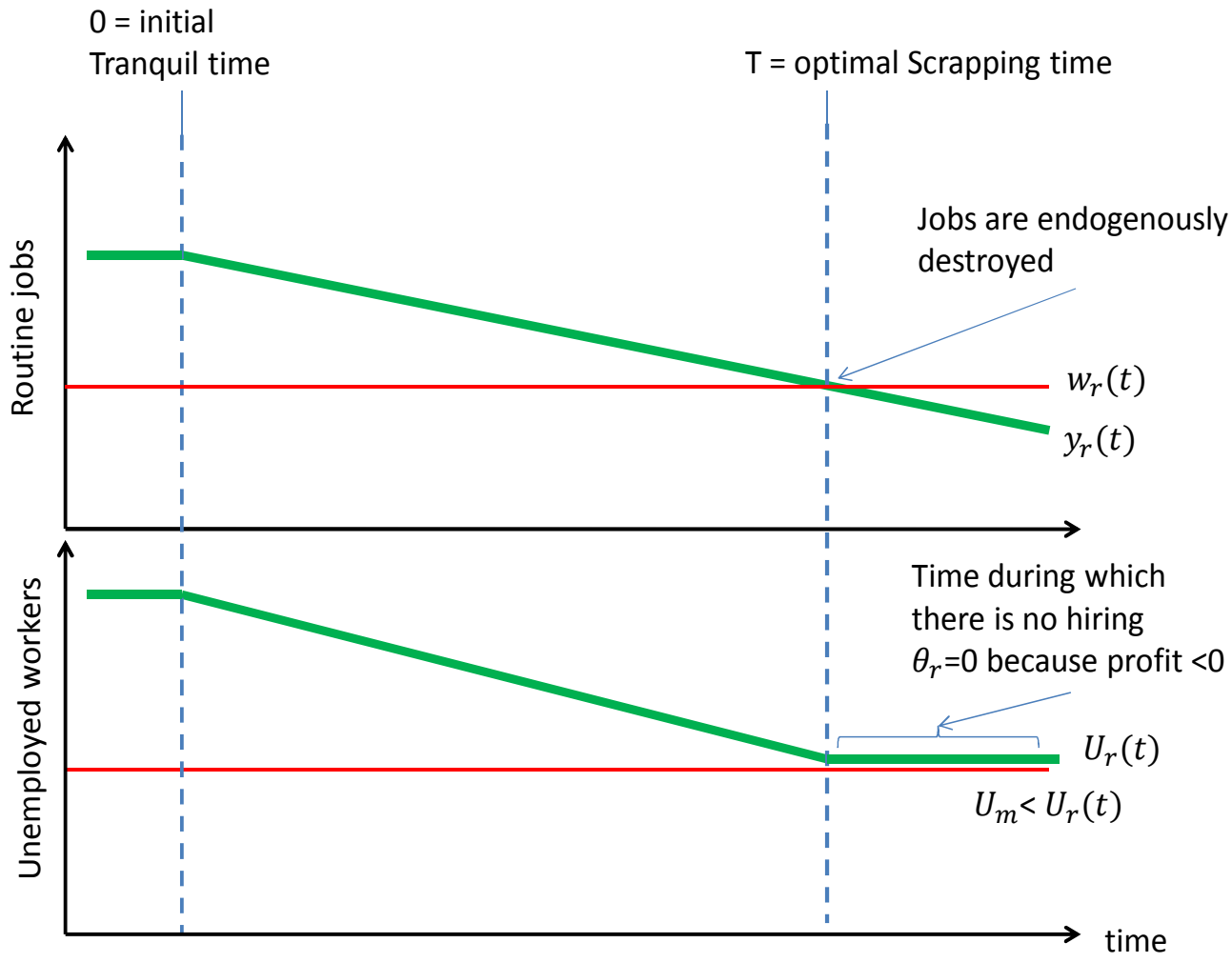
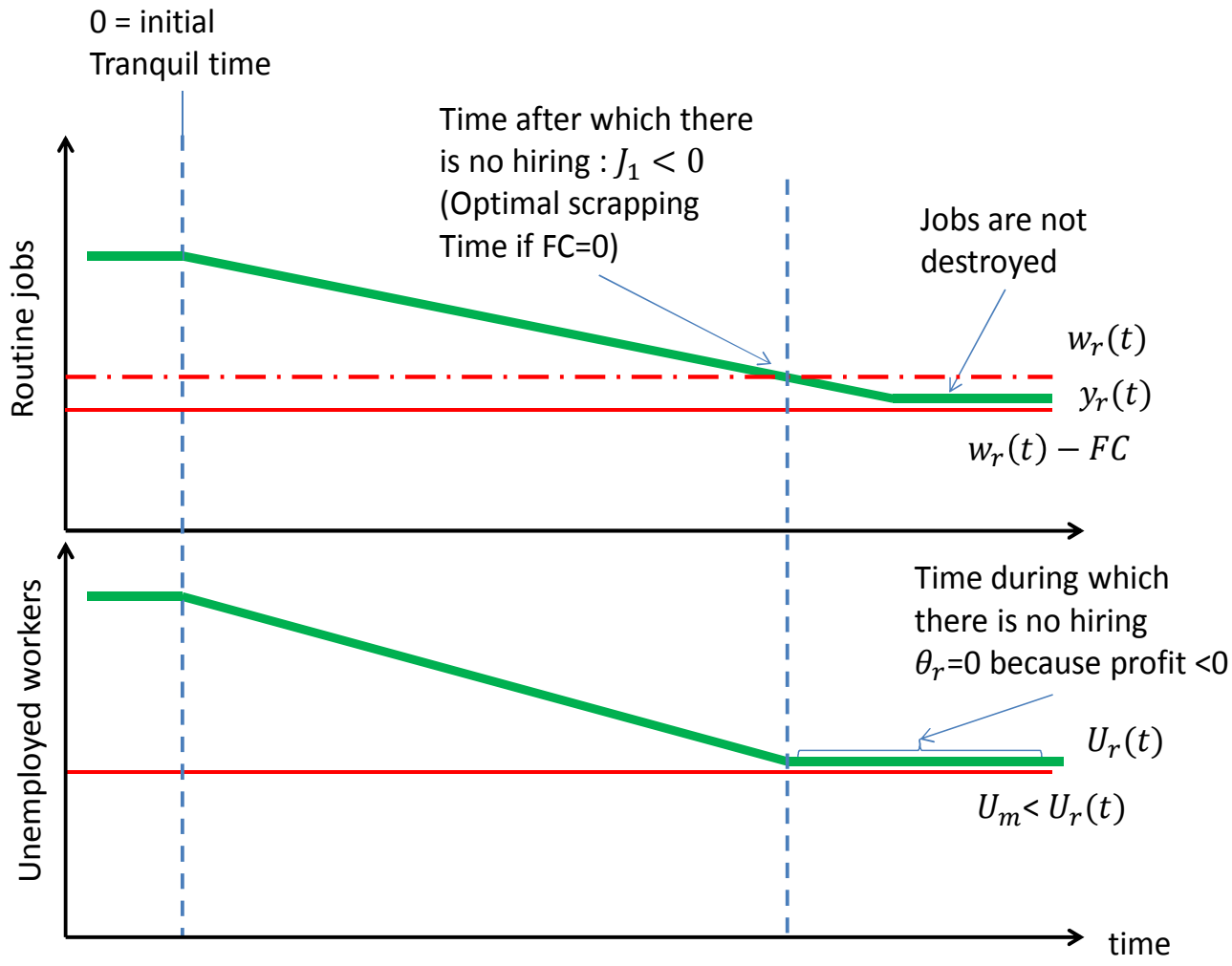


Scrapping-time with rigid wage and firing costs

Back



The interaction between moving time and scrapping time

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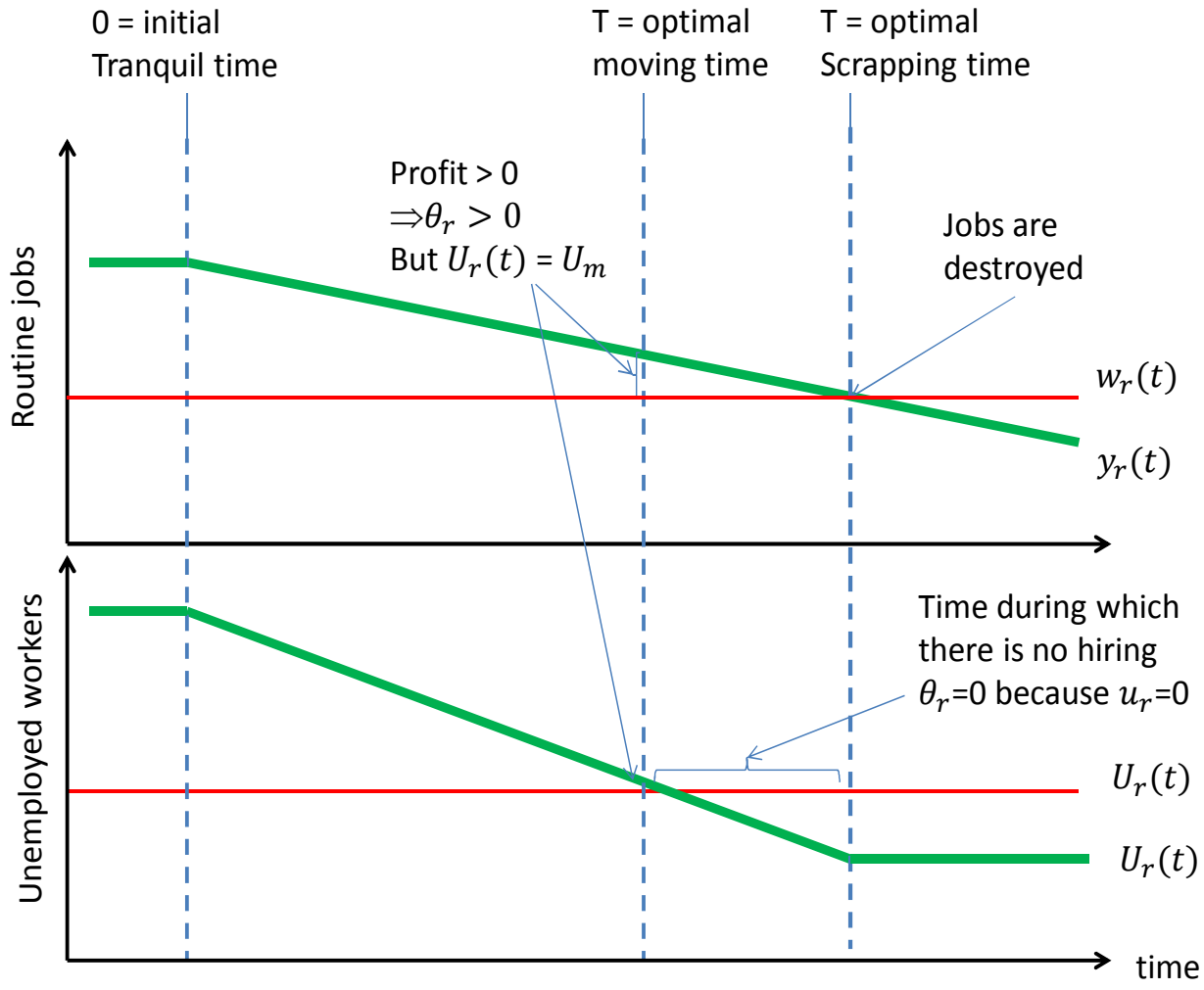
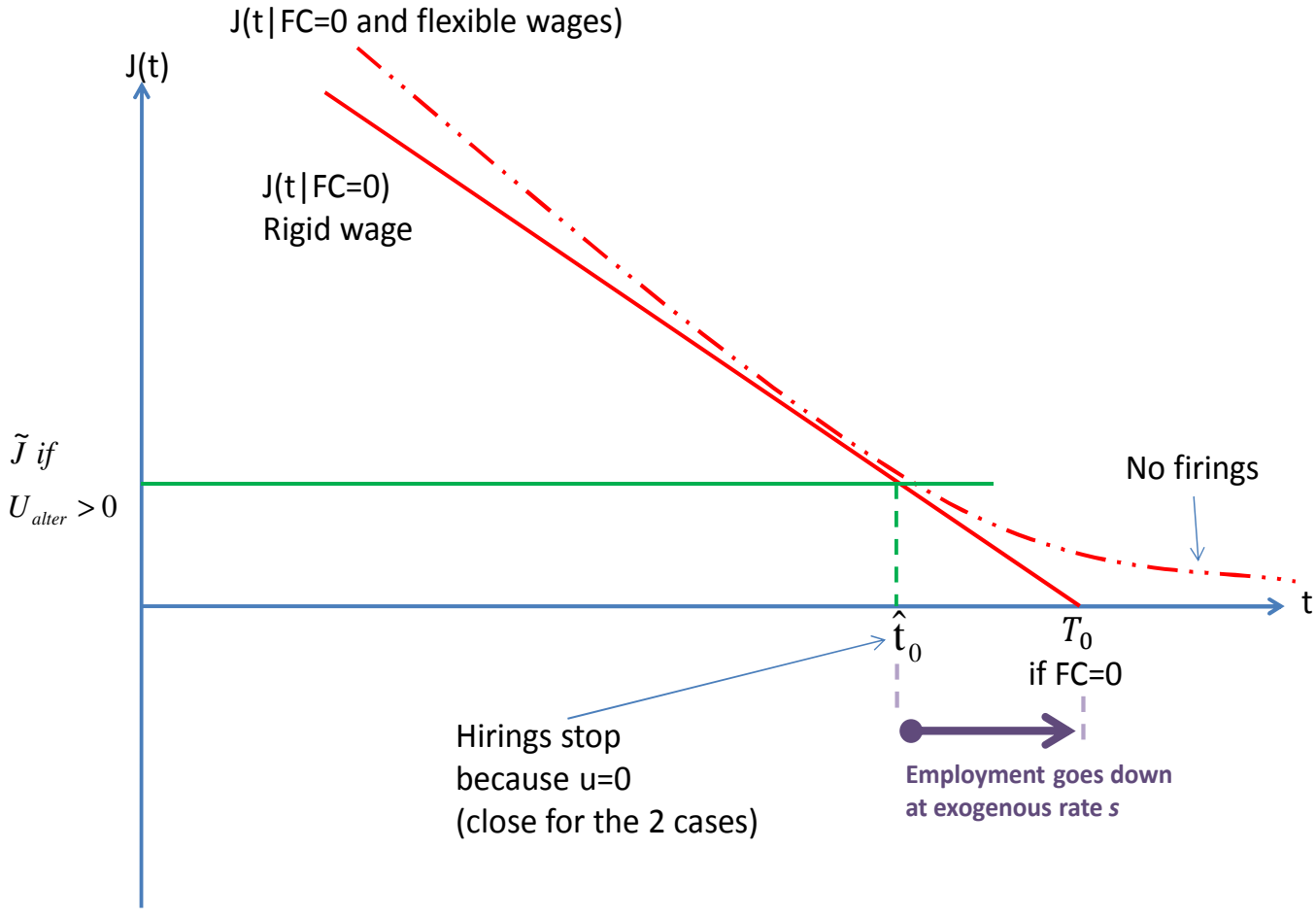
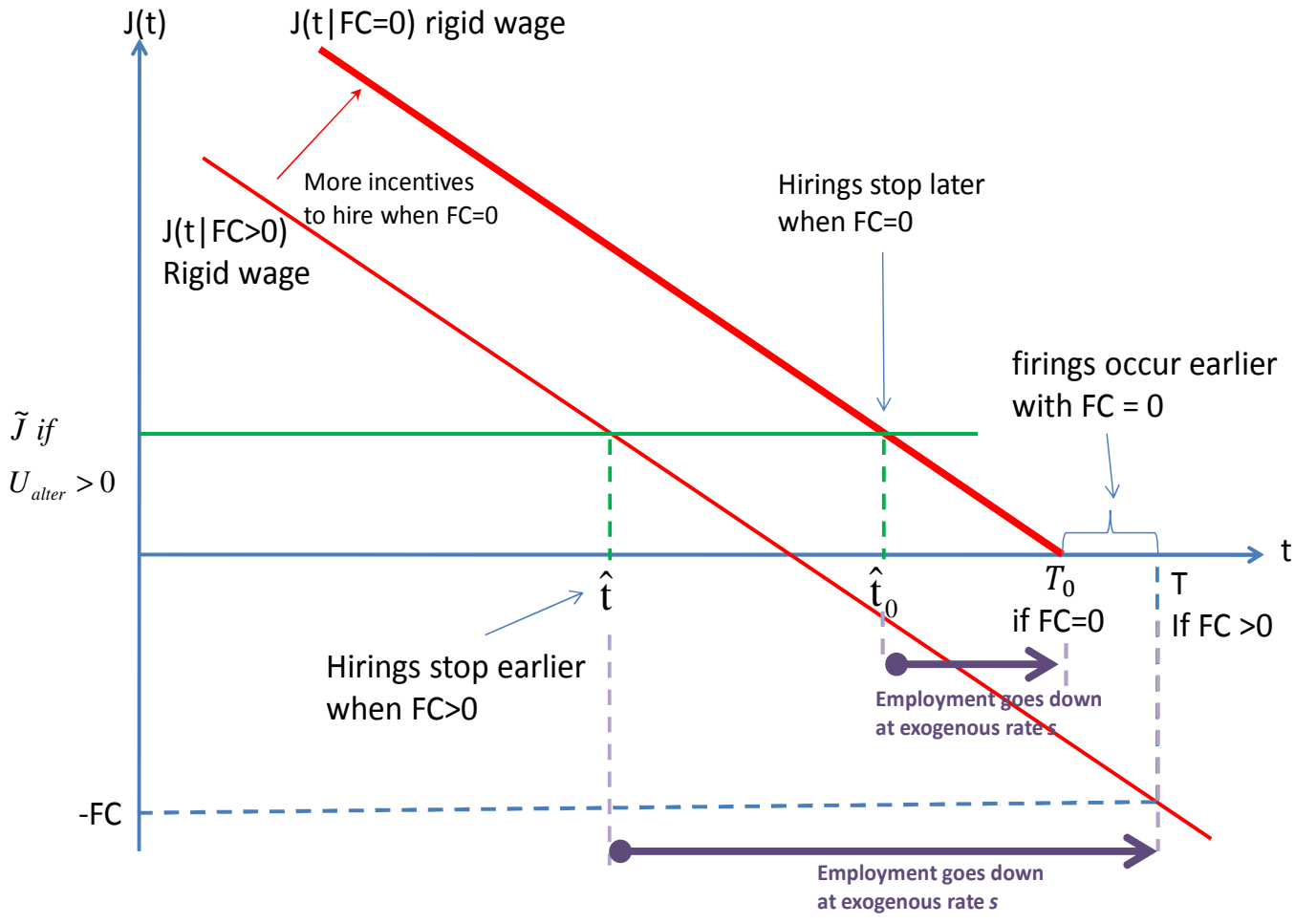


The interaction between moving time and scrapping time



The interaction between moving time and scrapping time, with firing costs



Employment reallocation in France

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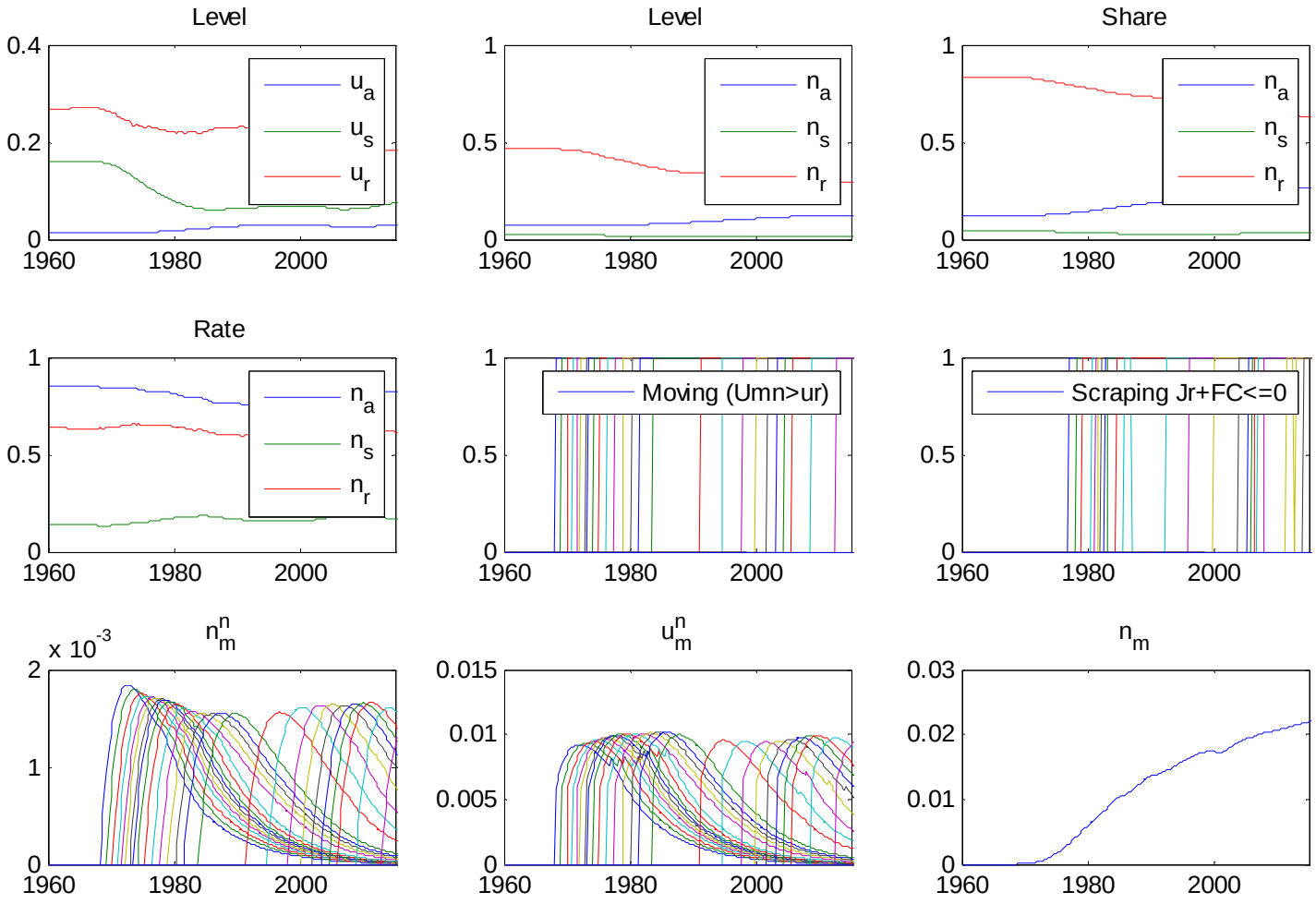
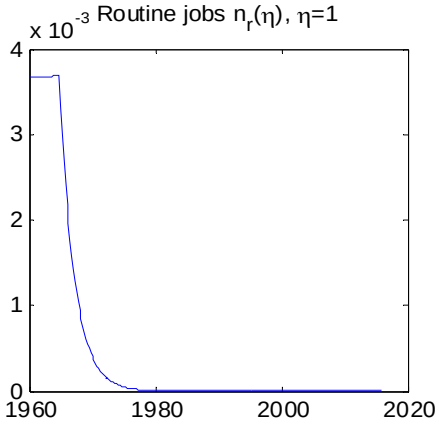
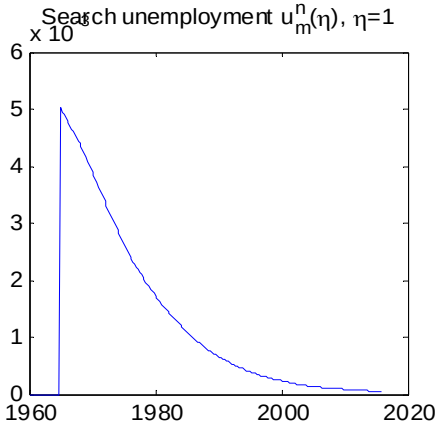
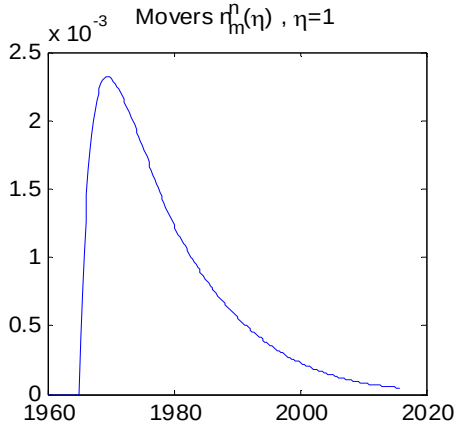


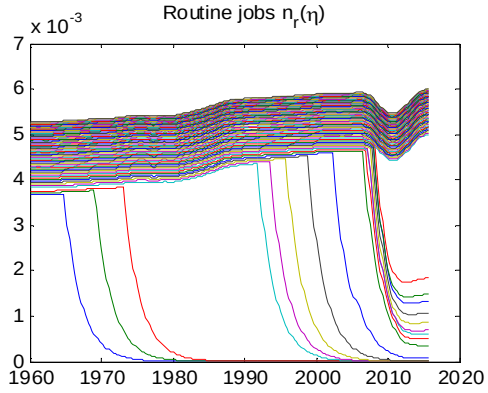
Employment reallocation in the US

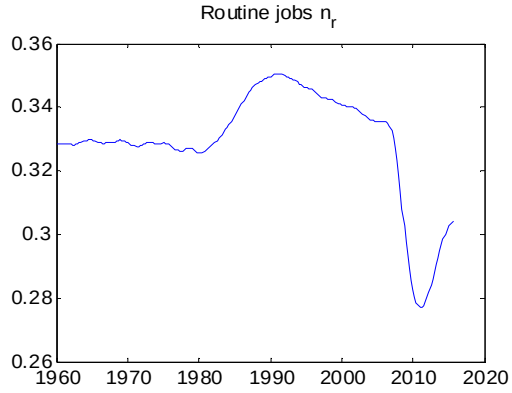


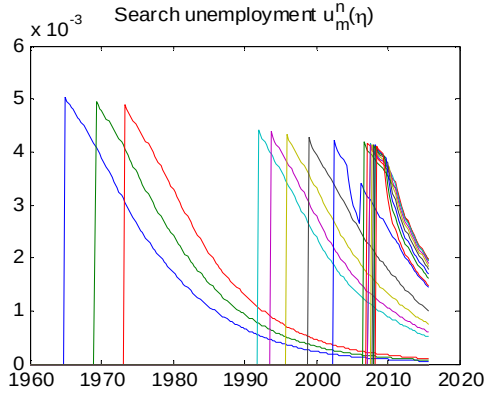


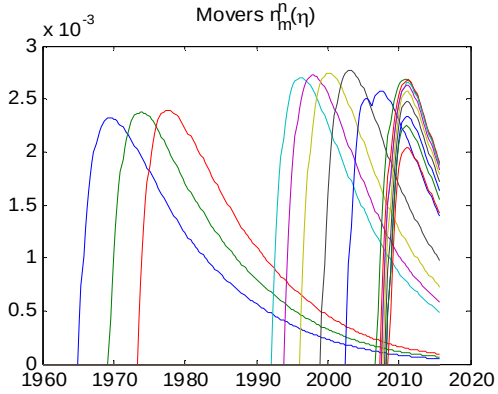


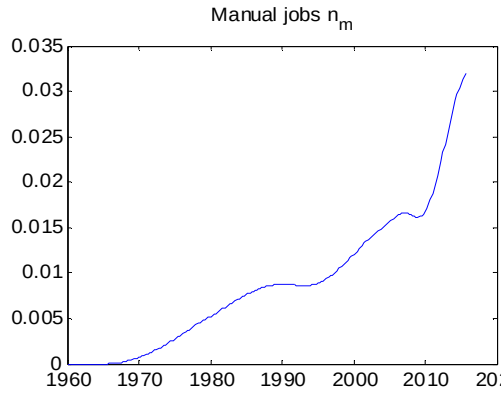
Employment reallocation in the US











In a frictionless labor market

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In Autor and Dorn (2013), the impact of the Task-Biaised Technological Change (TBTC) is governed by two equations

$$\text{Worker Mobility} : \tilde{\eta} y_r = A_s p_s \quad \text{Demand} : p_s = MRS(C_g, C_s)$$

where MRS is the marginal rate of substitution between goods, and $F(K, L_a, L_r) = AL_a^{\alpha}[((1-\mu)Lr)^{\sigma} + (\mu K)^{\sigma}]^{\frac{\alpha}{\sigma}}$ the production function of goods, leading to $y_r = F'_{L_r}$. The mobility condition determines the ability threshold $\tilde{\eta}$ below which workers choose manual jobs. Thus, if the elasticities of substitutions of $F(\cdot)$ and the $MRS(\cdot)$ depend on $\{\sigma, \alpha\}$ and ρ respectively, then the impact of the TBTC depends only on these 3 parameters. There is no labor supply elasticity because the supply of skilled labor is fixed in all markets.

In a partial equilibrium (p_s is constant and exogenous), we have in a matching model :

$$\text{Mobility :} \quad U(\theta_r(\tilde{\eta}), LMI) = U(\theta_m, LMI)$$

$$\text{where Hirings :} \quad \begin{cases} \theta_r(\eta) &= \varphi_r(\eta y_r, LMI) \\ \theta_m &= \varphi_m(A_s p_s, LMI) \end{cases}$$

We deduce that the mobility between labor market segments is governed by :

$$\varphi_r(\tilde{\eta} y_r, LMI) = \varphi_m(A_s p_s, LMI)$$

As previously, the impact of the TBTC depends on $\{\sigma, \alpha\}$ (and ρ if p_s is endogenous), but now, combined with $LMI = \{\underbrace{r, h}_{w^r}, \underbrace{\gamma, c}_{w_{Nash}}, \underbrace{MW, \omega, \overline{w}}_{\text{wage rigidity}}\}$ and thus on the labor supply elasticity (extensive margin).

Assume for simplicity that

- the wage is bargained *à la* Hall and Milgrom (2008). In this case, we have $w_r(\eta) = \gamma\eta y_r + (1-\gamma)(h + z_r(\eta))$ and $w_r(\eta) = \gamma p_s A_s + (1-\gamma)(h + z_m)$
- There is no social programs, and the unemployment benefits are proportional to productivity $z_r(\eta) = r\eta y_r$ and $z_m = r p_s A_s$, with r the replacement ratio.

The wage becomes $w_r(\eta) = (\gamma + (1-\gamma)r)\eta y_r$ and $w_m = (\gamma + (1-\gamma)r)p_s A_s$.
Under the assumption that y_r and p_s are constant (equilibrium growth path), mobility across labor market segments is governed by :

$$\eta y_r \left[r + \frac{\beta f_r(\eta)\gamma(1-r)}{1-\beta(1-s-f_r(\eta))} \right] = p_s A_s \left[r + \frac{\beta f_m \gamma(1-r)}{1-\beta(1-s-f_m)} \right]$$

This equation has a trivial solution : $\tilde{\eta} y_r = p A_m$. This comes from the proportionality of all values function to productivity and from the symmetry between routine and manual functional forms ($f_r(\cdot) = f_m(\cdot)$). In this case, the occupational choice is governed by the same equation as in Autor and Dorn (2013).

Thus, assume now that p_s is constant but y_r decreases at the rate g (ie. $y_r(t+1) = (1-g)y_r(t)$). We deduce that the occupational choice is now given by :

$$\eta y_r \left[r + \frac{\beta f_r(\eta)\gamma(1-r)}{1-\beta(1-g)(1-s-f_r(\eta))} \right] = pA_m \left[r + \frac{\beta f_m \gamma(1-r)}{1-\beta(1-s-f_m)} \right]$$

The capitalization effect in the LHS, and absent in the RHS, implies that $\tilde{\eta} y_r = A_m p_s$ is not the equation that determines the ability threshold $\tilde{\eta}$ below which workers allocate to manual jobs.

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A simple way to interpret the previous equation is to notice that it defines $\tilde{\eta}$ as follows :

$$\Gamma(\tilde{\eta}, g) = \Upsilon \quad \text{with } \Gamma'_1(\eta, g) > 0 \text{ and } \Gamma'_2(\eta, g) < 0$$

When $g = 0$, the solution is, as previously and as in Autor and Dorn (AD), $\tilde{\eta}_{AD} y_r = p_s A_m$, whereas, when $g > 0$, $\tilde{\eta} < \tilde{\eta}_{AD}$: Search and matching reduces the magnitude of the reallocation process such that less workers reallocate to manual jobs. Due to search and matching, employment is an investment decision : time matters, and thus the capitalization of future profit flows. If profit flows are expected to decline, firms' incentive to open vacancies is reduced. This leads workers to leave earlier the labor market of the routine jobs than in a frictionless market. This results appears even if wage is flexible (Nash bargaining rule) and even if there is no revenues non-indexed on wages, like social program. The gap between $\tilde{\eta}$ and $\tilde{\eta}_{AD}$ depends on the level of LMI, ie. in this example on $\{r, \gamma, c\}$.

- Need accurate data to pin down search costs
- Expected effects ?
- For example, ambiguous effects for predictions on EPL
  - With J2J, lower value of the firm (lower expected duration of the job) then, profit becomes negative sooner, hence larger effect of FC
  - With J2J, more workers leave the firm before profits become negative, hence, there are fewer workers when profit becomes negative, hence smaller effect of FC

Model parameters : values based on external information

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Matching	$c^\star$	$c_a^\star$	$\psi^\star$	$s^\star = s_a^\star$	$\Upsilon^\star$
	0.15	$2c^\star$	0.5	0.0125	0.025
Preferences	$\beta^\star$	$h_s^\star$	ρ	ν	
	4%	0	0.825	0.6	
Technology	A	A_s	σ	α	μ
	4.5	0.95	0.78	0.6	0.5
Learning	$\delta^\star$	$\chi^\star$	$\lambda^\star$		
	0.9	1	0.025		
Wage norms	$\omega_{a,US}$	$\omega_{a,Fr}$	$\omega_{a,Ger} = \omega_{r,Ger}$		
	0.95	0.1	0.55		
Adjustments	g_{p_k}	g_{L_a}	g_{rr}	g_{h_u}	g_{MW}
	0.012	0.005	0.03	0.03	0.02

Blue : "estimated" parameters

Model parameters : calibration $dim(\Phi) = dim(\Psi)$

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The other set of parameters $\Phi = \{\Phi_1, \Phi_{2,US}, \Phi_{2,F}, \Phi_{2,G}, \Phi_3\}$:

$$\begin{aligned}
\Phi_1 &= \left\{ \rho, \nu, A, \sigma, \mu, \alpha, A_s, p_k(0), p_k(T), \overline{\eta}, \underline{\eta}, \sigma_\eta \right\} \\
\Phi_{2,i} &= \left\{ \omega_{a,i}, h_{u,i}(0), h_{u,i}(T) \right\}_{i=US,F} \\
\Phi_{2,G} &= \left\{ \omega_{a,G}, \omega_{r,G}, h_{u,G}(0) = h_{u,G}(T), h_{u,G}(1995) \right\}
\end{aligned}$$

The dynamics of all the exogenous variables are

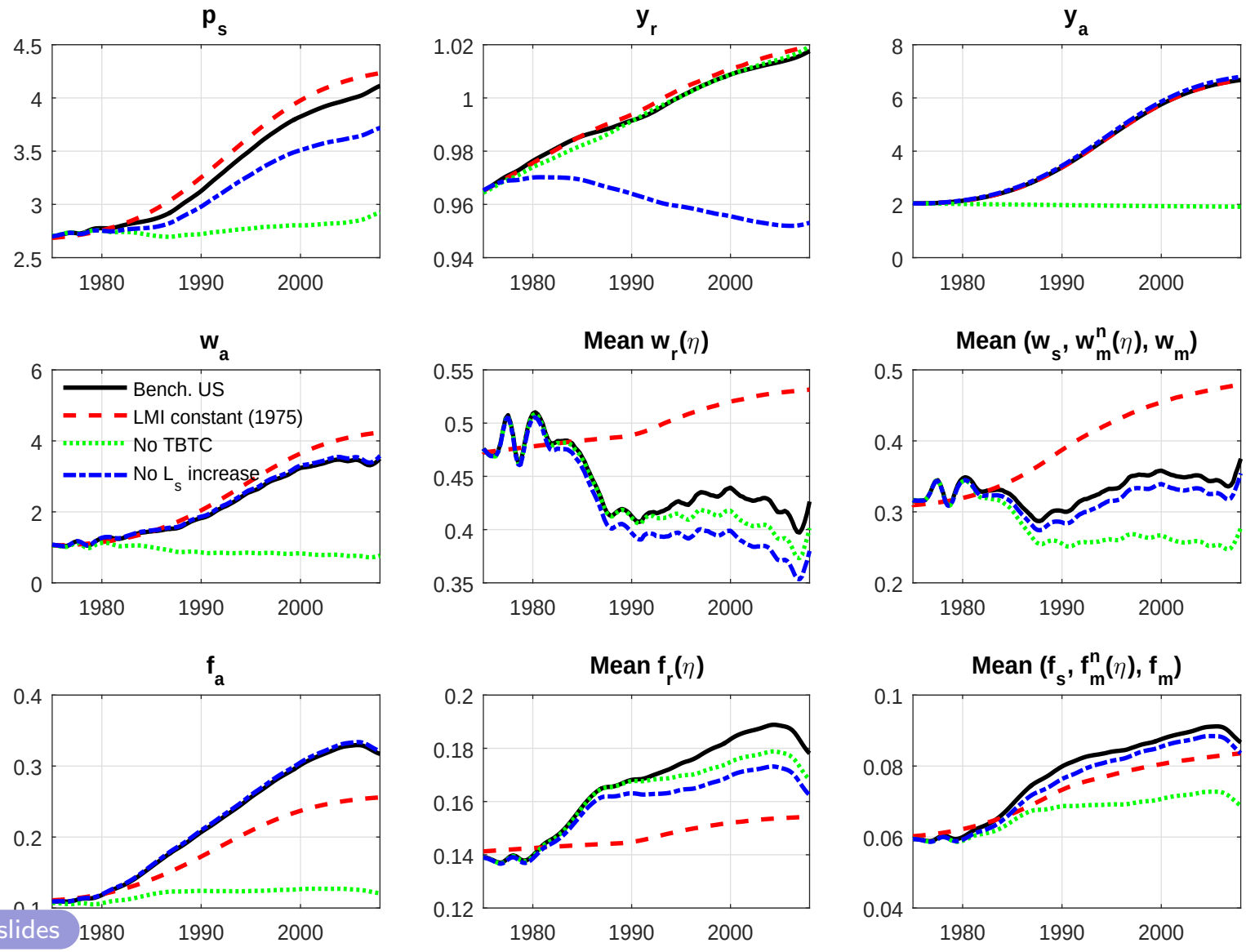
$$x(t) = (x(0) - x(T))e^{-g_x t} + x(T) \quad \text{for } t \in [0, T]$$

This adds $\Phi_3 = \{g_{p_k}, g_{L_a}, g_r, g_{h_u}, g_{MW}\}$ parameters, with $dim(\Phi) = 27$.
The targets of the calibration are :

$$\Psi = \left\{ \begin{array}{l} N_{a,i}(0), N_{r,i}(0), N_{m,i}(0), N_{a,i}(T), N_{r,i}(T), N_{m,i}(T), \\ E_i[N_a], E_i[N_r], E_i[N_m] \end{array} \right\}_{i=US,F,G}$$

with $dim(\Psi) = 27$.

Benchmark case, additional graphs : US



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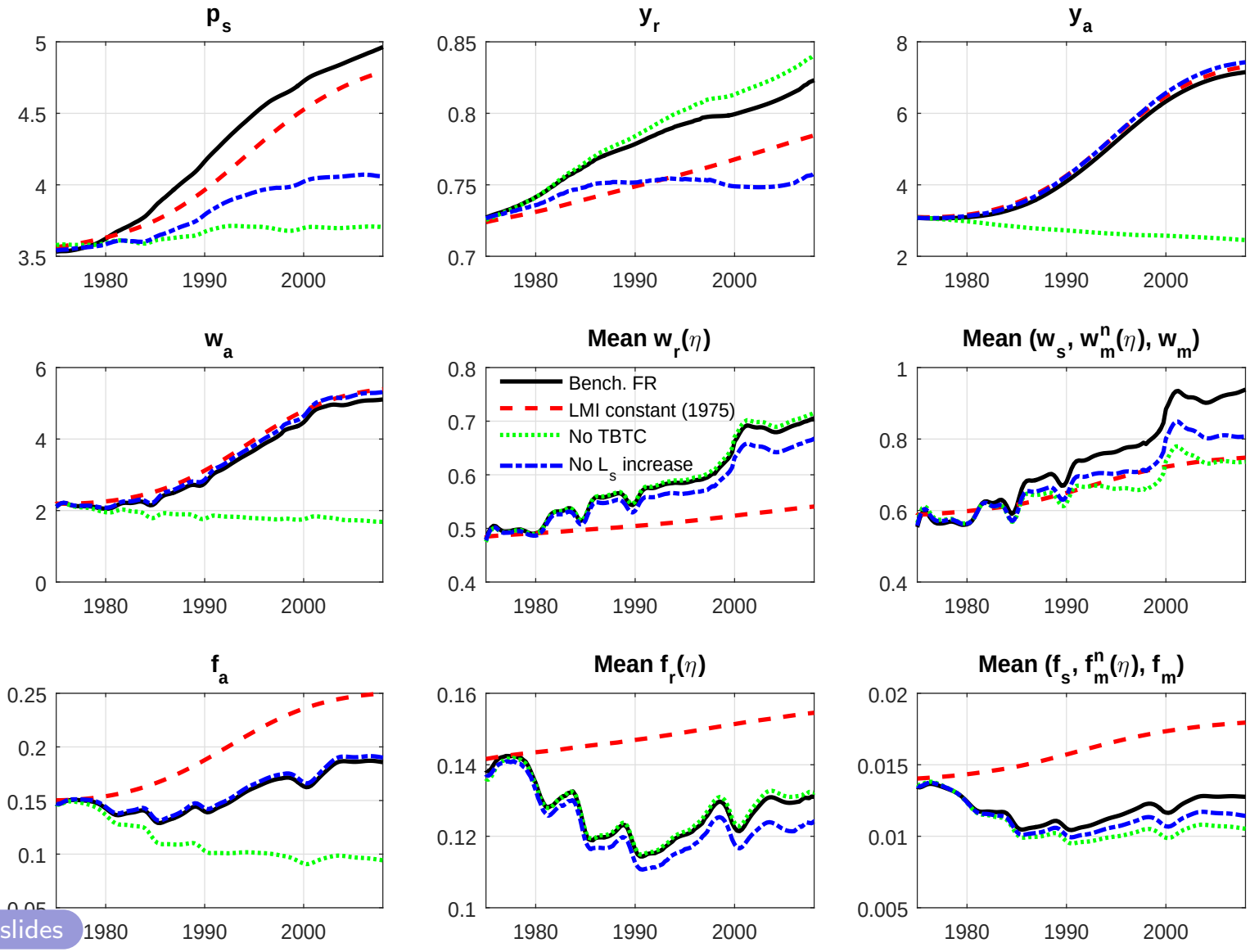
Benchmark case, additional graphs : France



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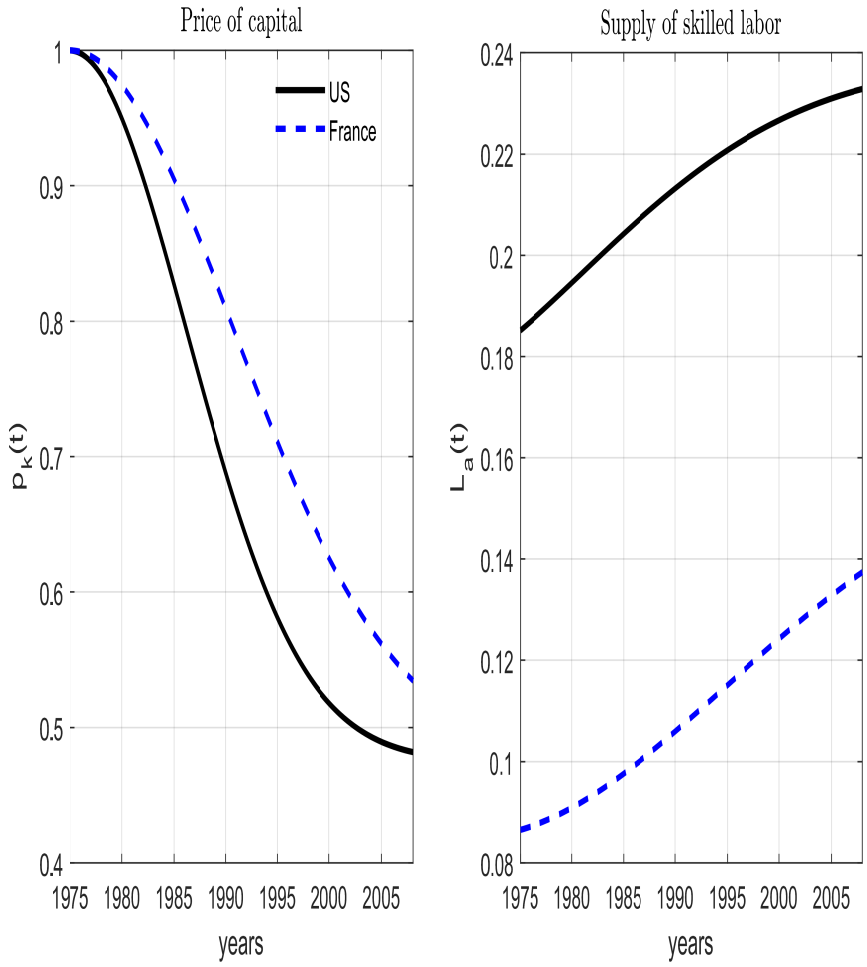
Estimated shocks



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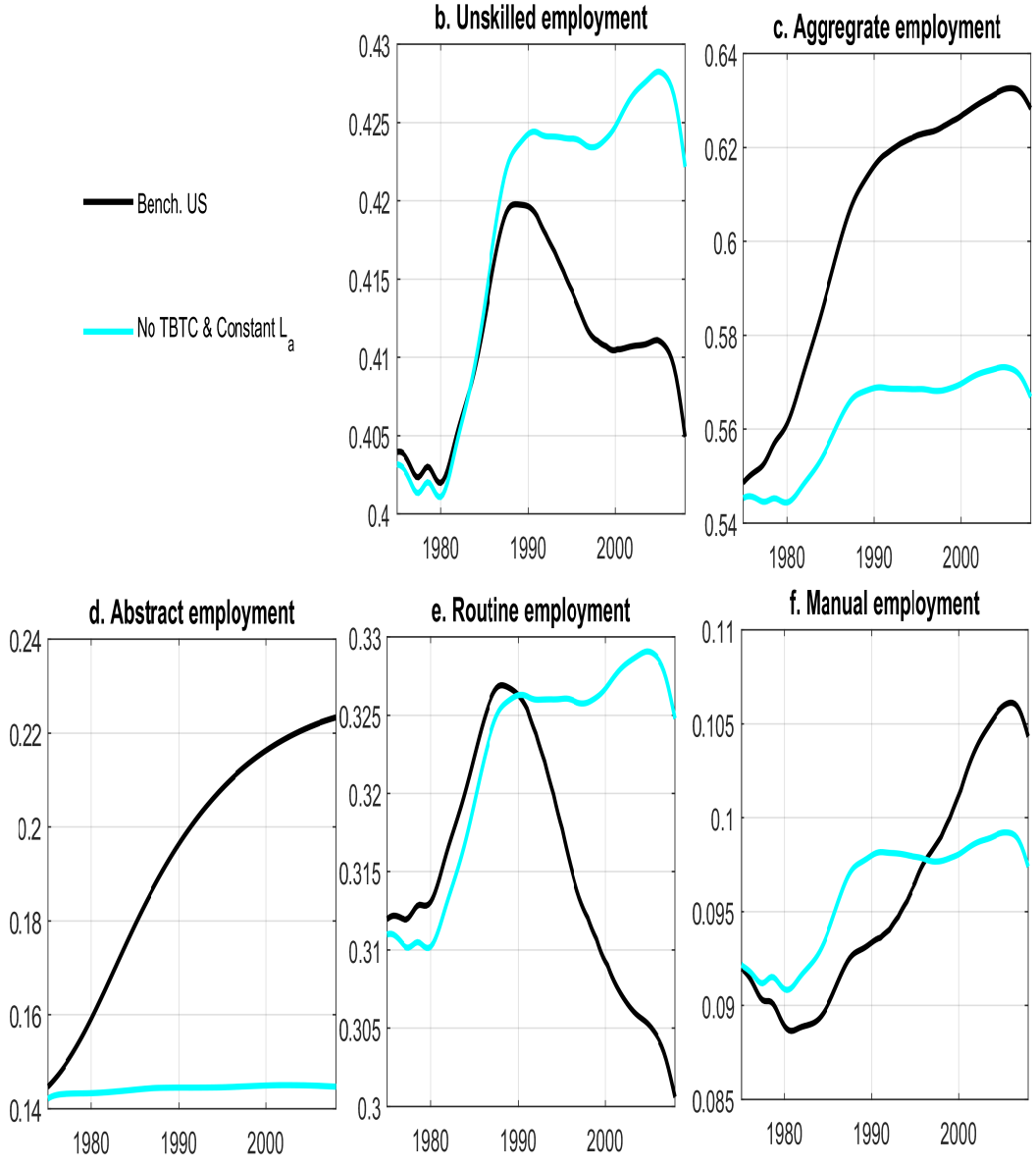
Shutting down 2 trends : US



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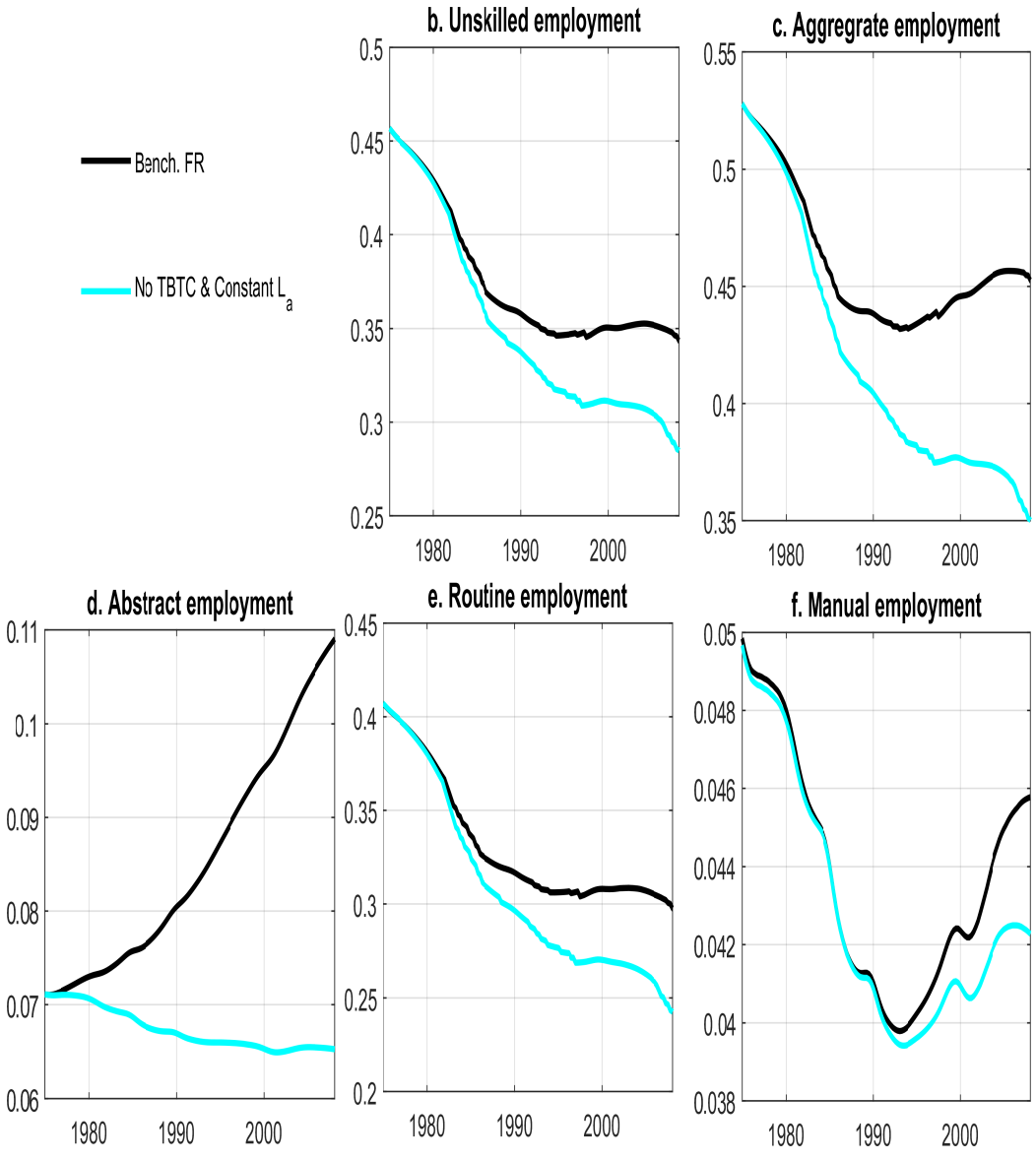
Shutting down 2 trends : France



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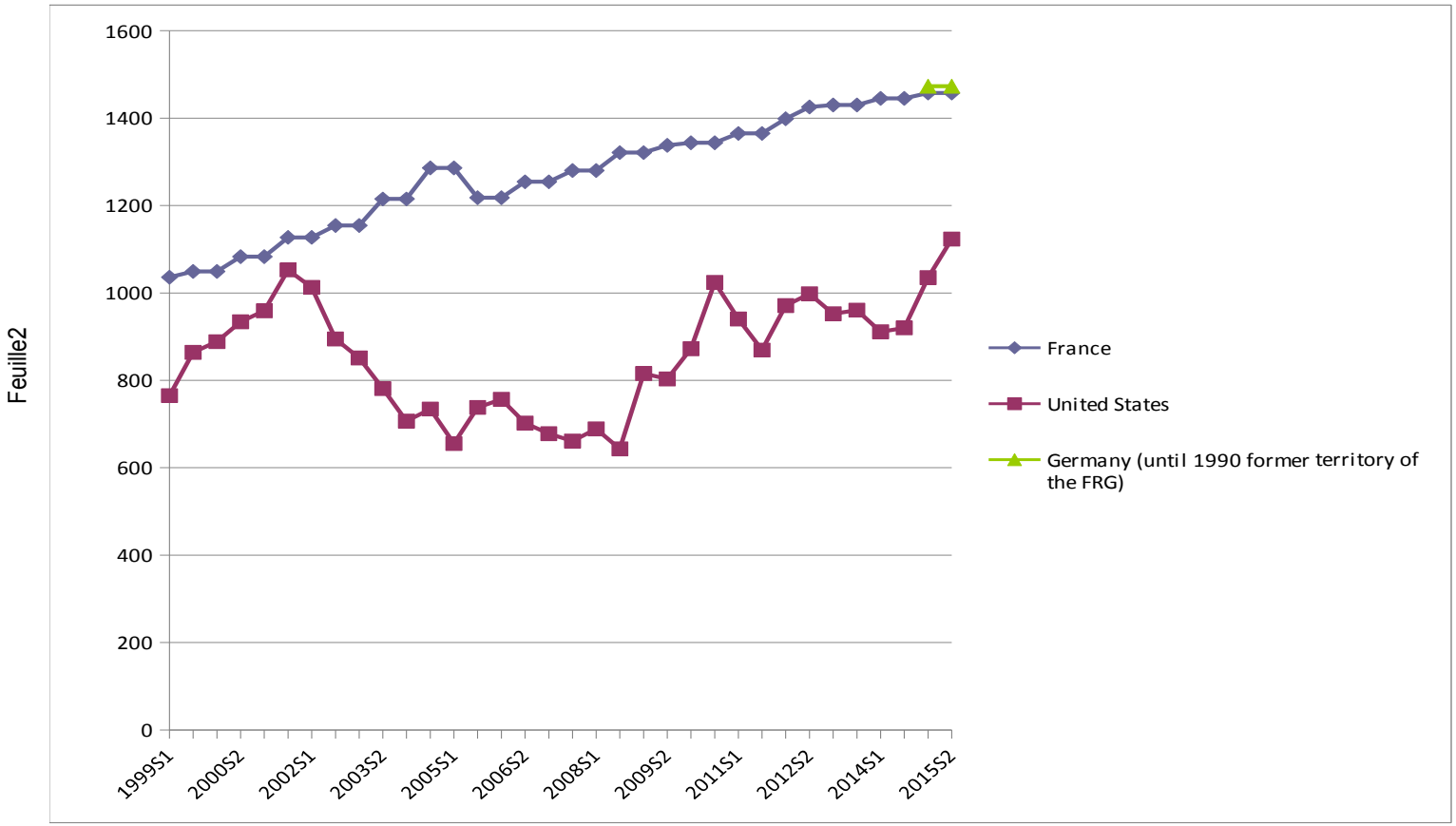
Minimum wage (monthly, in euros)



Eurostat

Declining price of capital

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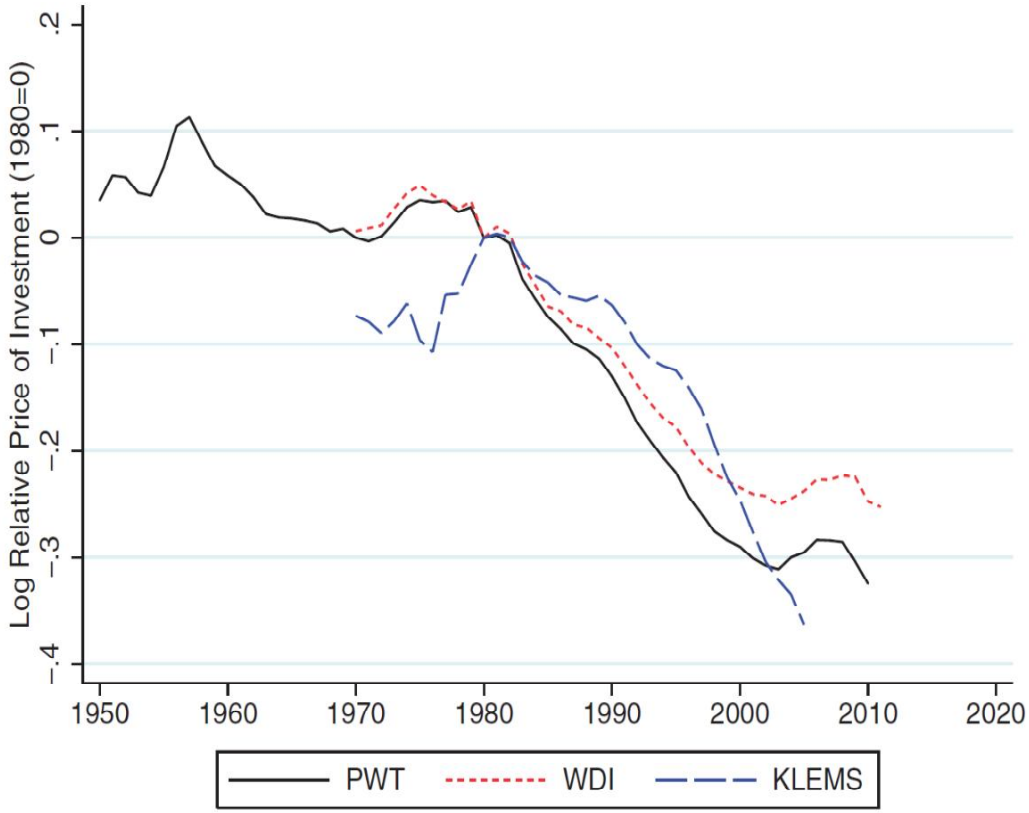

FIGURE VII

Declining Global Price of Investment Goods

Source: Source : Karabarbounis Neiman (QJE 2014).

Declining price of capital

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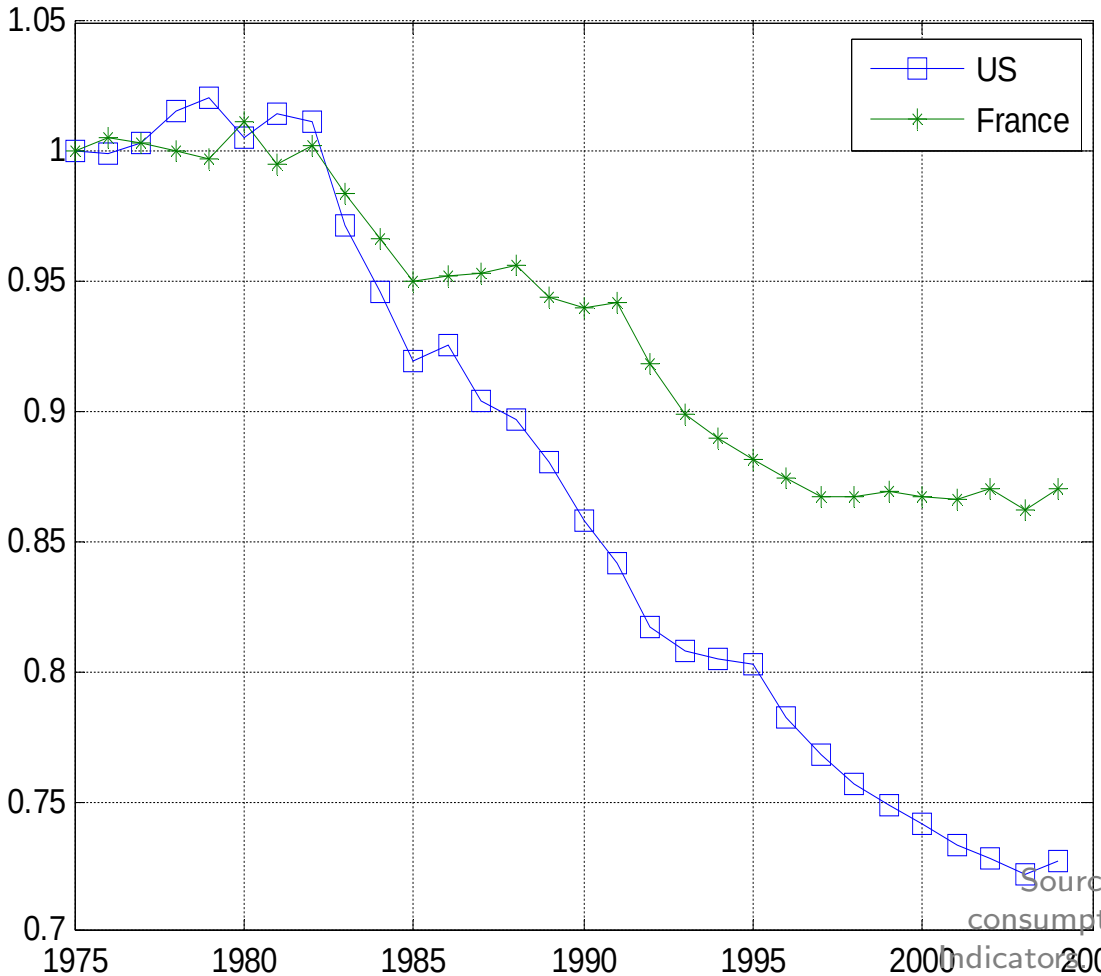

Source: Investment Price (relative to consumption price). World Development Indicators. The relative price is normalized to one in 1980.Source : Data from Karabarbounis Neiman (QJE 2014).

Increase in educational attainment

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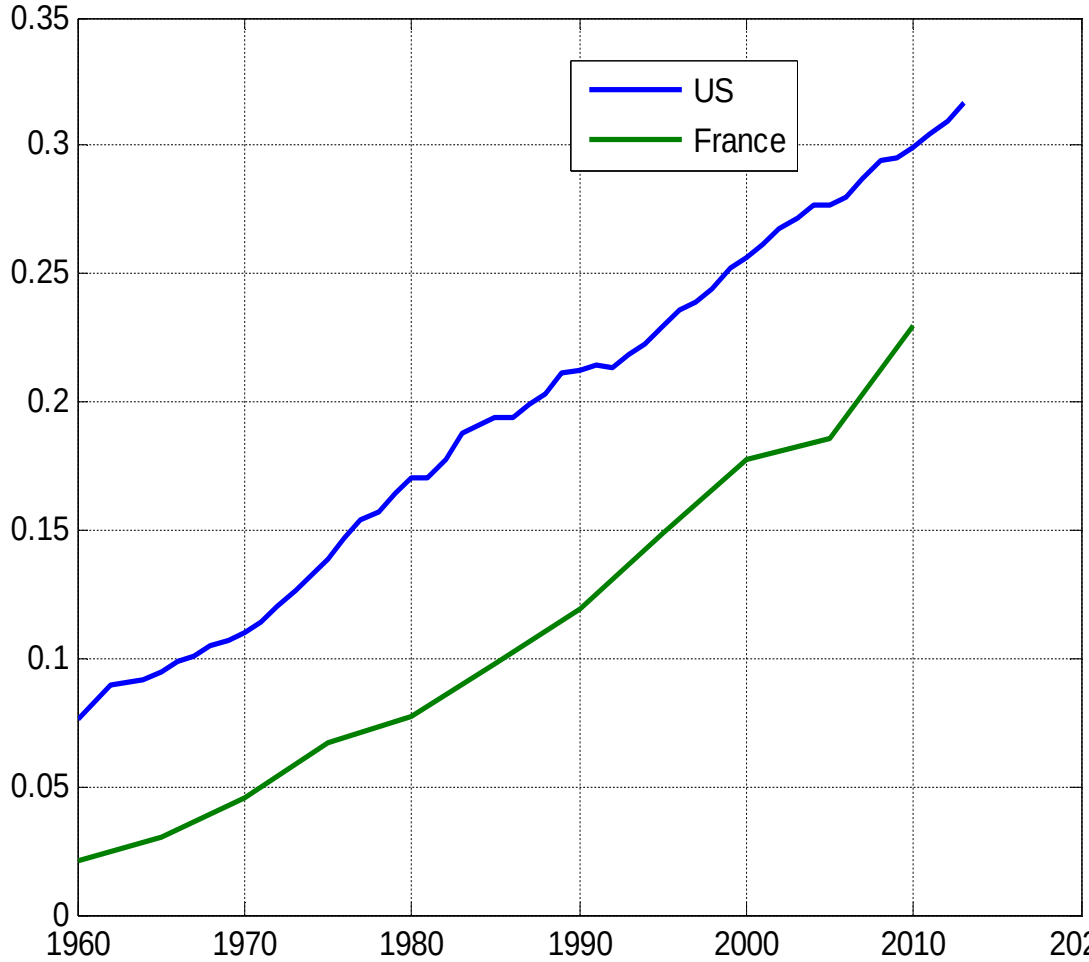
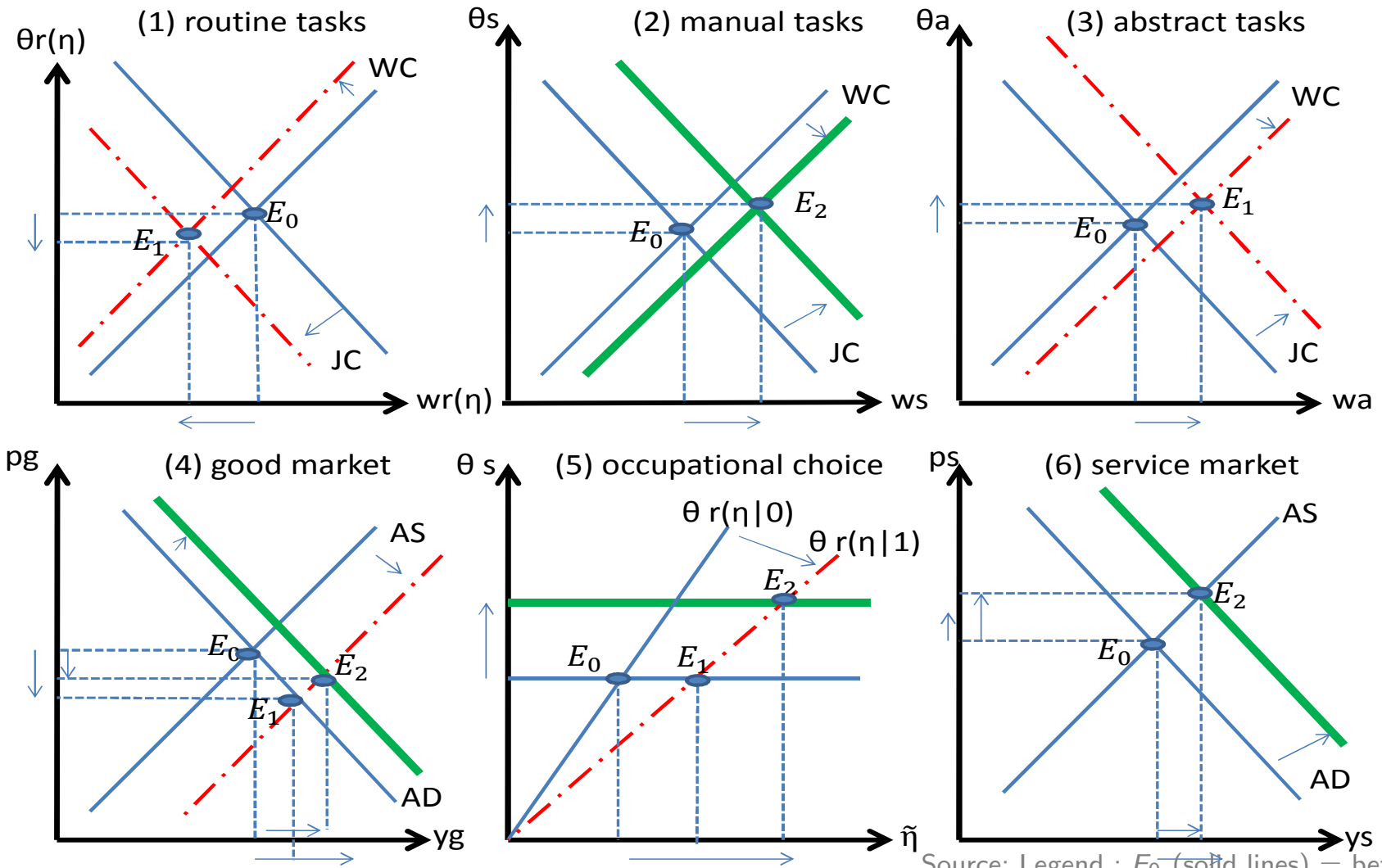
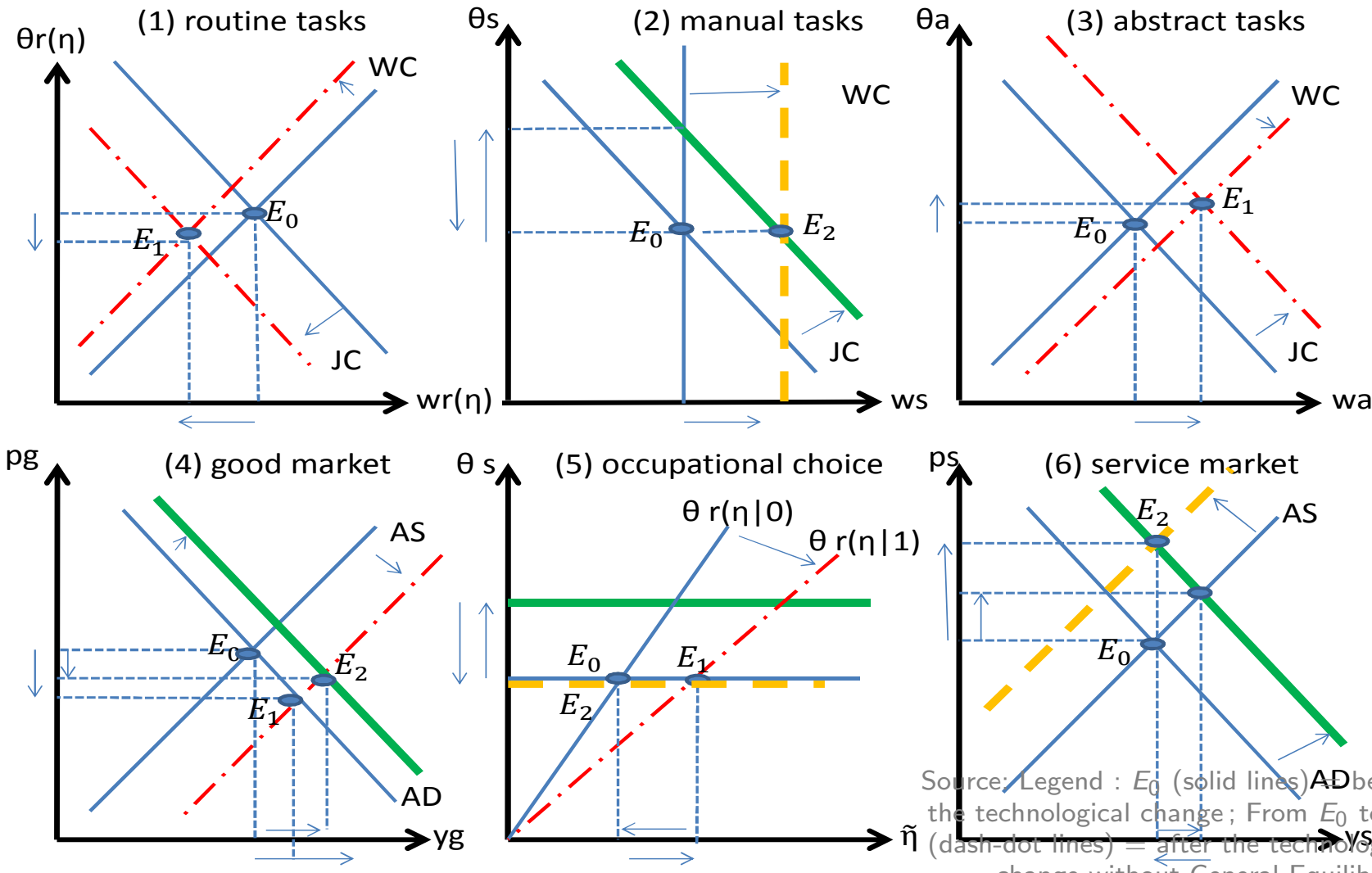


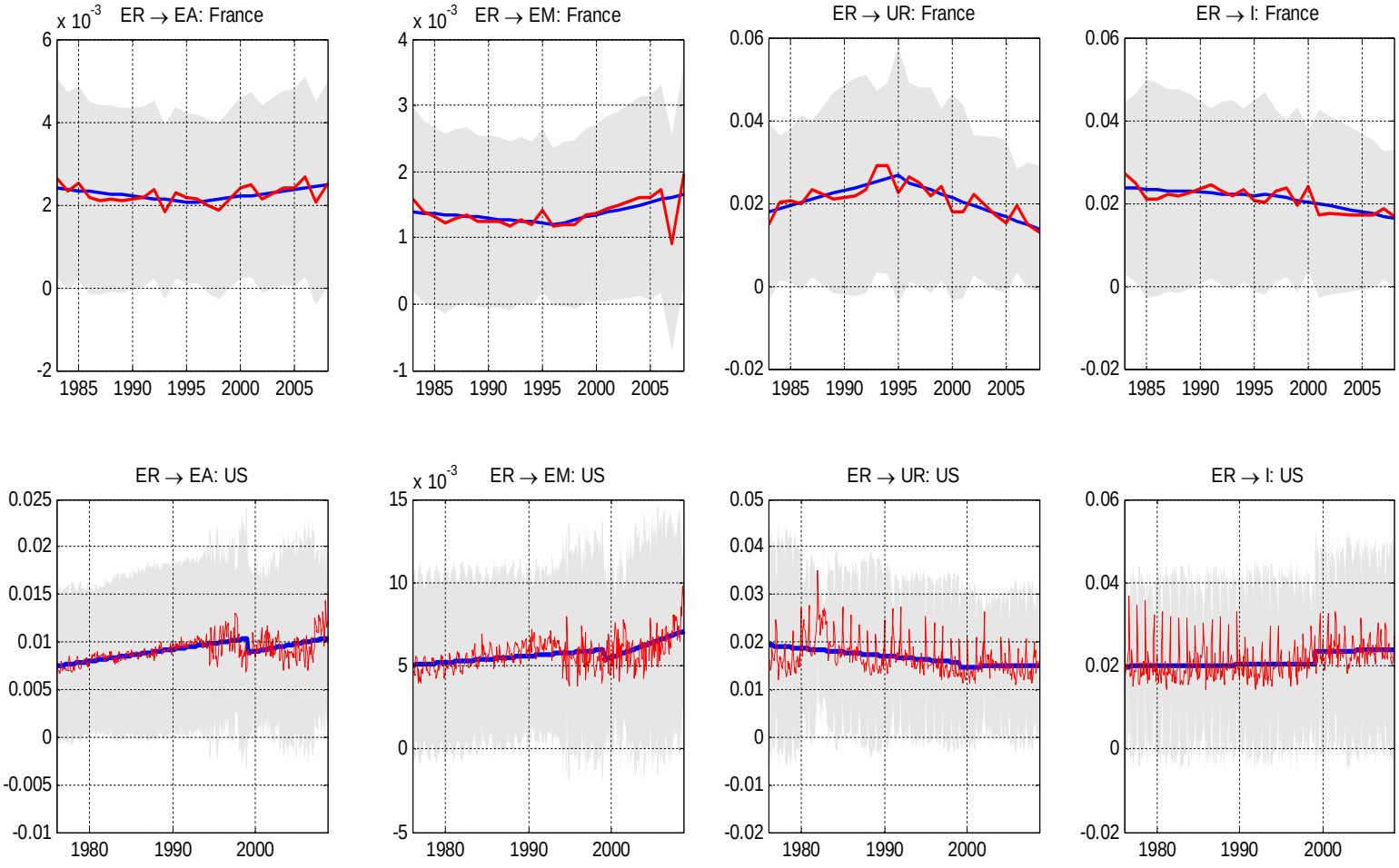
Source: French census. Diplôme universitaire 1er, 2ème ou 3ème cycle, BTS-DUT. US Census (Years of School Completed) College 4 years and more

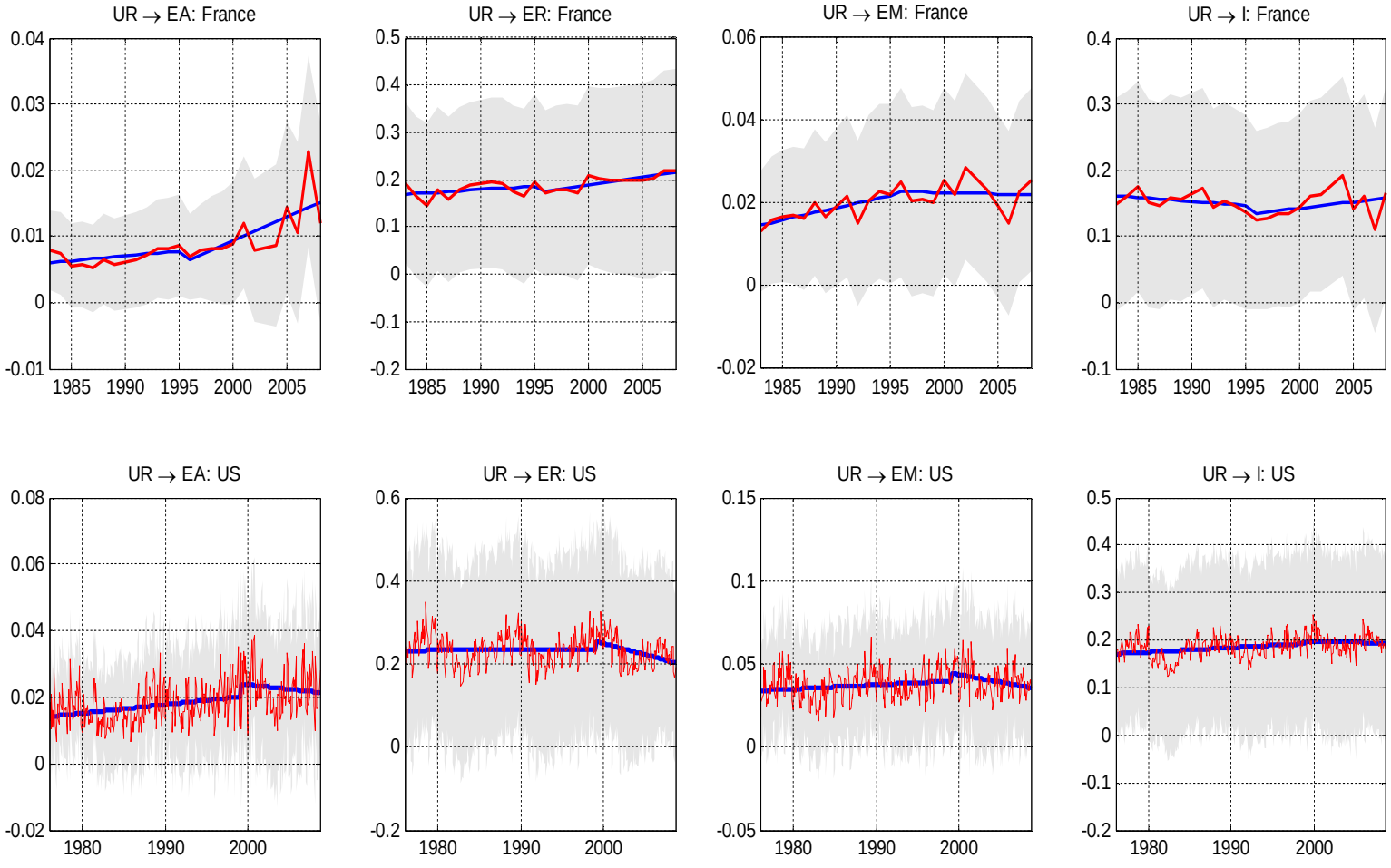


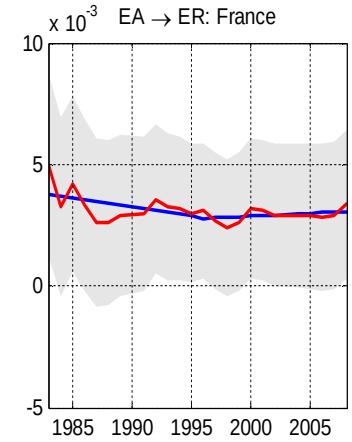
Source: Legend : E_0 (solid lines) = before the technological change ; From E_0 to E_1 (dash-dot lines) = after the technological change without General Equilibrium feedback (no increase in p_s) ; E_2 (bold lines) = after the technological change with General Equilibrium feedback (after increase in p_s).

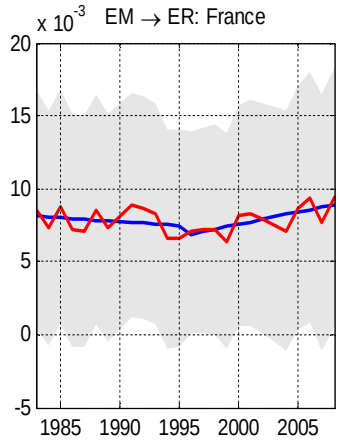


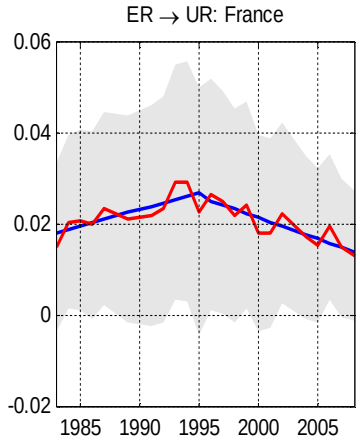
Source: Legend : E_0 (solid lines) = before the technological change ; From E_0 to E_1 (dash-dot lines) = after the technological change without General Equilibrium feedback (no increase in p_s) ; E_2 (bold lines) = after the technological change with General Equilibrium feedback (after increase in p_s) ; bold-dashed lines = rise in minimum wage

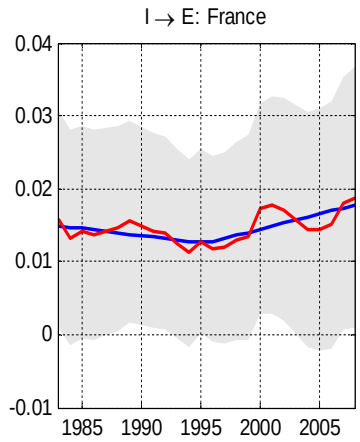

x 10^-3 ER → EA: France
x 10^-3 ER → EM: France
ER → UR: France
ER → I: France
ER → EA: US
x 10^-3 ER → EM: US
ER → UR: US
ER → I: US

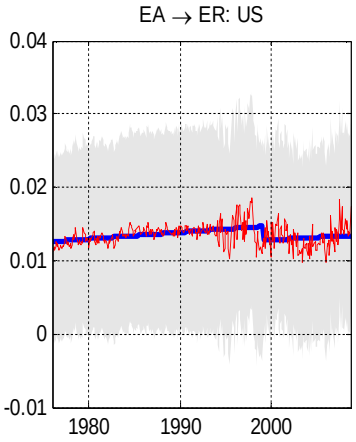

UR → EA: France
UR → ER: France
UR → EM: France
UR → I: France
UR → EA: US
UR → ER: US
UR → EM: US
UR → I: US

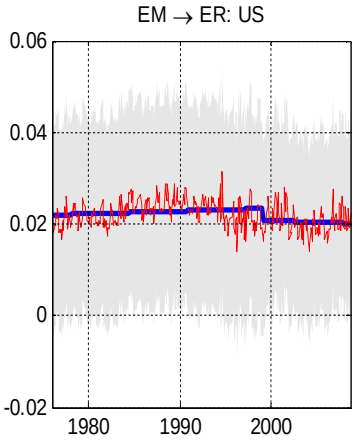

x 10^-3
EA → ER: France
10
5
0
-5
1985
1990
1995
2000
2005

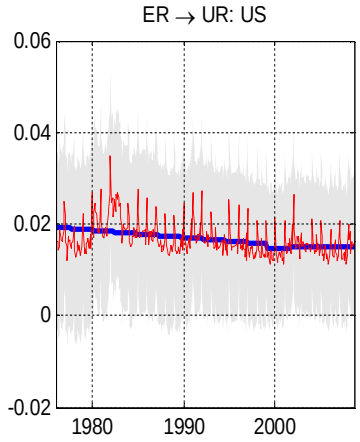

x 10^-3
EM → ER: France
20
15
10
5
0
-5
1985
1990
1995
2000
2005

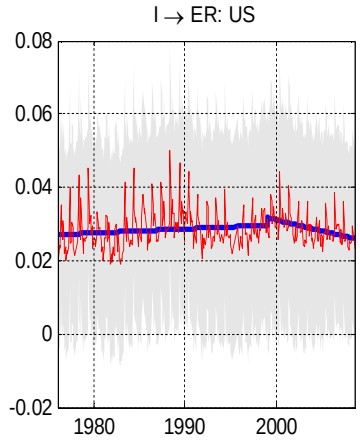

ER → UR: France
0.06
0.04
0.02
0
-0.02
1985
1990
1995
2000
2005

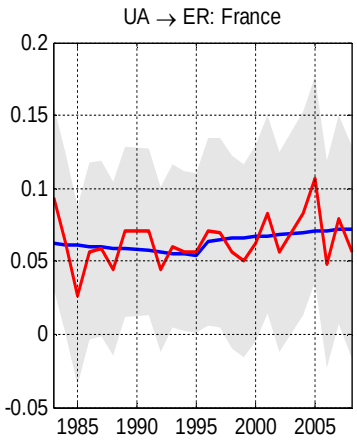

I → E: France
0.04
0.03
0.02
0.01
0
-0.01
1985
1990
1995
2000
2005

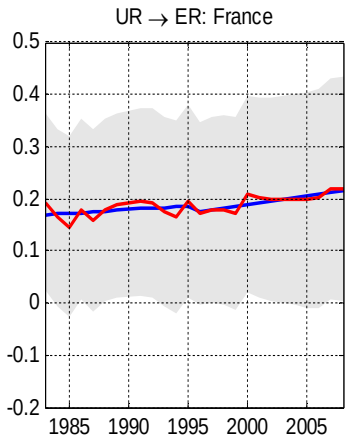

EA → ER: US
0.04
0.03
0.02
0.01
0
-0.01
1980
1990
2000

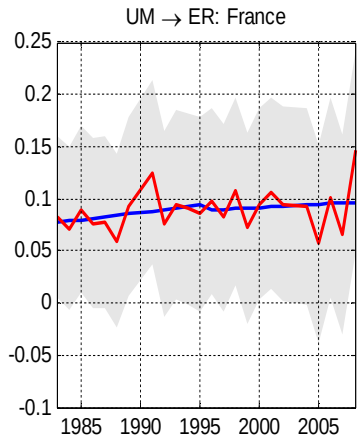

EM → ER: US
0.06
0.04
0.02
0
-0.02
1980
1990
2000

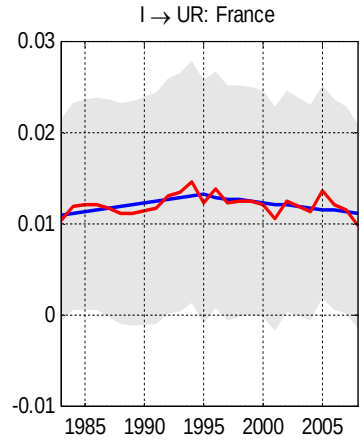

ER → UR: US
0.06
0.04
0.02
0
-0.02
1980
1990
2000

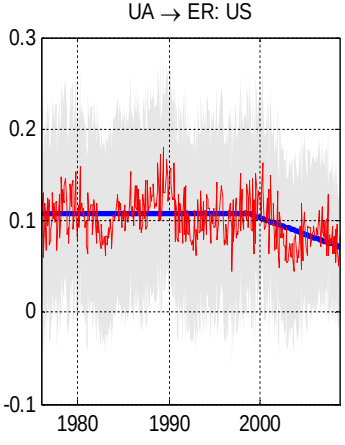

I → ER: US
0.08
0.06
0.04
0.02
0
-0.02
1980
1990
2000

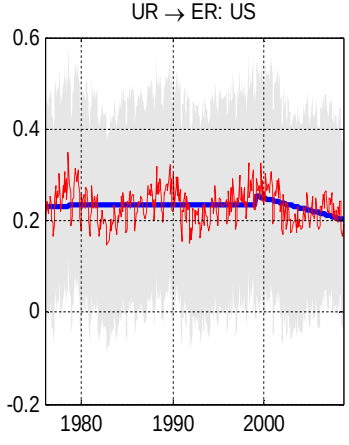

UA → ER: France
0.2
0.15
0.1
0.05
0
-0.05
1985
1990
1995
2000
2005

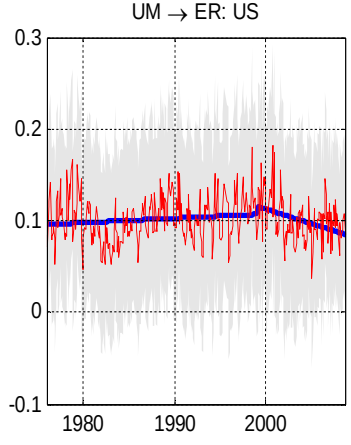

UR → ER: France
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
1985
1990
1995
2000
2005

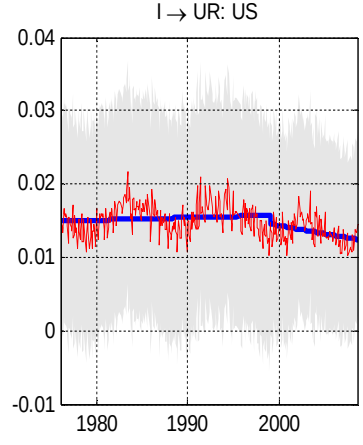

UM → ER: France
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
1985
1990
1995
2000
2005


I → UR: France
0.03
0.02
0.01
0
-0.01
1985
1990
1995
2000
2005


UA → ER: US
0.3
0.2
0.1
0
-0.1
1980
1990
2000


UR → ER: US
0.6
0.4
0.2
0
-0.2
1980
1990
2000


UM → ER: US
0.3
0.2
0.1
0
-0.1
1980
1990
2000


I → UR: US
0.04
0.03
0.02
0.01
0
-0.01
1980
1990
2000

Worker flows

The story behind the disappearance of routine jobs

Documenting worker flows in France and in the US

- Survey data : US CPS (monthly, Jan 1976-July 2016) and French LFS (annual, 1983-2014)
- use current or most recent occupation to categorize individuals into task groups : Abstract, Routine, Manual
- Compute each period transition rates between 7 states : Employed (Abstract, Routine, Manual), Unemployed (Abstract, Routine, Manual), Not in Labor Force
- Trends (HP-filter), sample stops before the 2008 crisis

$ER \rightarrow EA, ER \rightarrow EM$, $ER \rightarrow UR$, $ER \rightarrow I$ ▸ Figure

$UR \rightarrow EA, UR \rightarrow ER$, $UR \rightarrow EM$, $UR \rightarrow I$ ▸ Figure

$EA \rightarrow ER, EM \rightarrow ER$, $ER \rightarrow UR$, $I \rightarrow ER$ ▸ Figure

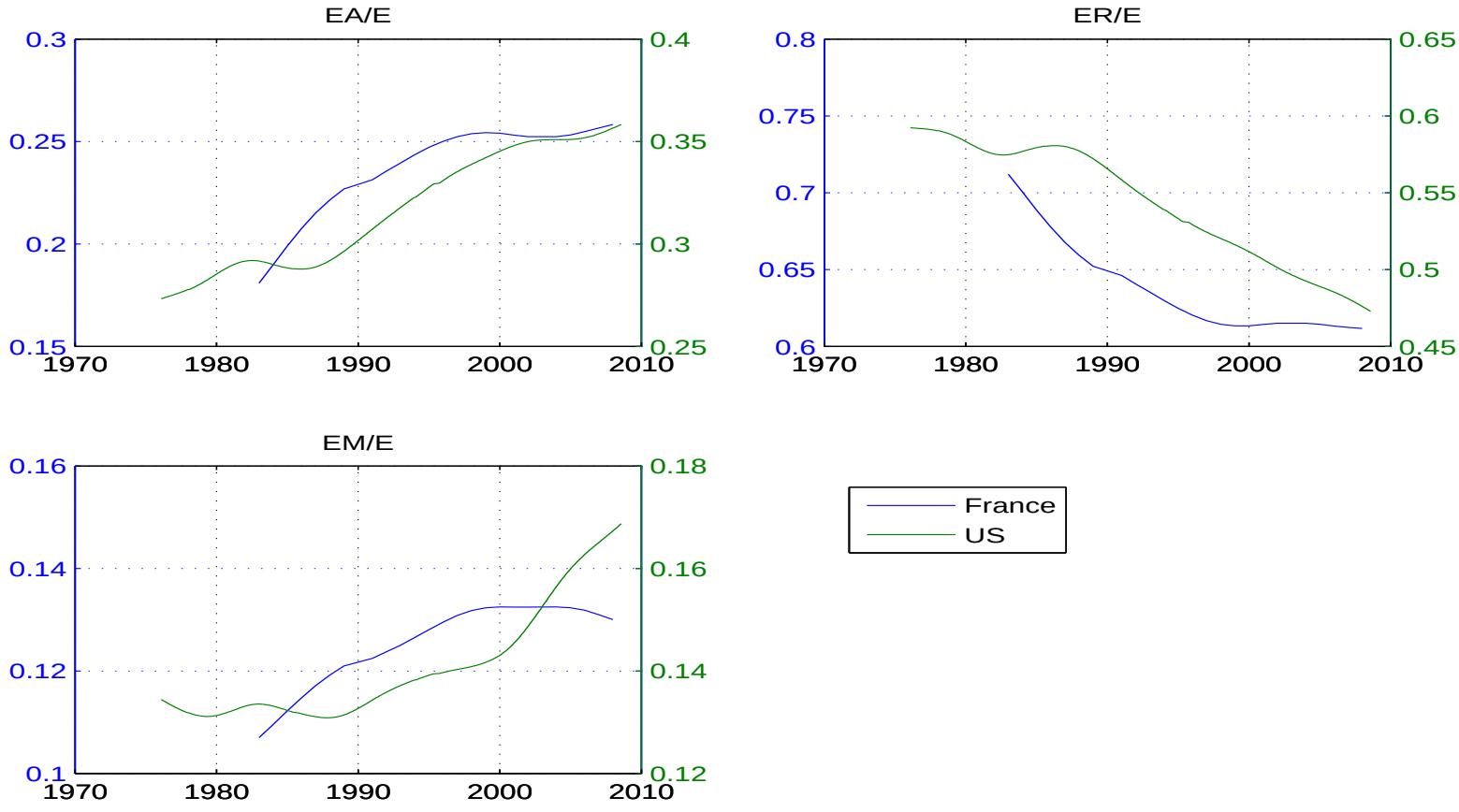
$UA \rightarrow ER, UR \rightarrow ER$, $UM \rightarrow ER$, $I \rightarrow UR$ ▸ Figure

TABLE – Transition matrix(t) : 7×7 matrix of transition rates

	EA(t+1)	ER(t+1)	EM(t+1)	UA(t+1)	UR(t+1)	UM(t+1)	I(t+1)
EA(t)							
ER(t)							
EM(t)							
UA(t)							
UR(t)							
UM(t)							
I(t)							

stocks(t+1)=matrix(t) × stocks(t).
stocks are a vector of size (7,1) each period

The employment shares : a measure of polarization



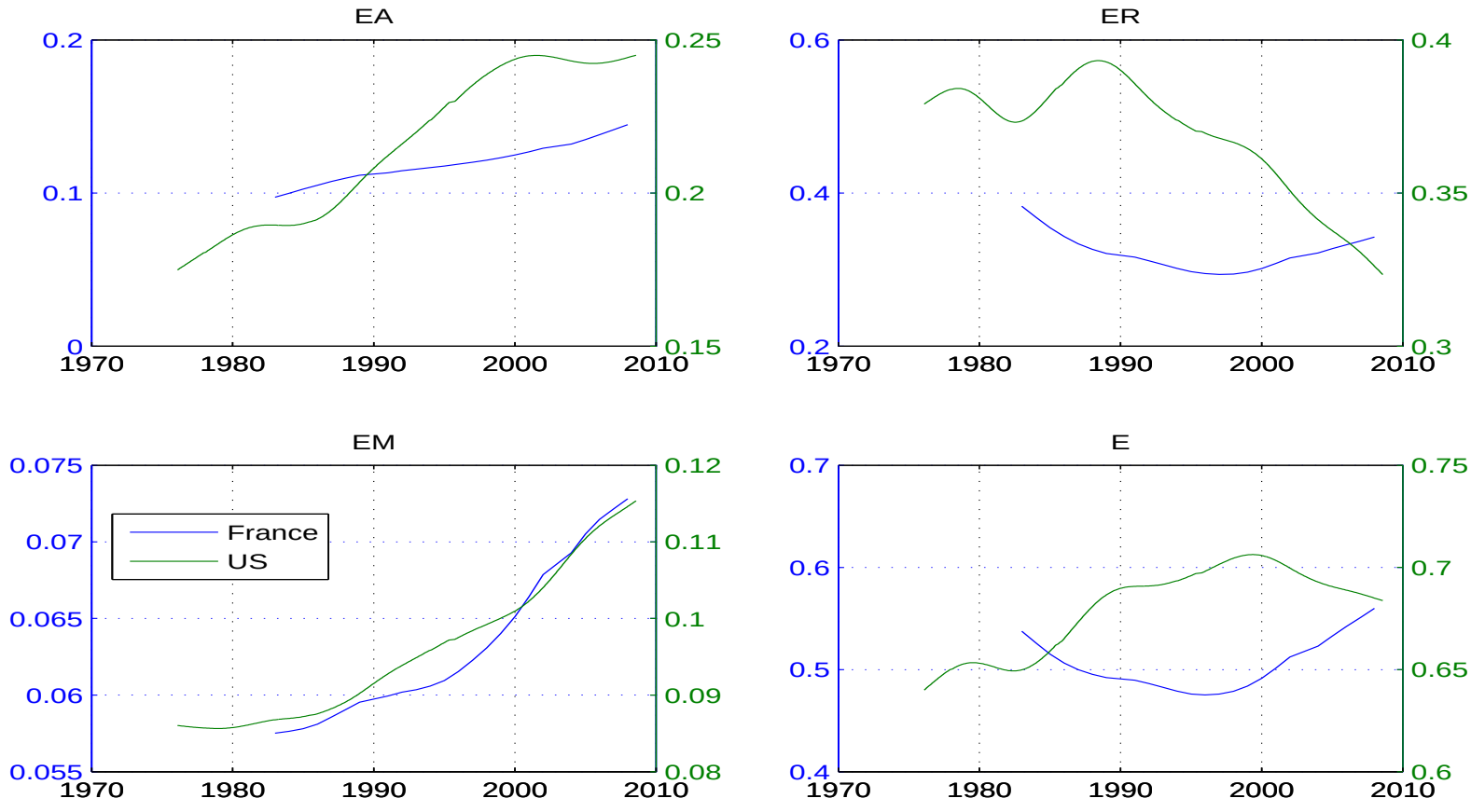
- Shares of abstract and services jobs increased in both countries.
- Routine jobs : a great similarity between France and the United States $\Leftrightarrow$ a decrease of about 10 points.

The employment shares : a measure of polarization

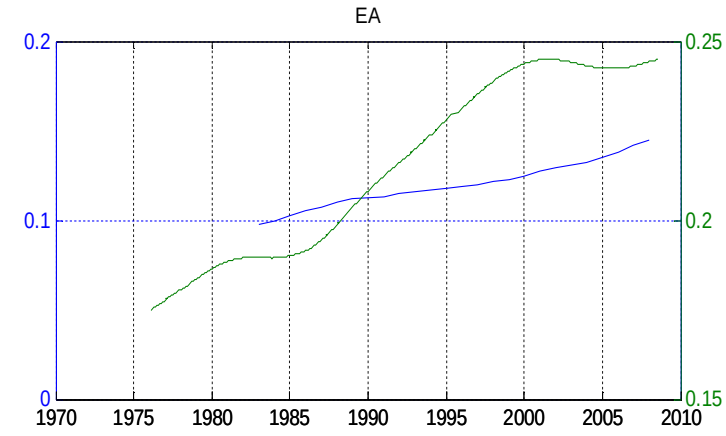
Common decline in the share of routine jobs in total employment but for different reasons

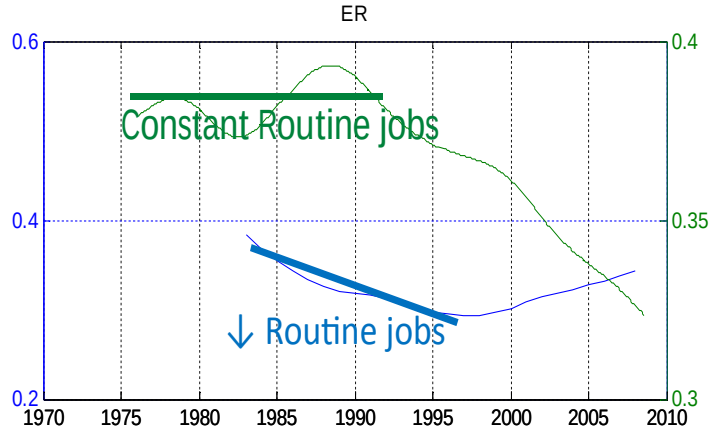
Employment levels :

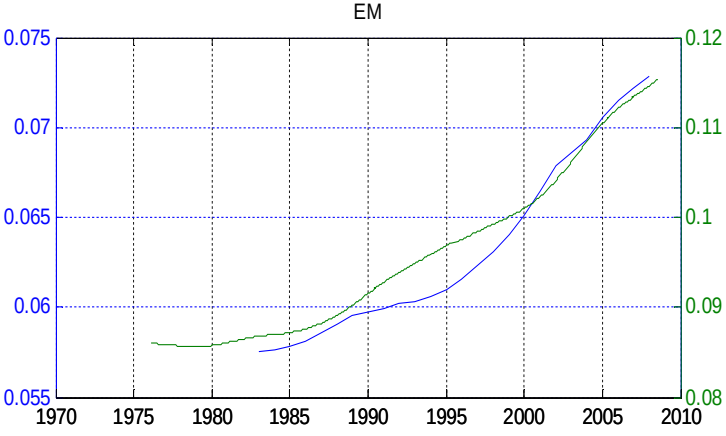
Routine per-capita employment is different across countries.

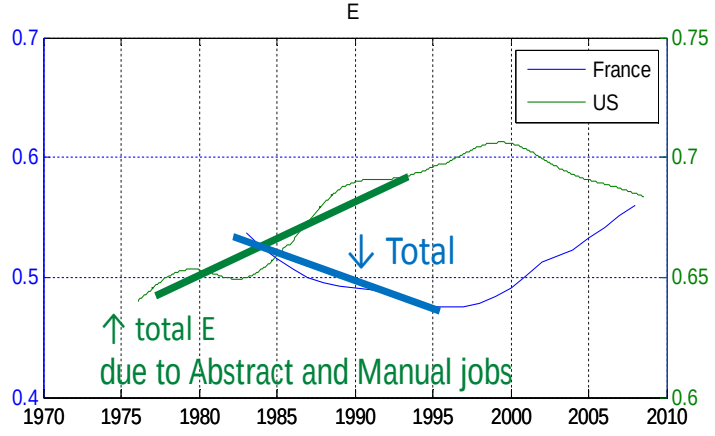


Employment levels :

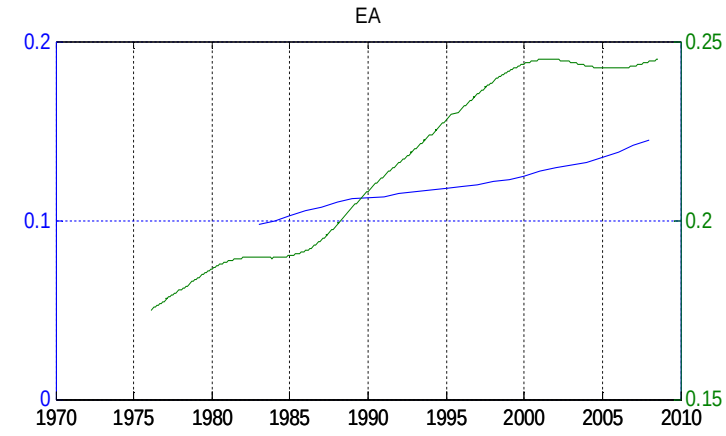


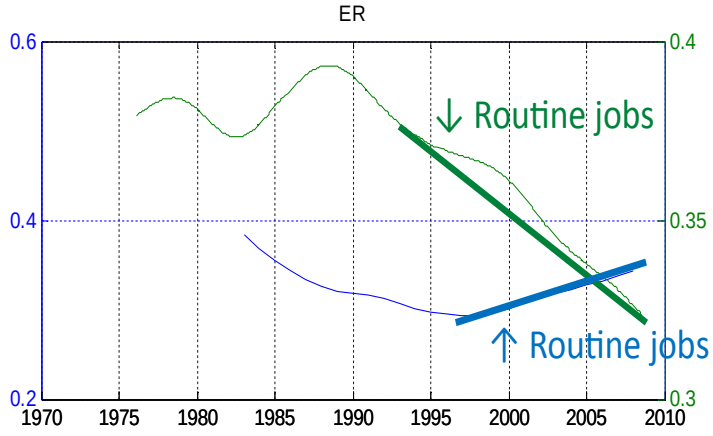


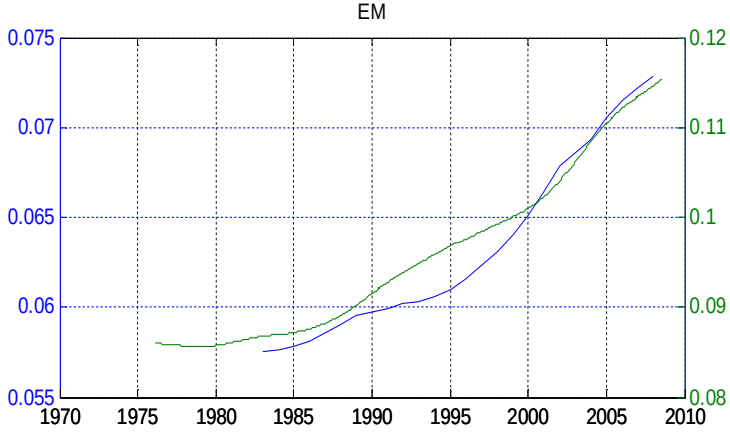


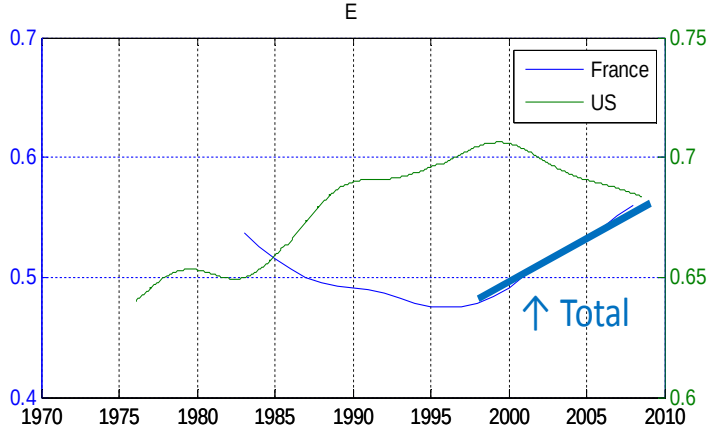


Employment levels :









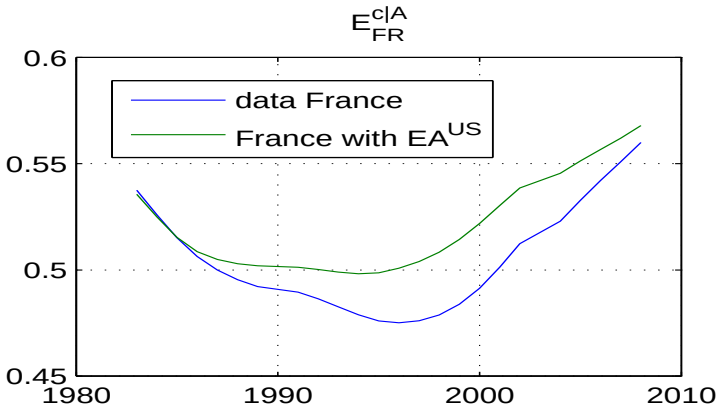
The employment shares : a measure of polarization

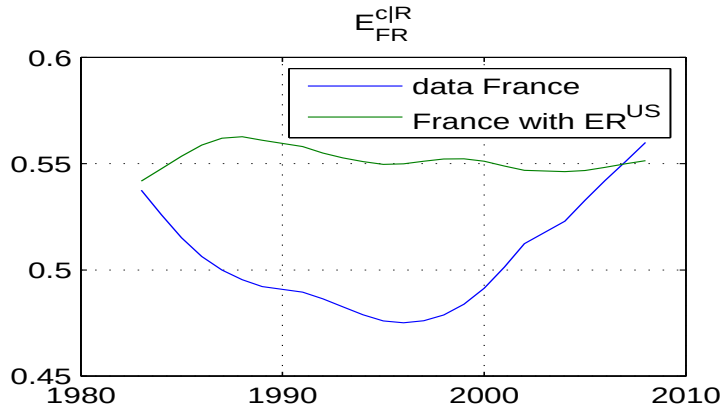
Common decline in the share of routine jobs in total employment but for different reasons

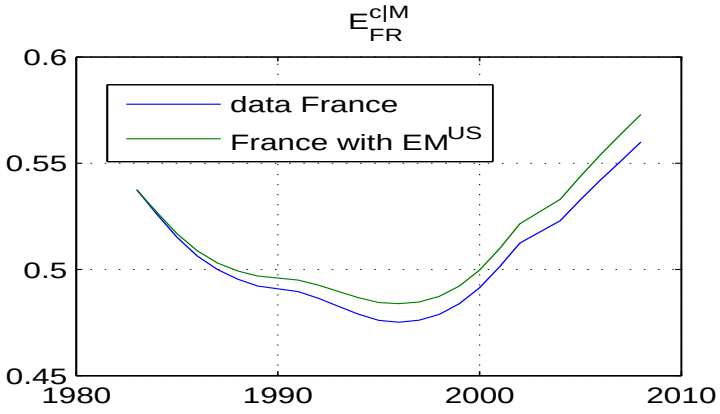
Any analysis based on employment *shares* alone provides a partial picture of job polarization

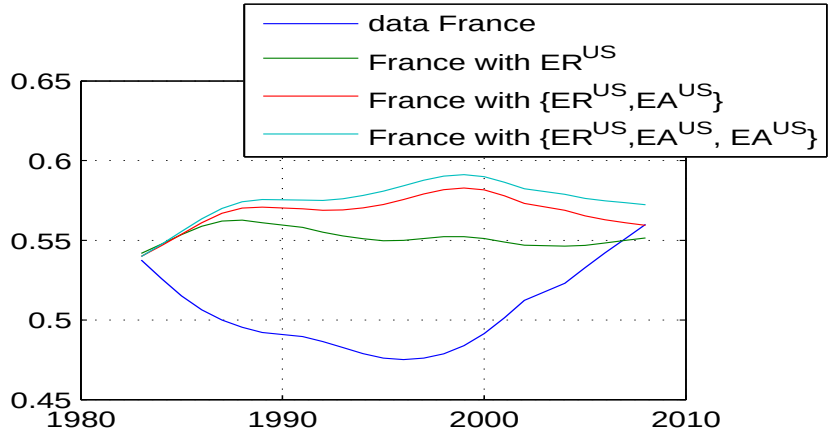
Dynamics of Routine Employment

The decline in routine jobs in France is the main driver of the employment gap with respect to the US









Counterfactuals

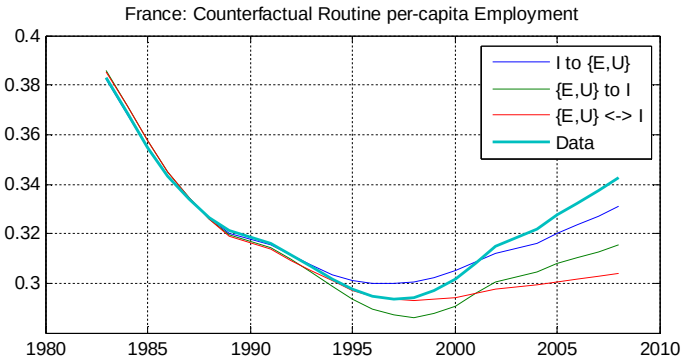
- Which changes in transition rates are key in accounting for the evolution of per capita routine employment ?
- Looking at the evolution of transition rates is not enough as transition rates interact with stocks
- Counterfactual experiments
  - fix some transition rates at their level at the beginning of the sample $\Rightarrow$ get counterfactual transition rates
  - Using the initial stocks, iterate forward using the counterfactual transition rates : stocks(t+1)=matrix(t)$\times$stock(t)
  - predict the counterfactual routine per-capita employment
  - compute the gap between the observed and counterfactual evolutions of routine employment
  - how much of the fall in routine employment would have been prevented if particular transition rates had remained at the levels observed prior to the onset of job polarization ?
  - as in Cortes, Jaimovich, Nekarda and Siu (2015)

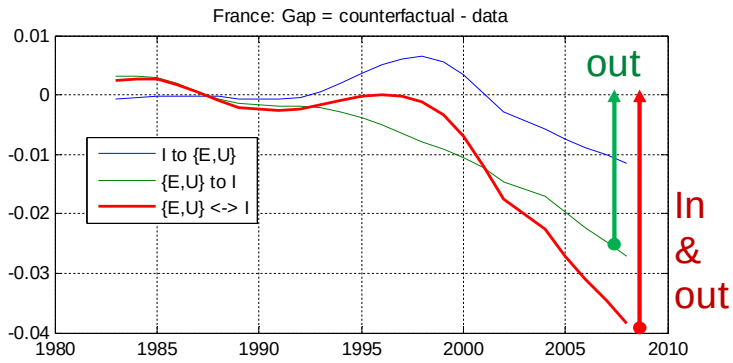
Counterfactuals

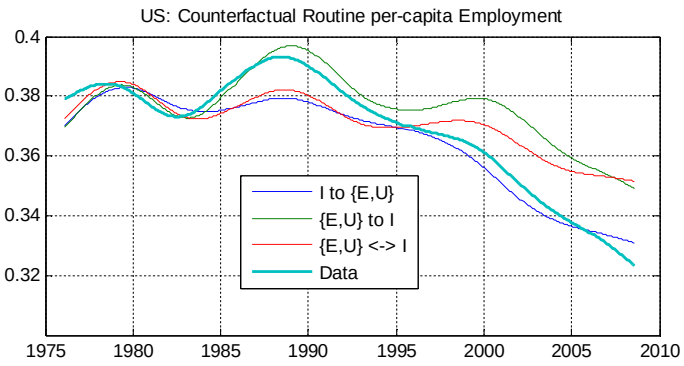
Ins and Outs of routine employment

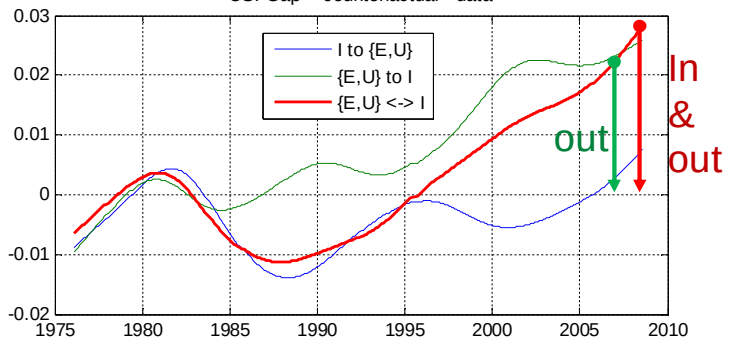
- Inactivity : Labor market participation
- Employment : Job-to-job, occupational mobility
- Unemployment : Job finding, job separation

INs-OUTs of Routine jobs from Inactivity



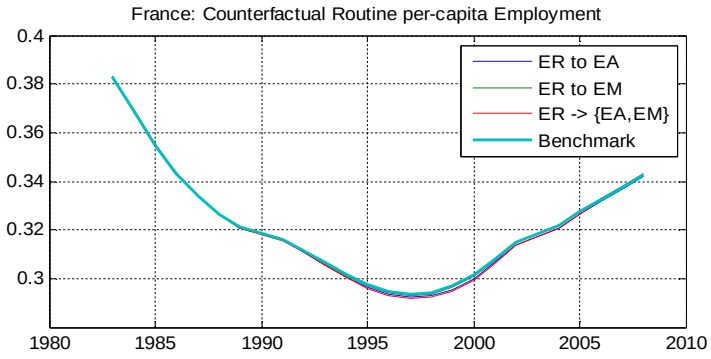


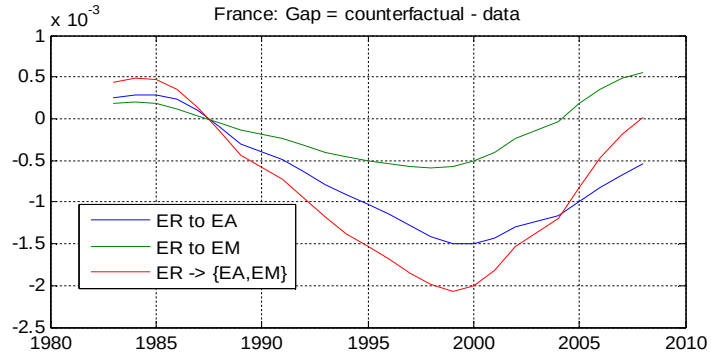


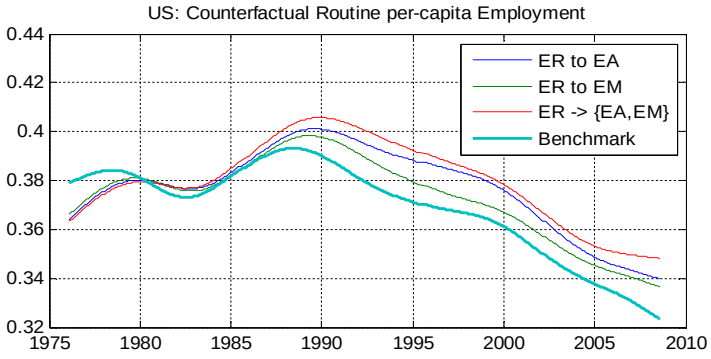


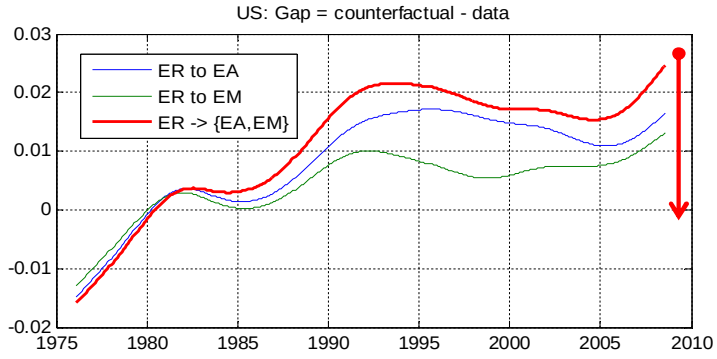
- France : +4pp of ER generated by a decline in the outflows to inactivity (pension reforms ?)
- US : after 1995, -2.5pp in ER due to an increase in the outflows to inactivity, consistent with Cortes et al (2015)

Occupational mobility



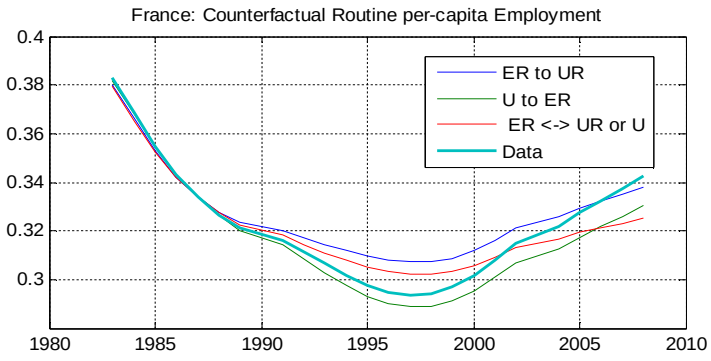


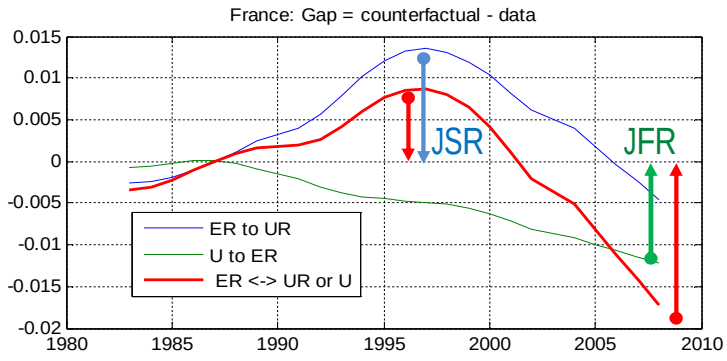


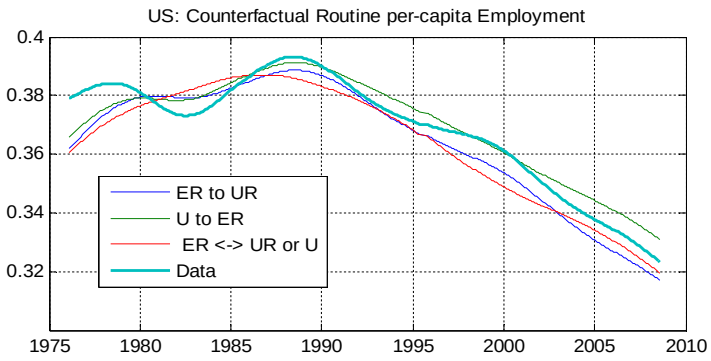


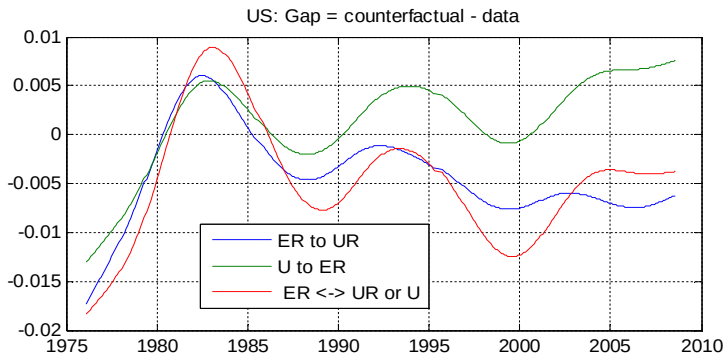
- France : $\nexists$ changes in mobility across occupations
- US : -2pp in ER due to a rise in occupational mobility, whether downward or upward

INs-OUTs of Routine jobs from Unemployment









- in France, in the mid-1990s, - 1 pp of *ER* due to high *JSR*. After the mid-1990s, the increase in *ER* is driven by higher JFR.
- The In-Out flows from U does not explain *ER* in the US.

Summary

	France	US
Routine N	Nr down then up after 1995	Nr flat then down after early 1990s
Inactivity	less outflows to inactivity especially after mid-1990s	more outflows to inactivity
Job-to-Job		more outflows to others jobs
Unemployment	high JSR before mid-1990s high JFR after mid-1990s	

Consistent with the view that, in France,

- Lower payroll taxes for low-paid jobs since the late 1990s
- $\rightarrow$ rebound in routine employment = Protection of routine jobs
- Hence, workers are not enticed to look for a job elsewhere (low job-to-job)

Research Agenda

Model with additional features

- Endogenous participation
- Job-2-Job
- Institutional differences :
  - France : payroll tax subsidy on low-wage workers and pension reforms increase retirement age $\Rightarrow$ life-cycle features in the model
  - US : identifying cross-country difference in cost of job-2-job mobility

Occupational choices, LMIs and General Equilibrium effects

In Autor and Dorn (2013) : No labor market frictions, Mobility choice based on wage comparison :

- wage routine $w_r = w_s$ wage service
- ability threshold $\tilde{\eta}$ such that $\eta > \tilde{\eta} =$ routine

$$\left.\begin{array}{rcl} \text{Mobility} : \tilde{\eta} y_r & = & A_s p_s \\ \text{Demand} : p_s & = & MRS(C_g, C_s) \end{array}\right\} \Rightarrow \quad \tilde{\eta} = \phi_w(\sigma, \alpha, \rho)$$

- Good production function : σ, α (technological parameters), $\downarrow p_k \Rightarrow \downarrow$ cost of routine tasks and $\uparrow$ capital $\Rightarrow \uparrow$ supply of goods $\Rightarrow \uparrow$ demand for goods
- ρ (consumer preference, must favor variety) : so that demand for service $\uparrow$

General equilibrium effect through p_s : $\uparrow p_s$ is a signal that routine workers shall switch to manual jobs

Occupational choices, LMIs and GE effects

Our paper : **"search unemployment"**

$$\left.\begin{array}{ll} \text{Mobility :} & U(\theta_r(\tilde{\eta}), LMI) = U(\theta_m, LMI) \\ \text{Demand :} & \left\{\begin{array}{rcl} \theta_r(\eta) & = & \varphi_r(\eta y_r, LMI) \\ \theta_m & = & \varphi_m(A_s p_s, LMI) \end{array}\right. \end{array}\right\} \Rightarrow \quad \tilde{\eta} = \phi_{SaM}(\{\sigma, \alpha, \rho\}, LMI)$$

$$\text{where : } LMI = \{\underbrace{rr, h}_{w^r}, \underbrace{\gamma, c}_{w_{Nash}}, \underbrace{MW}_{\substack{\text{wage} \\ \text{rigidity}}}, taxes\}$$

General equilibrium effect through p_s

LMI on both sides of equations but does not go away because of capitalization effect (as long as divergent evolution of productivity across sectors) ▸ Example

"Rest unemployment" : $\theta_m = 0$. Reallocations are stalled.

▸ Solution method in a non-stationary, non-linear general-equilibrium model with heterogenous agents

▸ Example : France

Welfare analysis : Winners and losers of the US and French polarization

B. Obama, The Economist, October 2016.
"What is happening in the American political system ?
How has a country that has benefited - perhaps more than any other - from [...] technological innovation suddenly developed a strain of [...] anti-innovation protectionism ?
Why have some [...] embraced a crude populism ?"

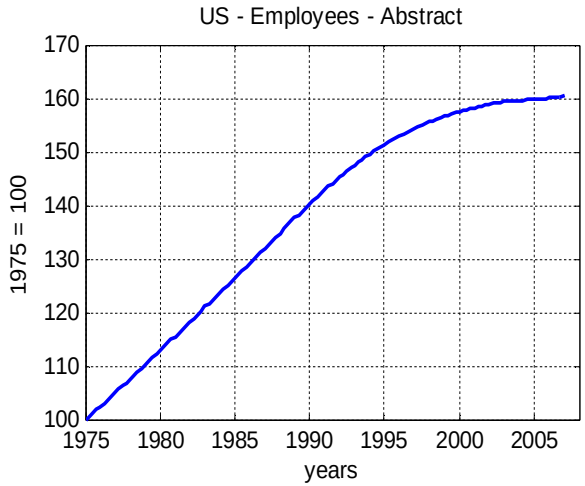
Measuring welfare

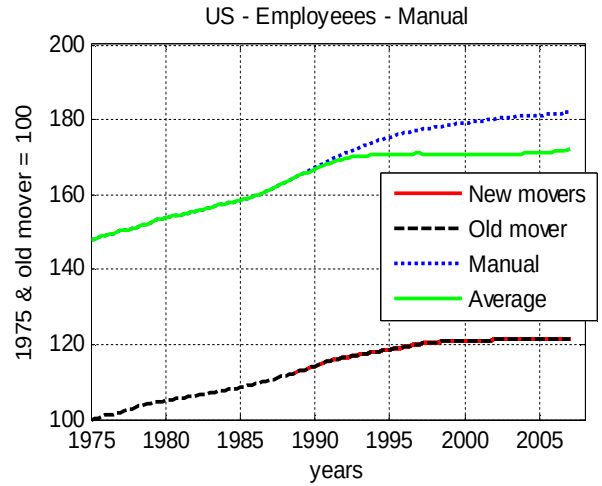
- Value functions W, U that include
  - income flow
  - future employment opportunities
- Average measures based of number of workers in each category (employment status, task, ability η)
- divided by consumer price index (which increases due to rise in relative price of services)

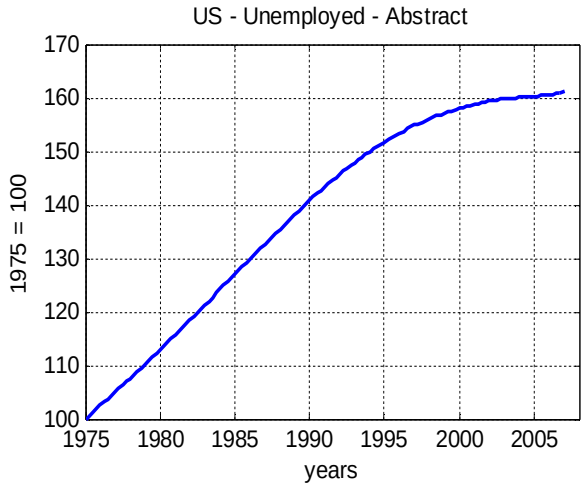
TABLE – Winners and losers of the US and French polarization

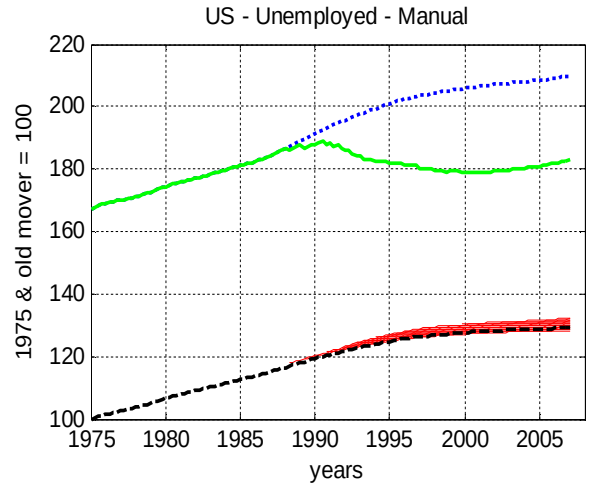
	US	France
Common features :	Average welfare ↑ Manual and abstract workers are the winners of JP	
Difference : The fate of routine workers linked to LMI changes	The US sacrificed "stayers" and favored "movers" to ↑ employment	France favored "stayers" to the detriment of "movers"

Abstract and manual workers are the winners of JP



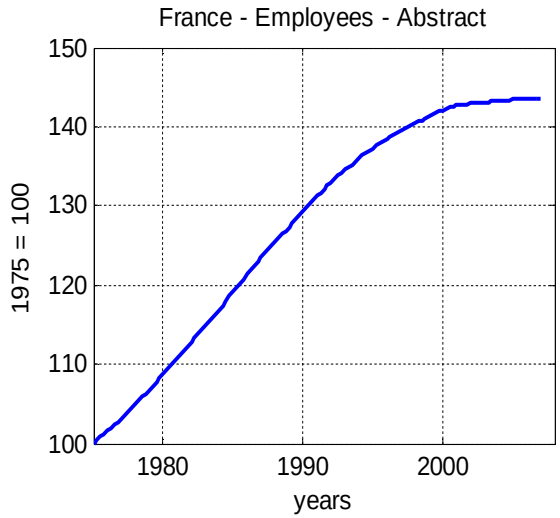


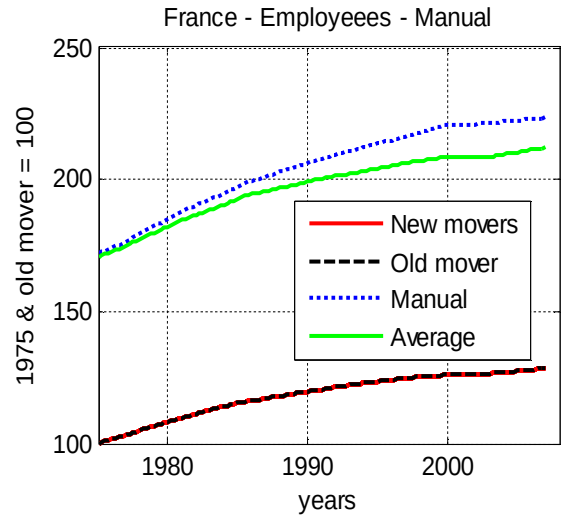


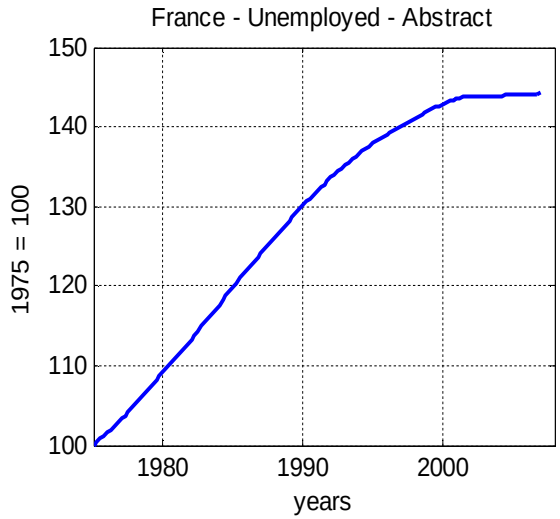


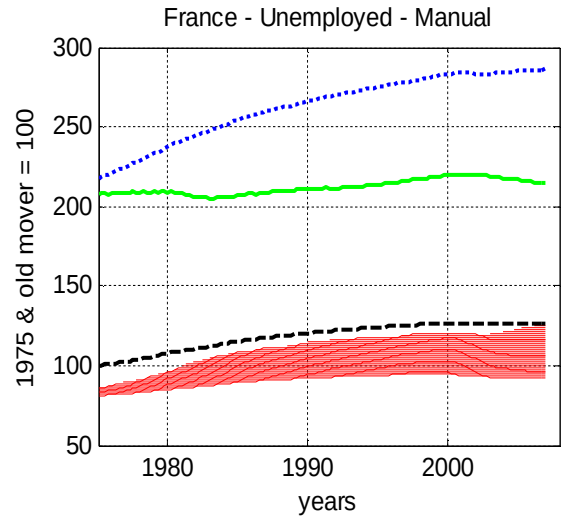
Index base 100 = 1975

Abstract and manual workers are the winners of JP

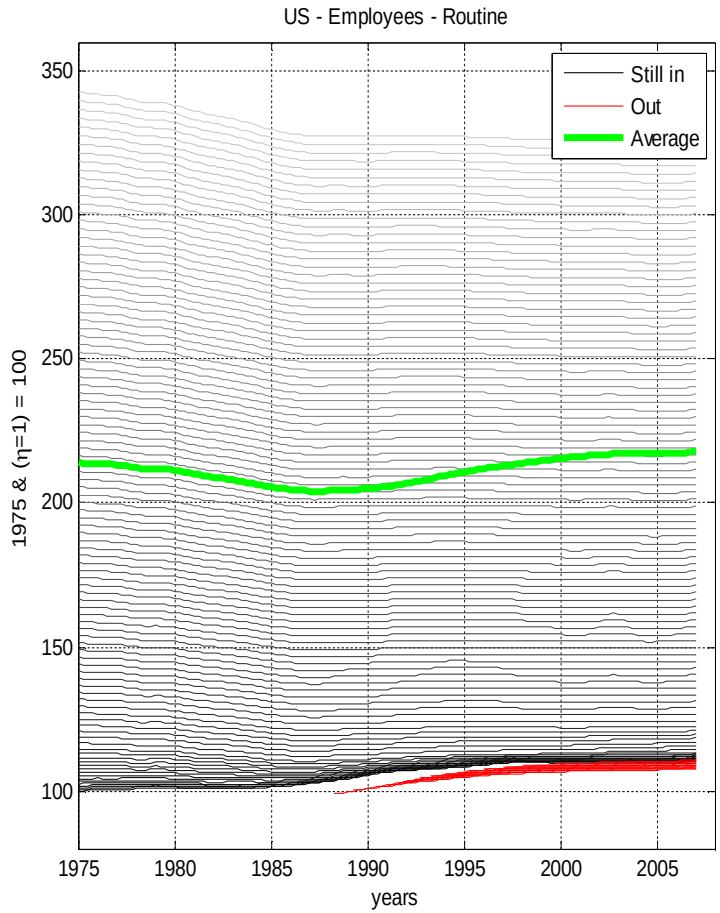


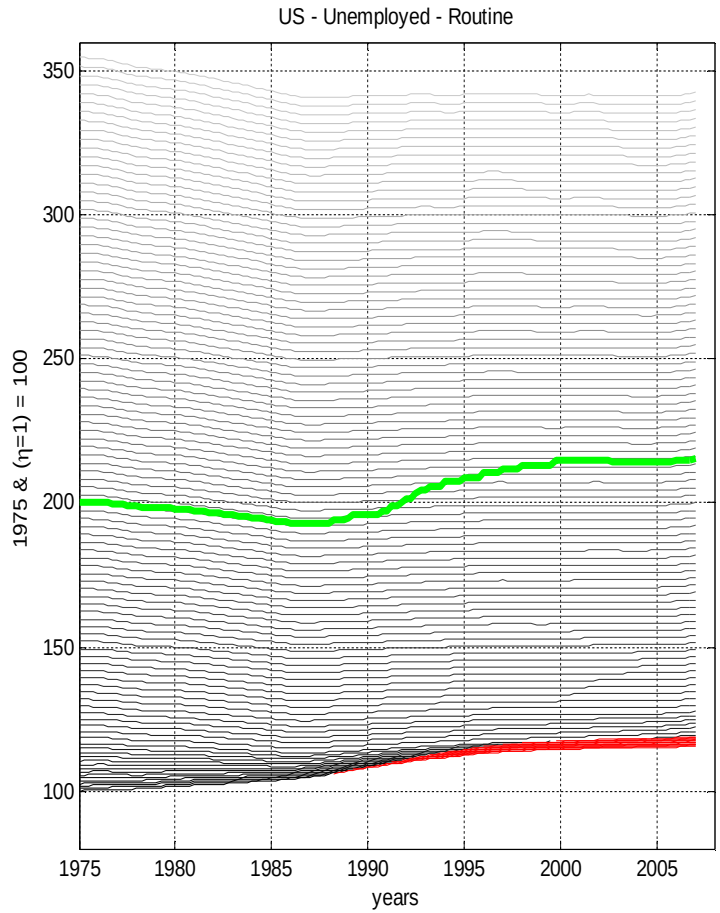






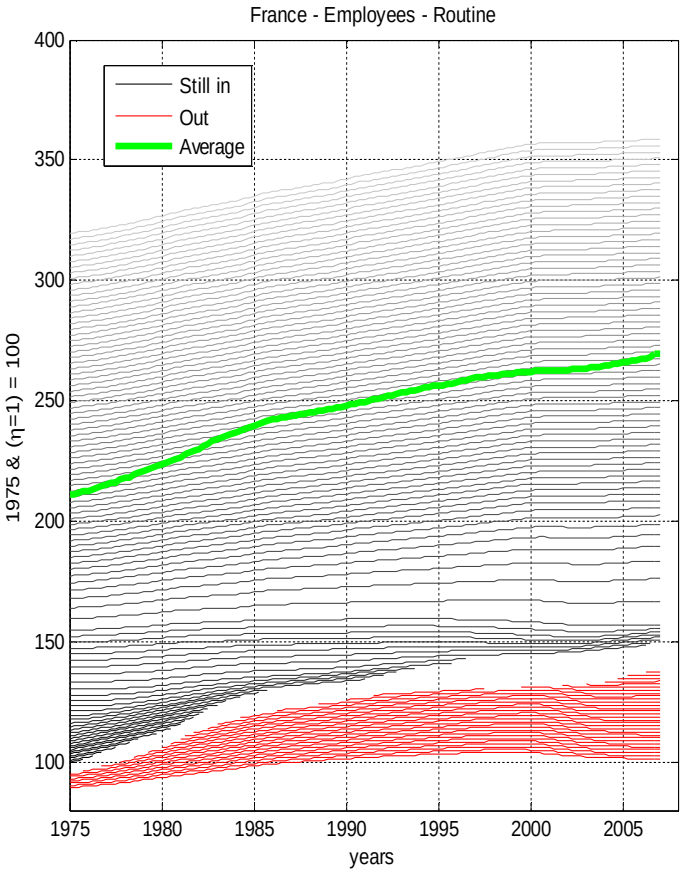
Index base 100 = 1975

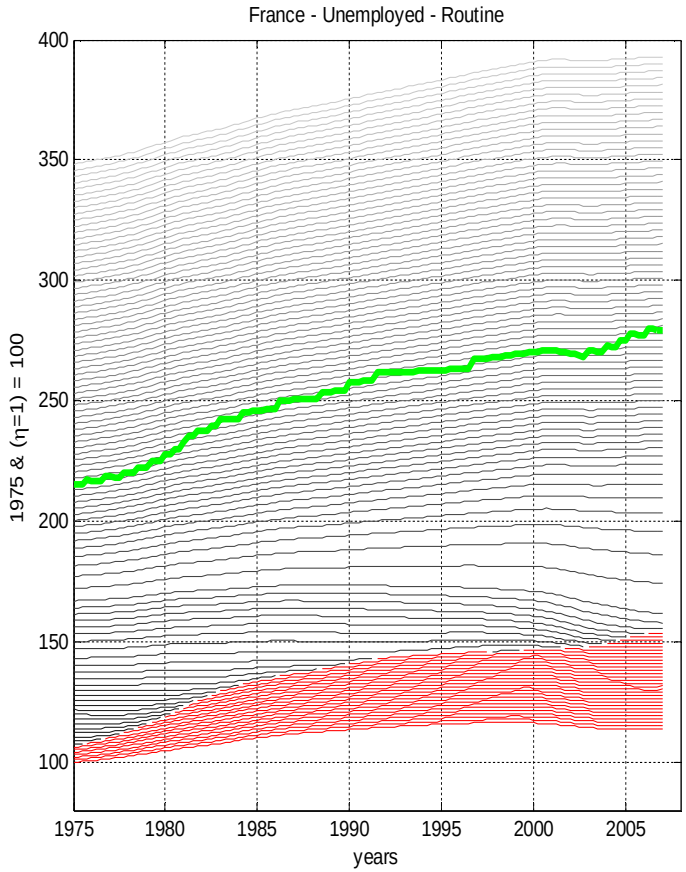




Index base 100 $=$ 1975 for $\widetilde{\eta}$, and Index base 100 $*$ Welfare(η)/Welfare($\widetilde{\eta}$) $=$ 1975 for $\eta > \widetilde{\eta}$. "Still in" : in routine pool, the highest welfare line is the routine worker with the highest productivity η, "Out" : displaced routine worker (with the lowest productivity η) who switch to manual job.

France





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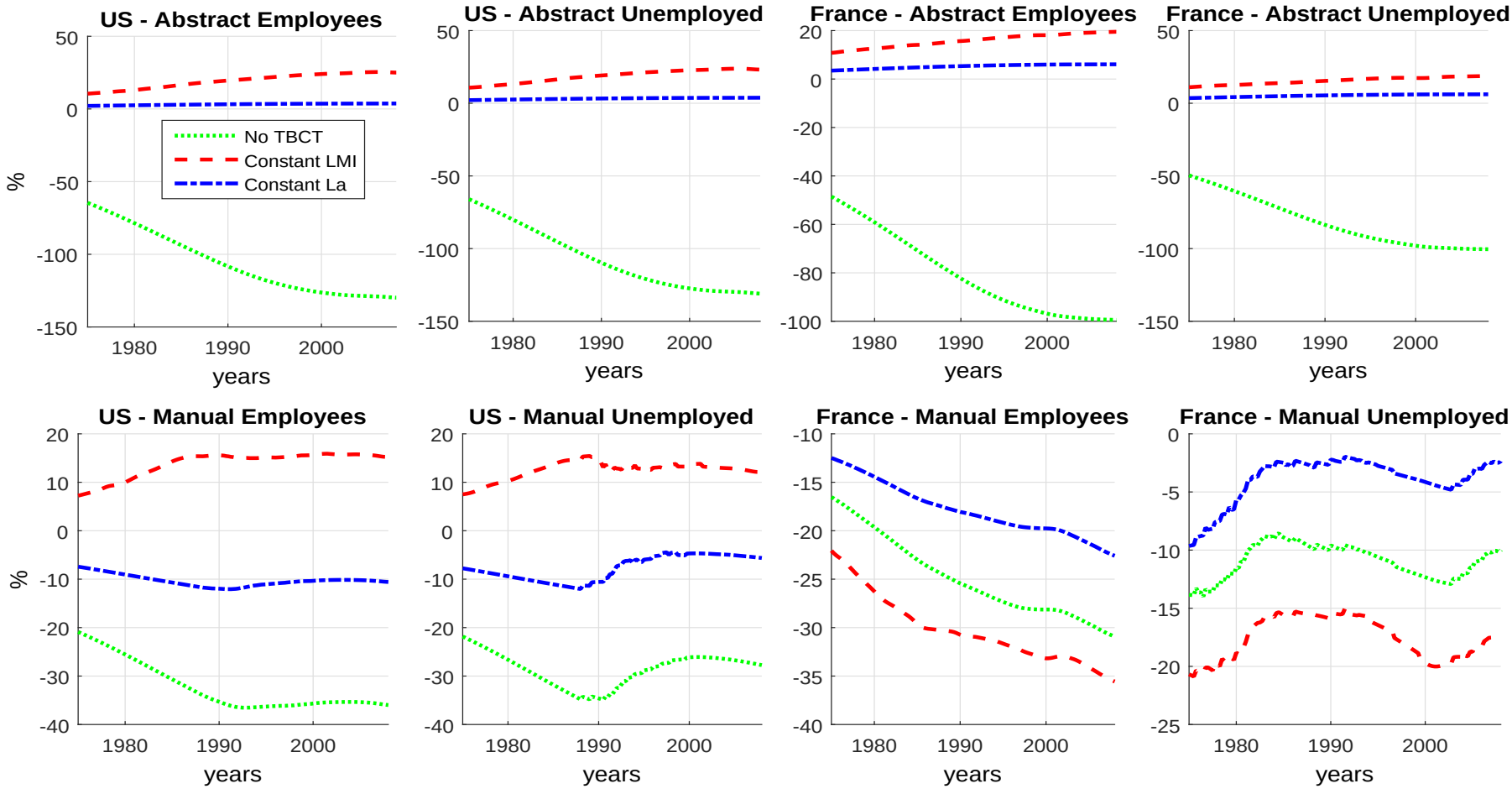
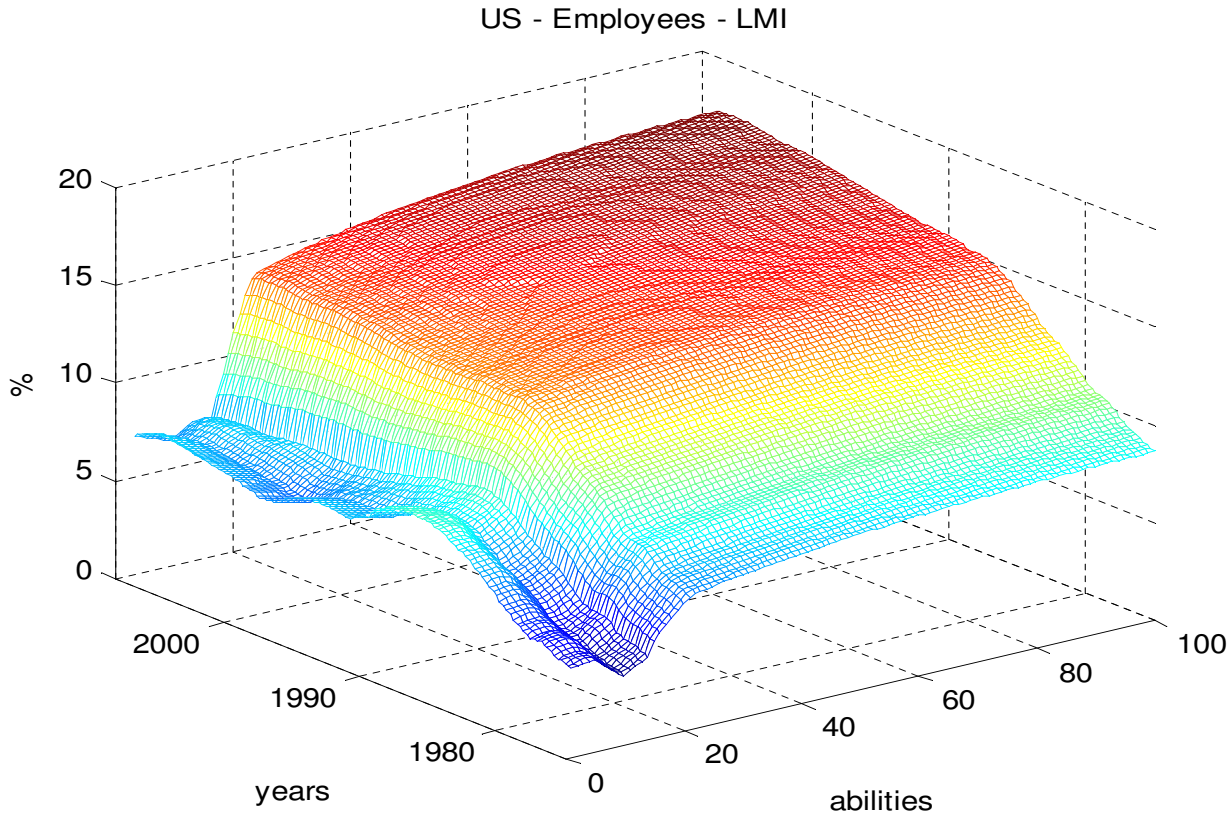
Abstract and manual welfare : counterfactuals



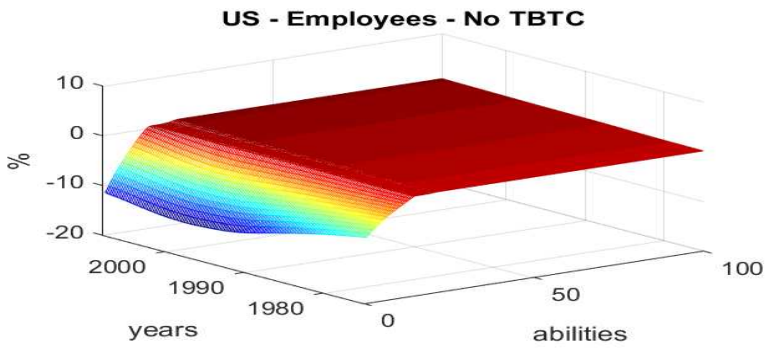
"%" : welfare gap (in percentage) between benchmark simulation and counterfactual experiment. "Constant LMI" : LMI set at 1975 value. "No TBTC" : price of capital p_k is constant. "Constant L_a" : L_a constant, set at 1975 value.

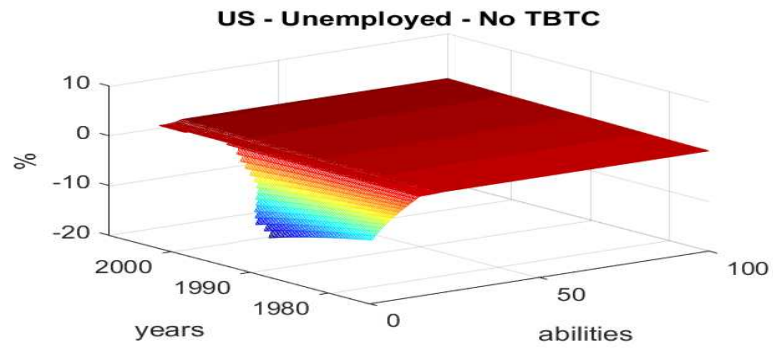
Routine welfare : US counterfactuals

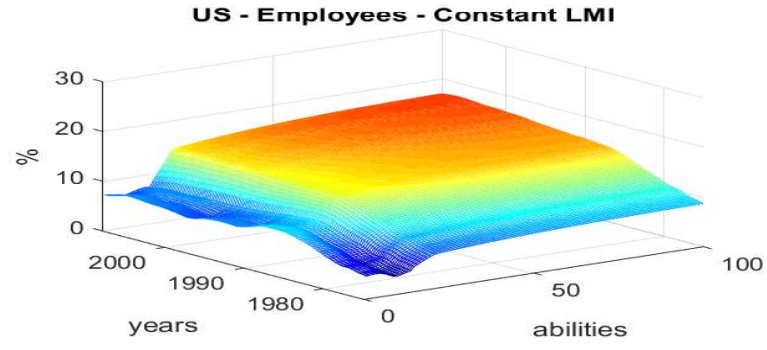


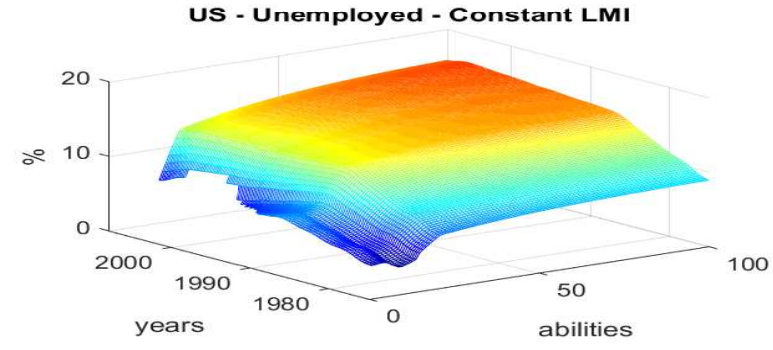
"%" : welfare gap (in percentage) between benchmark simulation and counterfactual experiment. Gap$>$0 : routine workers are happier with conterfactual.

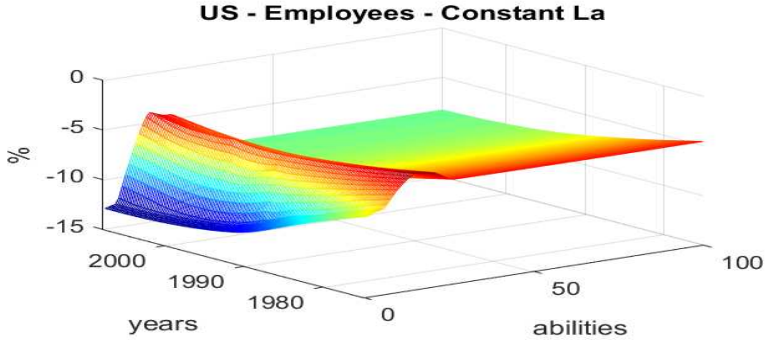
Routine welfare : US counterfactuals

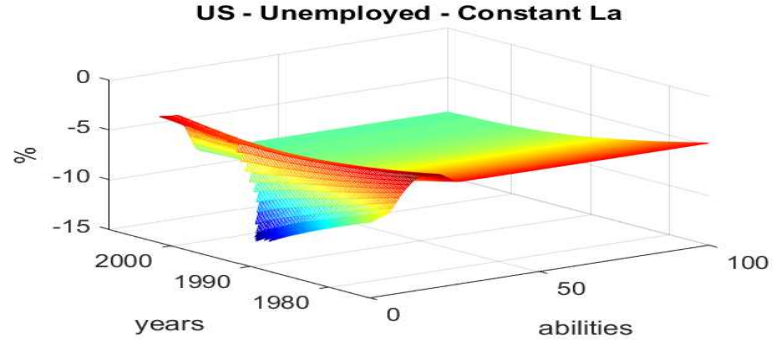




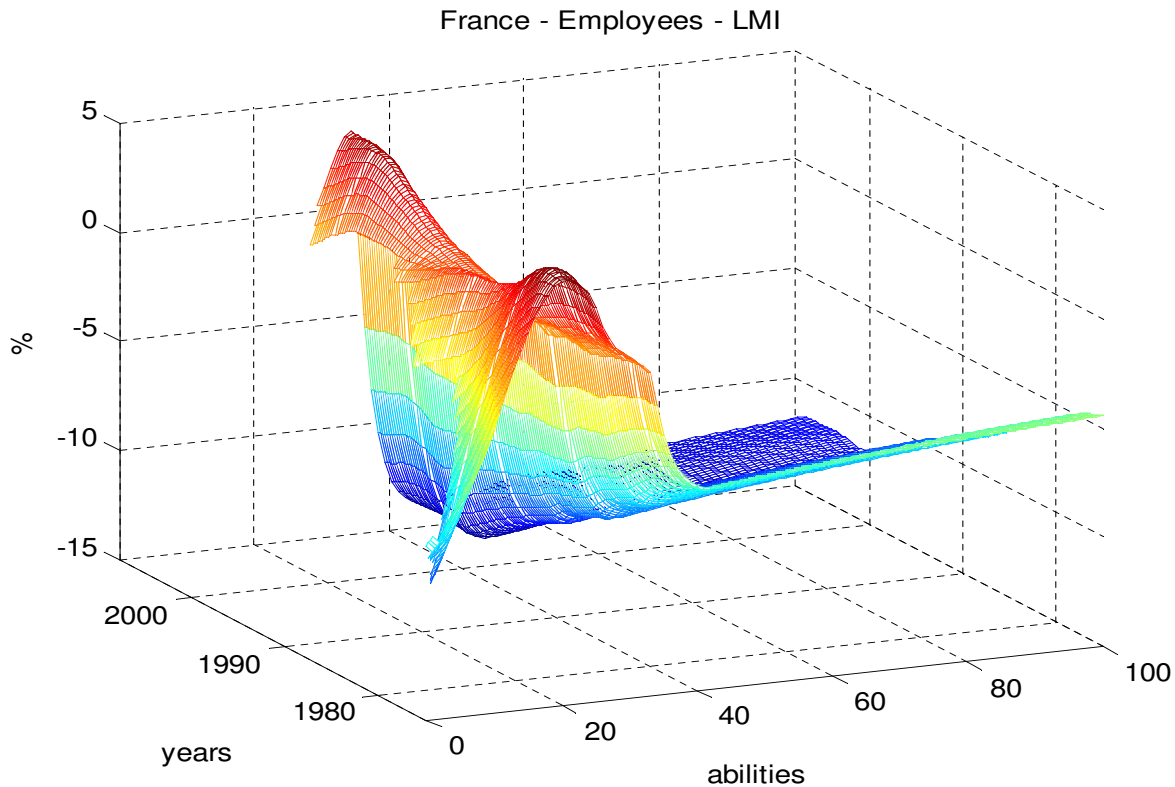








Routine welfare : France counterfactuals



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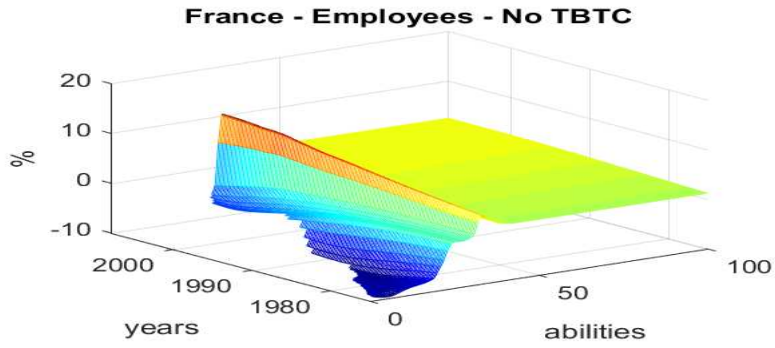
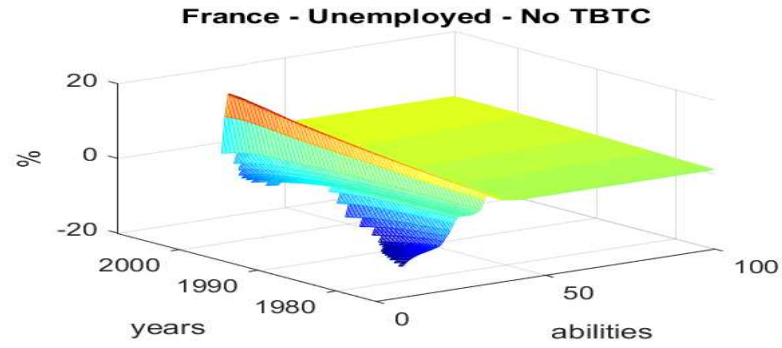
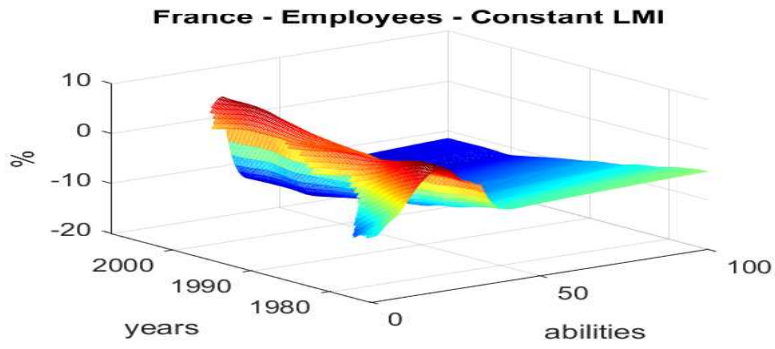
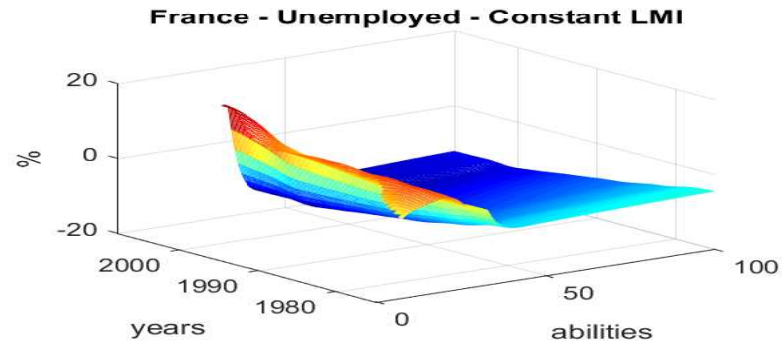
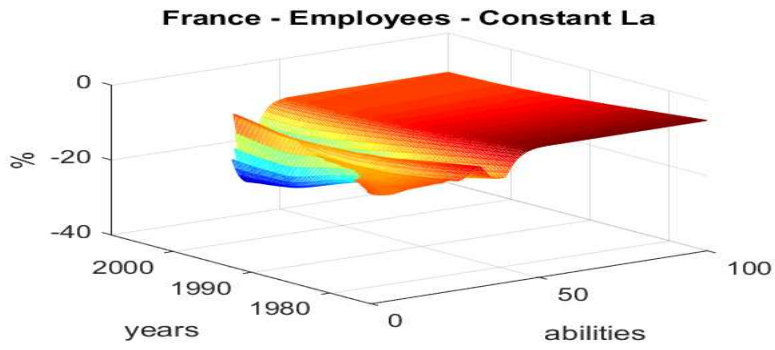
Routine welfare : French counterfactuals

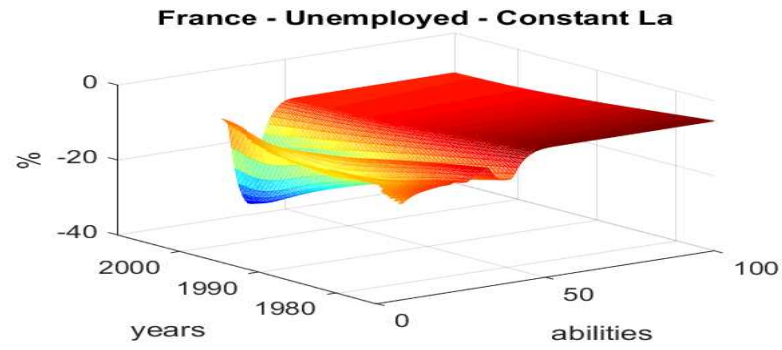












"%" : welfare gap (in percentage) between benchmark simulation and counterfactual experiment. "Constant LMI" : LMI set at 1975 value. "No TBTC" : price of capital p_k is constant. "Constant L_a" : L_a constant, set at 1975 value.

Conclusion

Job polarization using US and French data.

- Dynamics of employment shares are very similar across countries.
- but major differences in the dynamics of routine employment levels
  - US routine employment level actually increase until the early 1990s, then started falling.
  - The evolution of French routine employment went in opposite directions to that of the US economy.