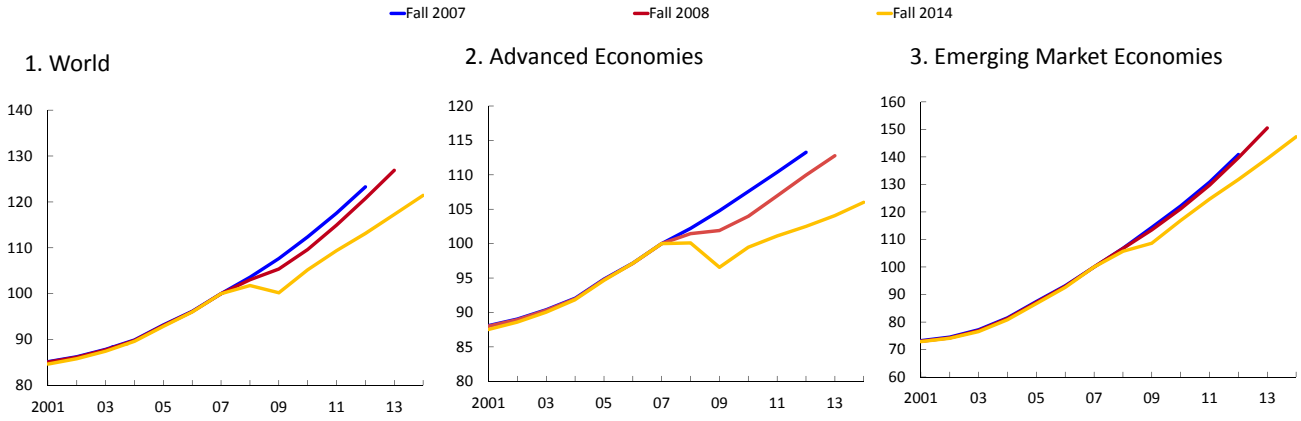
World Economic Outlook
International Monetary Fund

Where are We Headed? Perspectives on Potential Output

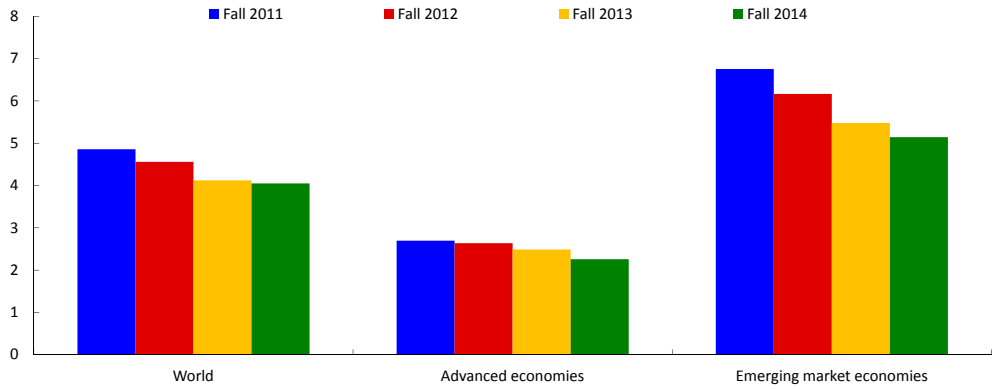
Patrick Blagrave , Mai Dao, Davide Furceri (team lead), Roberto Garcia-Saltos, Sinem Kilic Celik, Annika Schnücker, Juan Yepez, Hongyan Zhao and Fan Zhang, and with support from Rachel Szymanski

Six years after the GFC, output remains below precrisis expectations…



Note: The index is created using real GDP growth rates and their WEO forecasts.

…and growth expectations have been steadily revised down



Note: WEO medium-term growth projections are five-year-ahead growth forecasts.

Questions

- **Before the crisis:** how did potential output and its components evolve from the mid-1990s until the crisis?
- **Looking at the Crisis:** what happened to potential growth during the crisis?
- **Looking Forward:** where potential growth is headed?

Potential Output: A Primer

Estimating potential output

- Definition of potential: output without inflationary or deflationary pressures

- Estimates of potential output using *multivariate* filtering techniques:
  - Simultaneous Equation Model estimated with Bayesian methods: Stochastic process for output and the NAIRU; Phillips Curve; Okun's relationship

- Estimates of potential growth from the multivariate filter are decomposed as follows:

$$\Delta\bar{y} = \bar{a} + \alpha\Delta\bar{n} + (1-\alpha)\Delta k$$

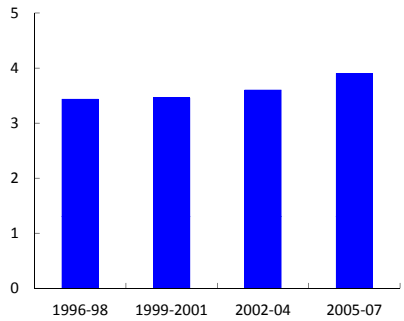
where $\bar{n}$ is potential employment; *k* capital; $\bar{a}$ trend TFP (estimated as a residual)

- Sample: unbalanced of 10 AEs-G20 and 6 EMs-G20 from the mid-1990s to 2020
  - Advanced economies: Australia, Canada, France, Germany, Korea, Italy, Japan, Spain, United Kingdom and the United States
  - Emerging Market Economies: Brazil, China, India, Mexico, Russia, Turkey

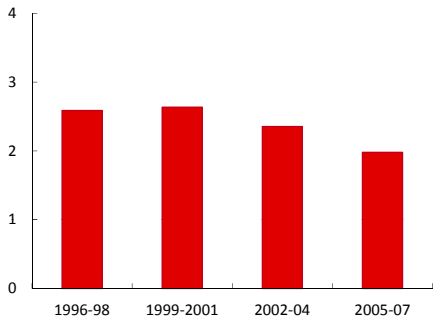
Before the Crisis

Potential growth was declining in AEs but increasing in EMs

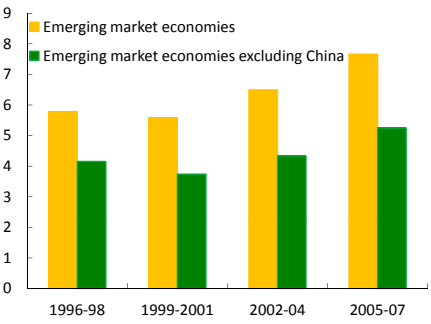
1. G16



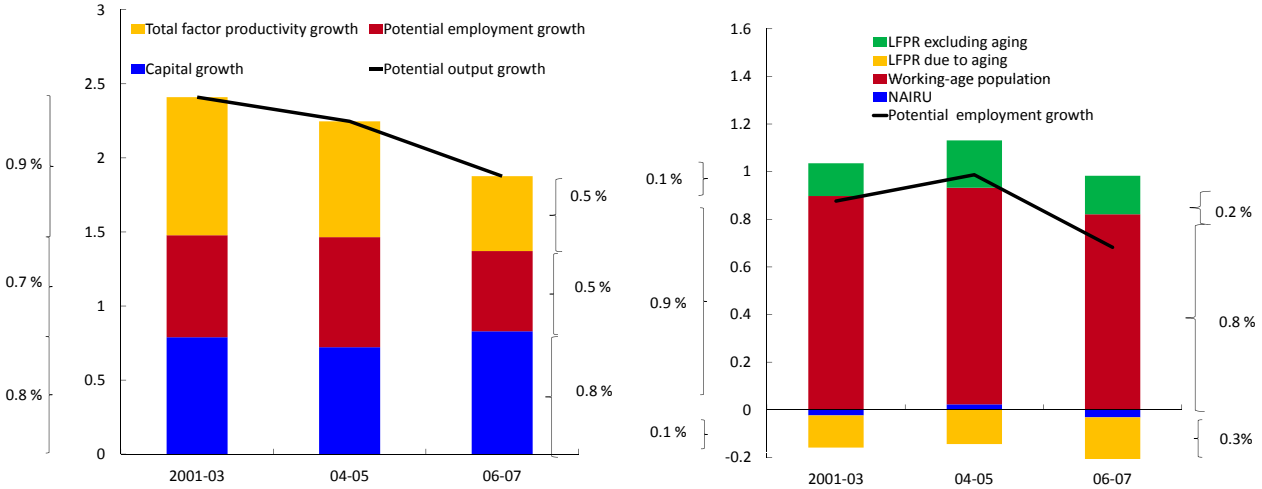
2. Advanced Economies



3. Emerging Market Economies

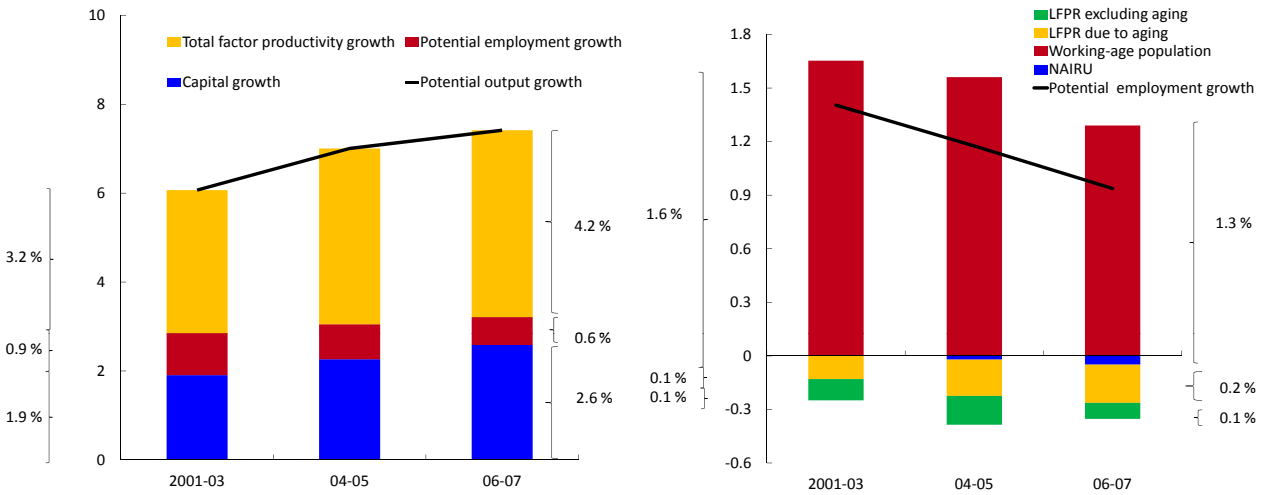


AEs: lower TFP growth and to a lesser extent lower potential employment growth (aging)



Note: LFPR = labor force participation rate; and NAIRU = nonaccelerating inflation rate of unemployment.

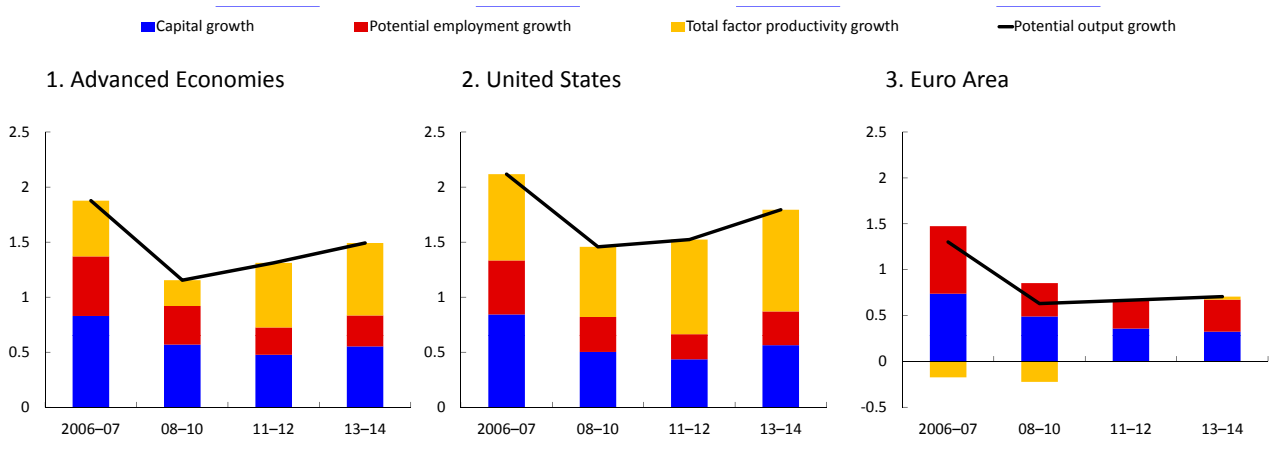
EMs: higher TFP growth and to a lesser extent capital growth



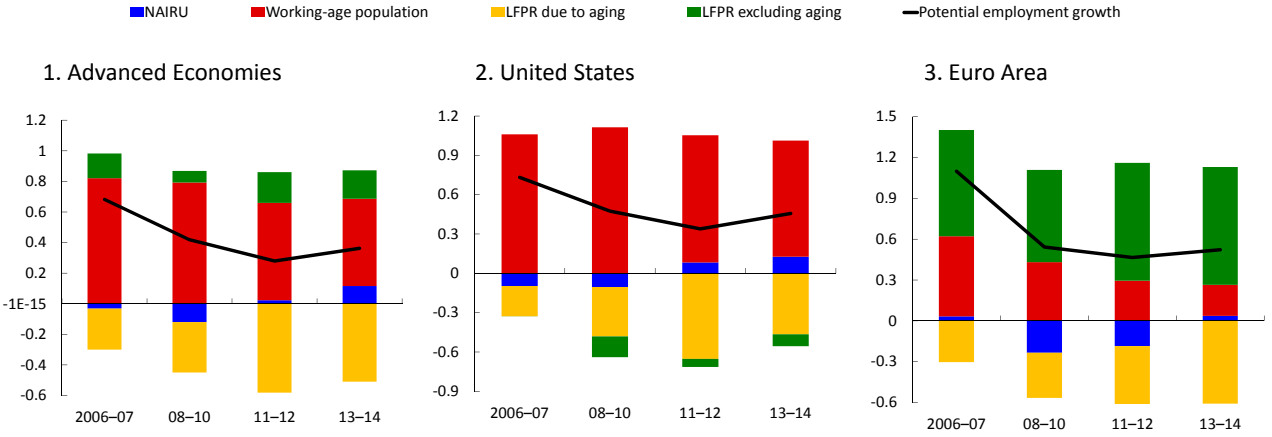
Note: LFPR = labor force participation rate; and NAIRU = nonaccelerating inflation rate of unemployment.

During the Crisis

AEs: potential growth declined by about ½ percentage point, due to lower capital and potential employment growth

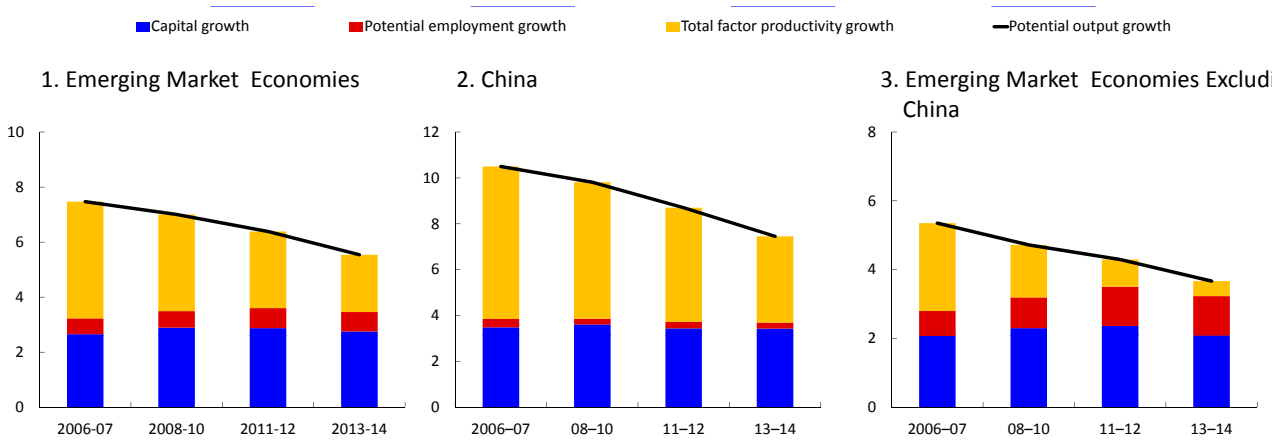


AEs: the decline in potential employment growth attributable to demographic factors



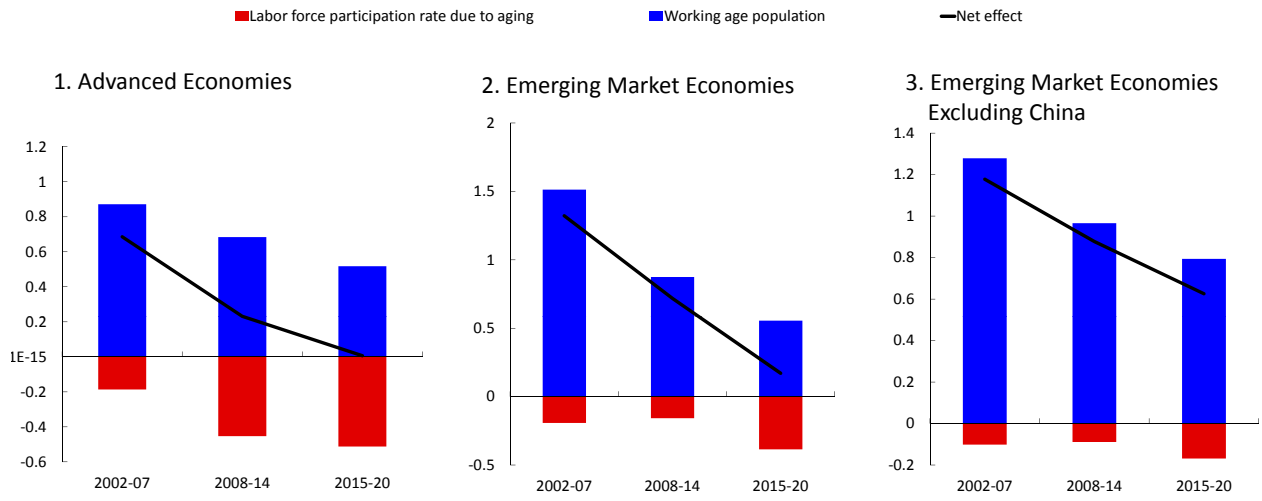
Note: LFPR = labor force participation, and NAIRU = nonaccelerating inflation rate of unemployment.

EMs: potential growth declined by about 2 percentage points, due to lower TFP growth



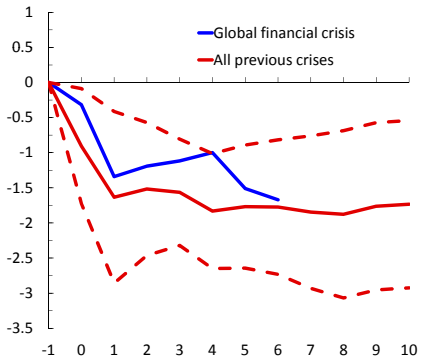
Where are We Headed?

Potential employment growth is expected to decline in both AEs and EMs due to aging

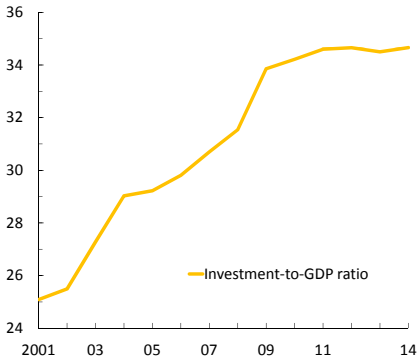


Capital growth is likely to remain below precrisis rates in both AEs and EMs due to lower investment-to-capital ratios

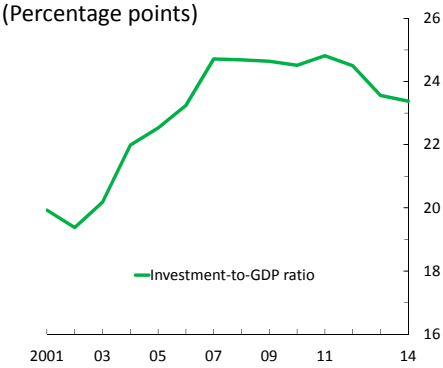
1. Advanced Economies
(Percentage points; years on *x*-axis)



2. Emerging Market Economies
(Percentage points)



3. Emerging Market Economies Excluding China
(Percentage points)



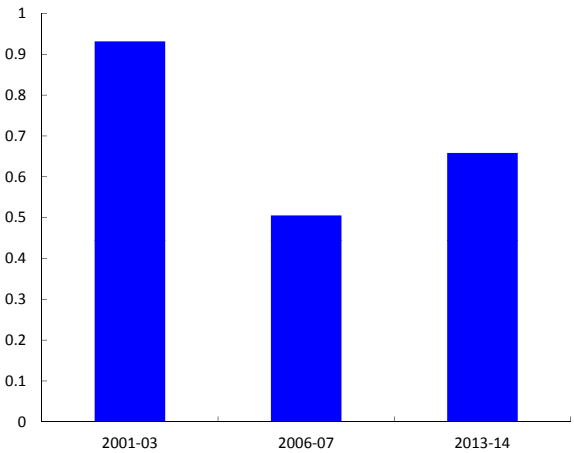
Sources: Laeven and Valencia 2014; and IMF staff estimates.
Note: In panel 1, the blue line represents the effect of the global financial crisis, and red lines represent the effect of previous financial crises (based on Laeven and Valencia 2014) on the investment-to-capital ratio. Dashed red lines denote 90 percent confidence bands.

Weak TFP growth in both AEs and EMs

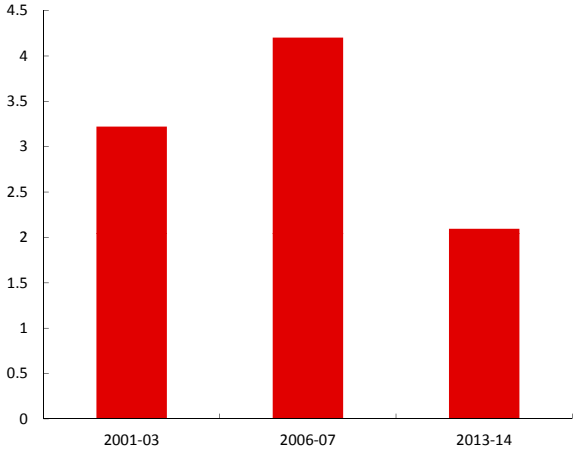
AEs: TFP growth returns to precrisis rate.

EMs: TFP lower than precrisis rates due to catch up.

1. Advanced Economies



2. Emerging Market Economies

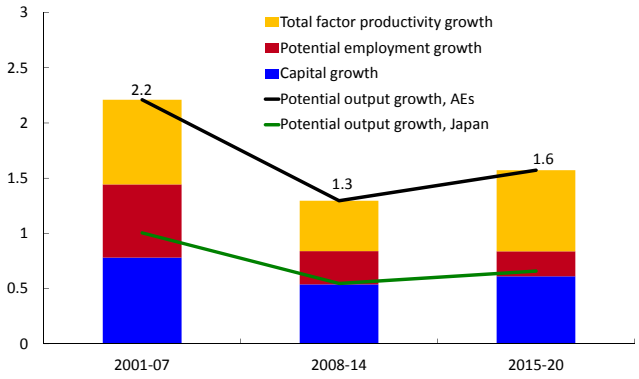


Putting it all together

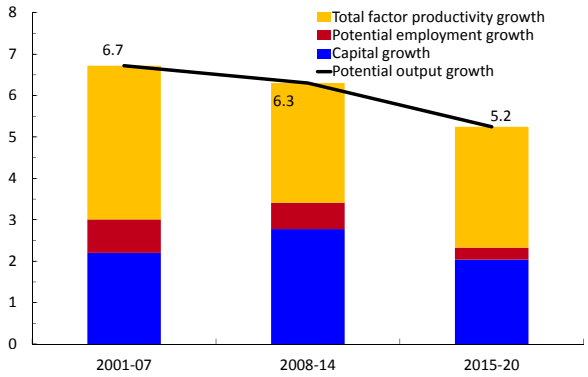
AEs: Potential growth remains below precrisis rates.

EMs: Potential growth declines further.

1. Advanced Economies



2. Emerging Market Economies



Implications

- **Implications for fiscal and monetary policy**
  - Harder to maintain fiscal sustainability and rebuild fiscal buffers
  - Zero lower bound in AEs may re-emerge
  - In some economies living standards may expand more slowly in the future

- **Increasing potential output a priority**
  - AEs: demand support to tackle weak investment and structural unemployment, policies and reforms to boost productivity, infrastructure capital and labor supply
  - EMs: policies and reforms directed at removing critical bottlenecks, improving business conditions and education

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Potential Output: A Primer

Estimating potential output

- Core Structure of the multivariate filter

$$(1) \qquad y_t = Y_t - \overline{Y}_t$$

$$(2) \qquad \overline{Y}_t = \overline{Y}_{t-1} + G_t + \varepsilon_t^{\overline{Y}}$$

$$(3) \qquad G_t = \theta G^{SS} + (1-\theta) G_{t-1} + \varepsilon_t^{G}$$

$$(4) \qquad y_t = \phi y_{t-1} + \varepsilon_t^{y}$$

Estimating potential output

- Additional Information to identify gap

$$(5) \qquad \pi_t = \lambda \pi_{t+1} + (1-\lambda)\pi_{t-1} + \beta y_t + \varepsilon_t^{\pi}$$

$$(6) \qquad \overline{U}_t = \left(\tau_4 \overline{U}^{SS} + (1-\tau_4)\overline{U}_{t-1}\right) + G_t^{\overline{U}} + \varepsilon_t^{\overline{U}}$$

$$(7) \qquad G_t^{\overline{U}} = (1-\tau_3) G_t^{\overline{U}} + \varepsilon_t^{G^{\overline{U}}}$$

$$(8) \qquad u_t = \tau_2 u_{t-1} + \tau_1 y_t + \varepsilon_t^{u}$$

$$(9) \qquad u_t = \overline{U}_t - U_t$$

Estimating trend participation rates

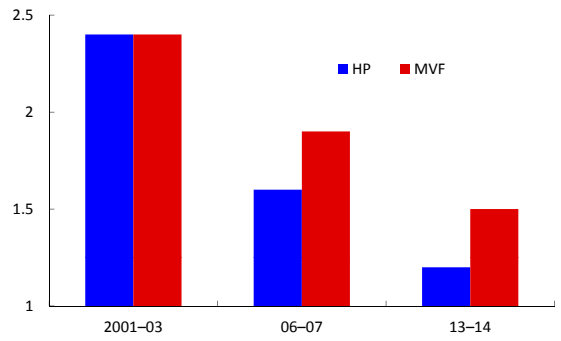
- Empirical methodology:

$$\log LFP_{a,g,t} = \alpha_{a,g} + \frac{1}{n_a}\sum_{b=1920}^{1998}\beta_{b,g} I_{a,t}(t-a=b) + \sum_{l=0}^{2}\gamma^{l}{}_{a,g} cycle_{t-l} + \lambda_{a,g} X_{a,g,t} + \varepsilon_{a,g,t}$$

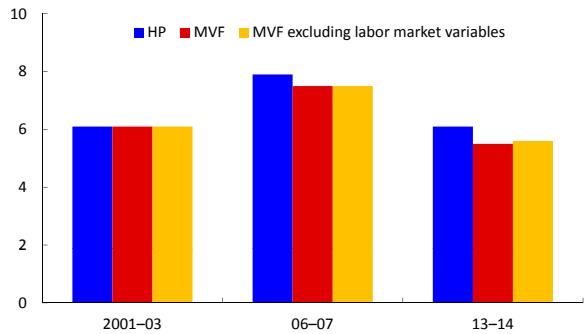
  - Cross-equation restriction on β b
  - Age groups: 15-19,20-24,…,65+
  - Cycle measure by employment gap
  - X includes a set of structural determinants :
    - Youth: enrollment rates in primary (for teen) and secondary (for twens)
    - Prime age women: education attainment, education attainment squared, fertility
    - Prime age men: linear and quadratic trend
    - Old: life expectancy, life expectancy squared

Comparison of potential growth estimates

1. Advanced Economies



2. Emerging Market Economies

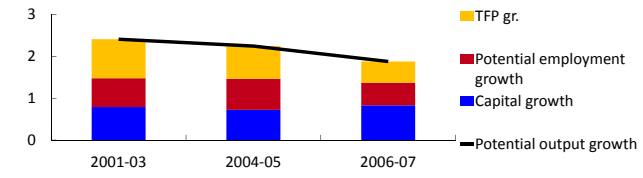


Note: HP = Hodrick-Prescott filter with smoothing parameter equal to 6.25; MVF = multivariate filter.

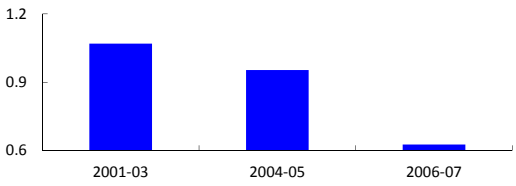
Before the Crisis

AEs: lower TFP growth and to a lesser extent lower potential employment growth (aging)

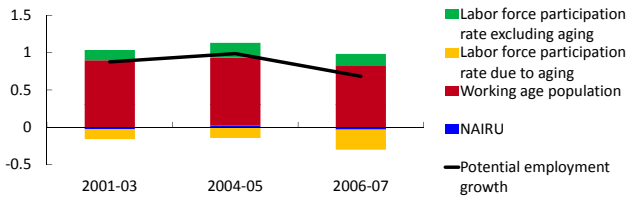
1. Contributions of Components of Potential Output Growth



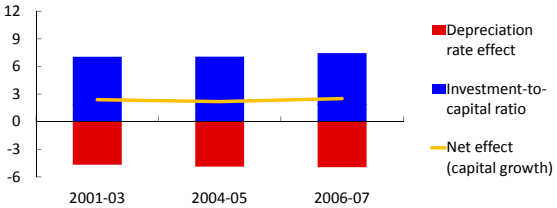
2. Human Capital Growth



3. Components of Potential Employment Growth



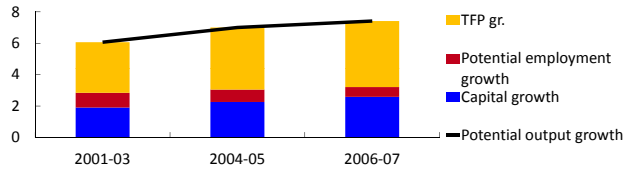
4. Components of Capital Growth



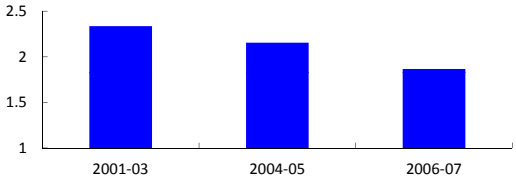
Sources: Barro and Lee 2010; and IMF staff estimates.
Note: Human capital is measured as the percentage of people in the population over 15 years old who have secondary education or higher.
NAIRU = nonaccelerating inflation rate of unemployment; TFP gr. = total factor productivity growth (including human capital growth).

EMs: higher TFP and to a lesser extent capital growth

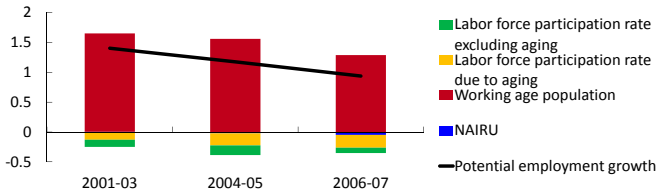
1. Contributions of Components of Potential Output Growth



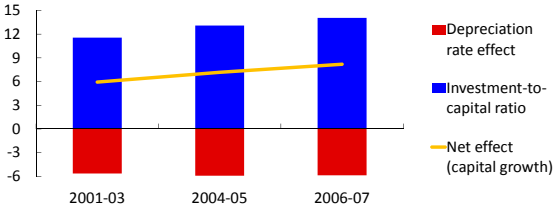
2. Human Capital Growth



3. Components of Potential Employment Growth



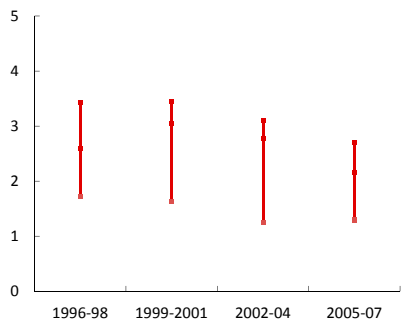
4. Components of Capital Growth



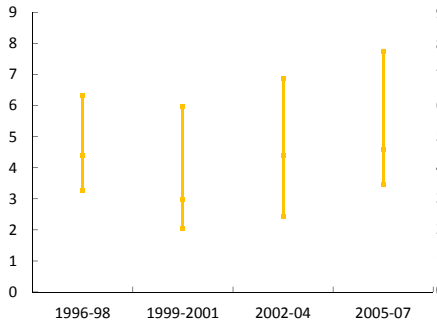
Sources: Barro and Lee 2010; and IMF staff estimates.
Note: Human capital is measured as the percentage of people in the population over 15 years old who have secondary education or higher. NAIRU = nonaccelerating inflation rate of unemployment; TFP gr. = total factor productivity growth (including human capital growth).

These patterns held for most countries within each group

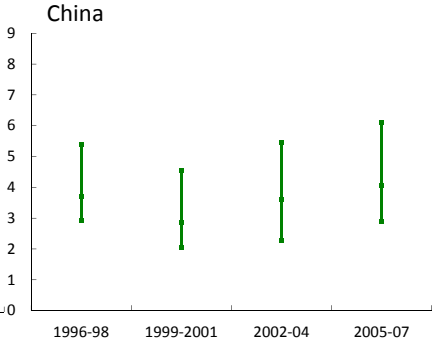
1. Advanced Economies



2. Emerging Market Economies



3. Emerging Market Economies Excluding China



Note: The upper and lower ends of each line show the top and bottom quartiles; the marker within the line shows the median within the group over the corresponding period.

During the Crisis

Methodology

• Estimating the effect of financial crises on level of potential output and its components as in Teulings-Zubanov (2014); IMF WEO April (2014); Romer and Romer (2014):

$$y_{i,t+k} - y_{i,t-1} = \alpha_i^k + \gamma_t^k + \sum_{j=1}^{2} \delta_j^k \Delta y_{i,t-j} + \beta^k D_{i,t} + \sum_{j=1}^{2} \theta_j^k D_{i,t-j} + \sum_{j=0}^{k-1} \rho_j^k D_{i,t+k-j} + \varepsilon_{i,t+k}^k$$

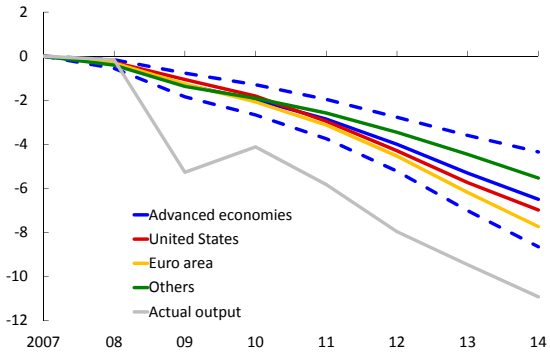
And on potential growth:

$$\Delta y_{i,t+k} - \Delta y_{i,t-1} = \alpha_i^k + \gamma_t^k + \sum_{j=1}^{2} \delta_j^k \Delta y_{i,t-j} + \beta^k D_{i,t} + \sum_{j=1}^{2} \theta_j^k D_{i,t-j} + \sum_{j=0}^{k-1} \rho_j^k D_{i,t+k-j} + \varepsilon_{i,t+k}^k$$

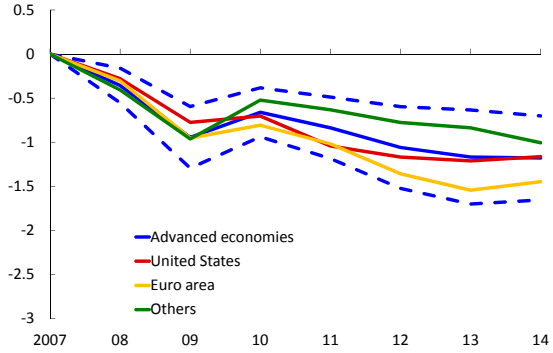
- y = log of (potential) output, capital, (potential) employment, and participation rates
- D = GFC dummy: 1 in 2008 and 0 otherwise

AEs: Potential output in the aftermath of the GFC

1. Potential Output
(Percent)



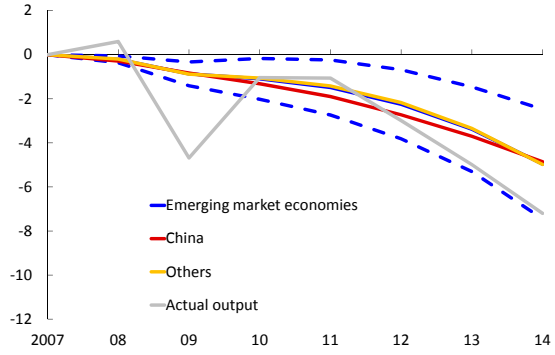
2. Potential Output Growth
(Percentage points)



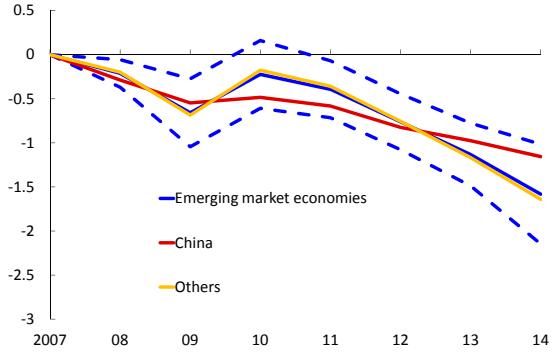
Note: Dashed lines denote 90 percent confidence bands.

EMs: Potential output in the aftermath of the GFC

1. Potential Output
(Percent)



2. Potential Output Growth
(Percentage points)



Note: Dashed lines denote 90 percent confidence bands.