

Potential Growth in Latin America

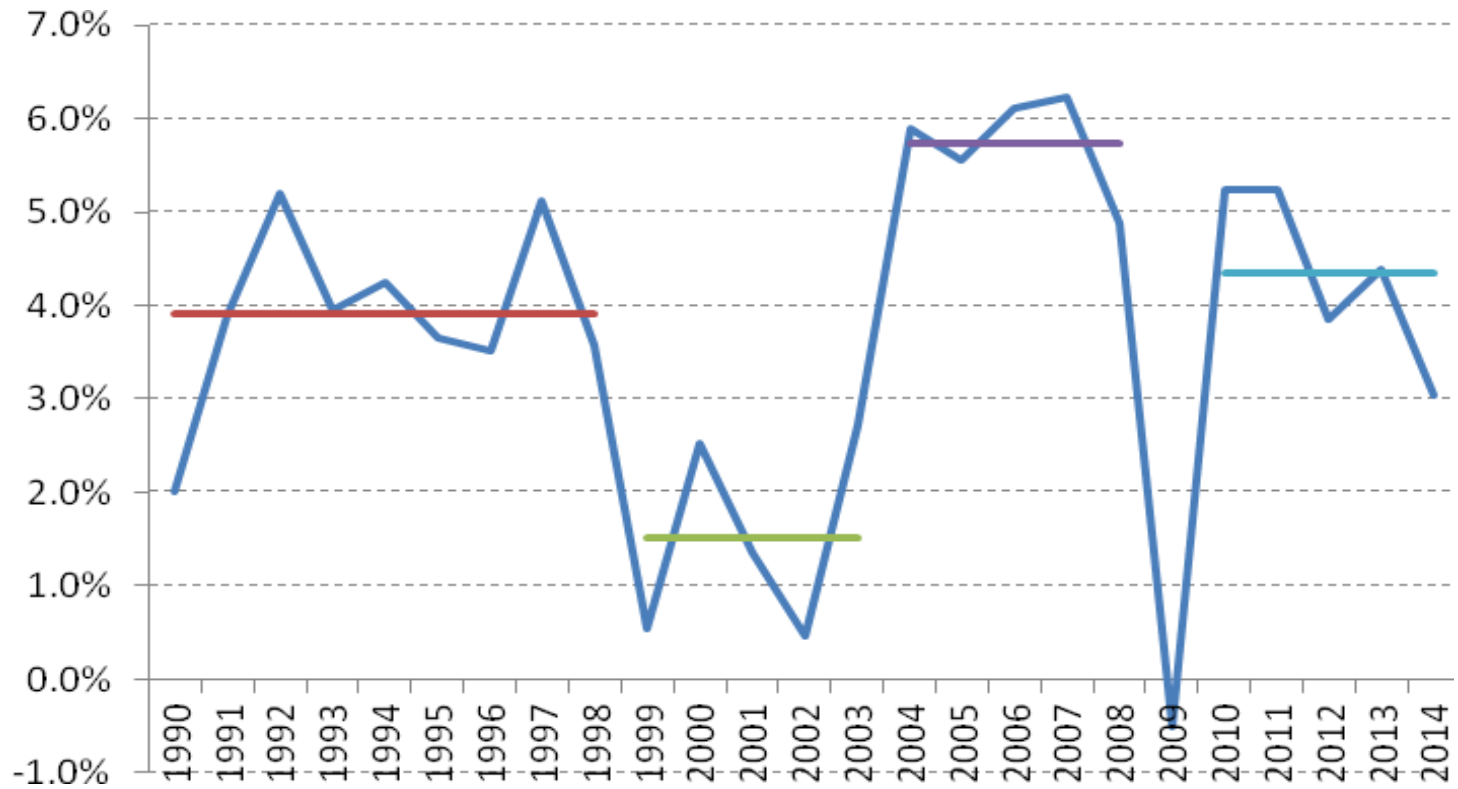
André Hofman, Claudio Aravena and Jorge
Friedman

World KLEMS, 23-24 May, 2016

Content of the presentation

- Introduction
- GDP dynamics in Latin America, 1990-2014.
- Decomposition of GDP with respect labor, considering the change in hours worked and the change in productivity (GDP per hour).
- Capital accumulation.
- Determinants of potential GDP.
- Outlook for economic growth in Latin America, 2015-2030.

LATIN AMERICA: RATE OF CHANGE OF GROSS DOMESTIC PRODUCT (ARITHMETIC AVERAGE FOR 18 COUNTRIES)



Phases of growth

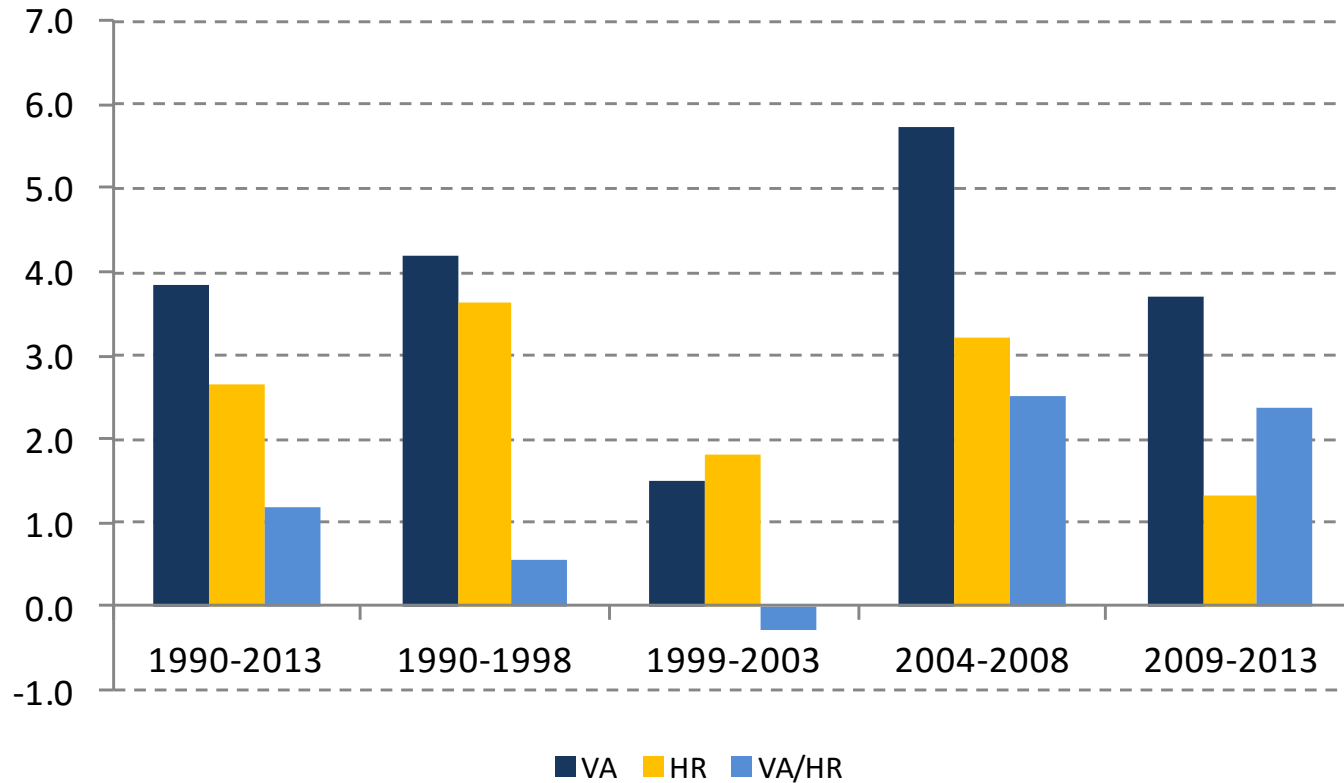
- Latin America has experienced major changes in its growth rate, The arithmetic average of 18 countries shows clearly four phases of growth.
- The first phase extends from 1990 to 1998. This phase consists of a period of recovery from the 1980s when average annual growth was only 1%. From 1990 to 1998 average annual growth was 4.2%.
- The second phase begins with the spread of the Asian and the Russian crisis, which affected primarily Argentina and Brazil. This phase extends until 2003 and shows an annual average economic growth of 1.5%, lightly above a third of the growth experienced in the previous phase.

Phases of growth (continued)

- The third phase lasted five years, from 2003 to 2008, on the basis of a very beneficial international context. The increase in prices of raw materials and favorable external financing conditions led to the acceleration of growth to an annual average of 5.7%. The US financial crisis of 2008 that caused a global debacle ended the phase of strong growth in the region, with a fall in GDP.
- After 2009, Latin America recovered its growth, but by one percentage point and a half lower than the previous period (around 4%).

LATIN AMERICA: GROWTH RATE OF GROSS DOMESTIC PRODUCT AND HOURS WORKED

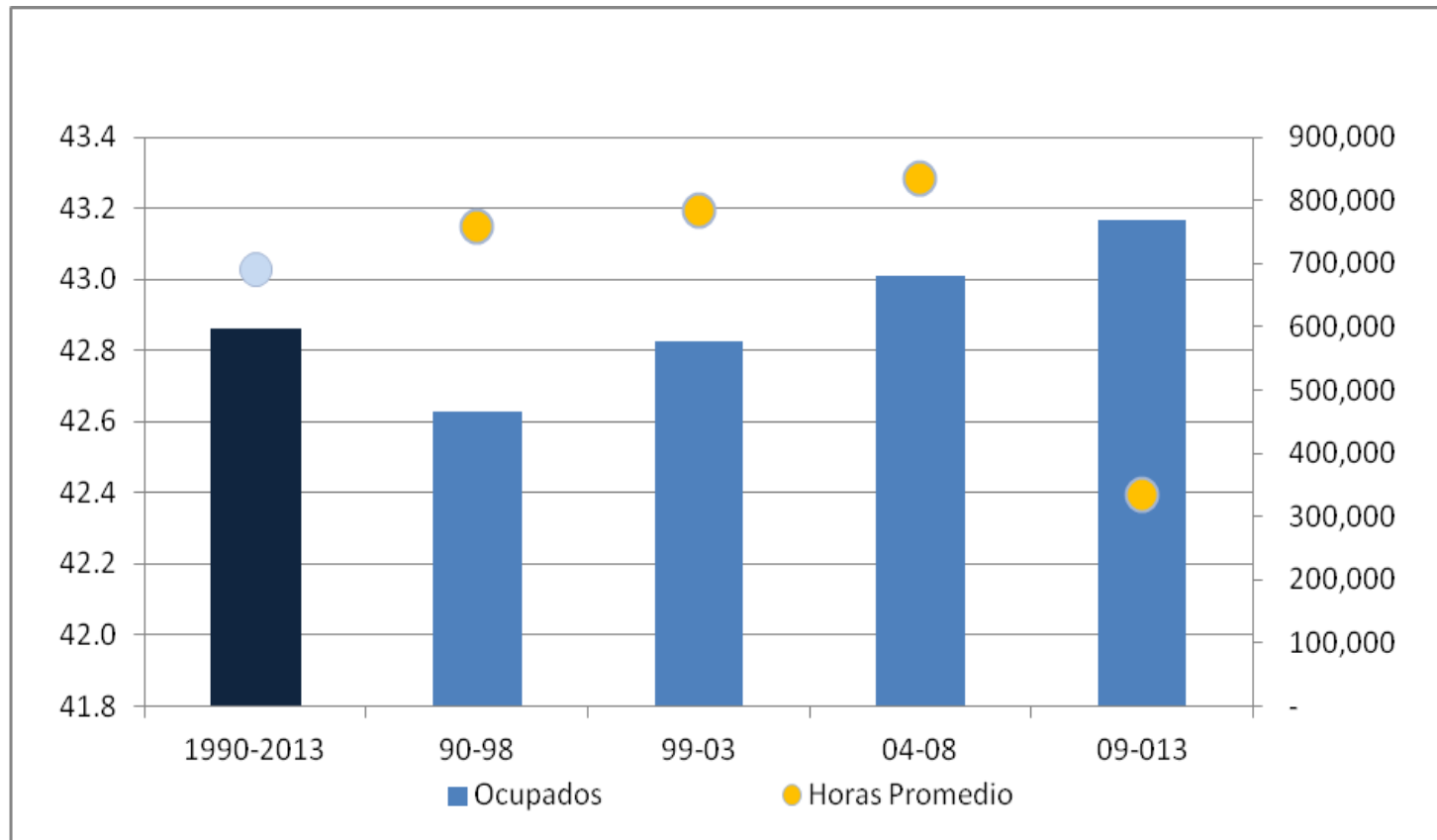
(ARITHMETIC AVERAGE FOR 18 COUNTRIES)



Labor growth and productivity

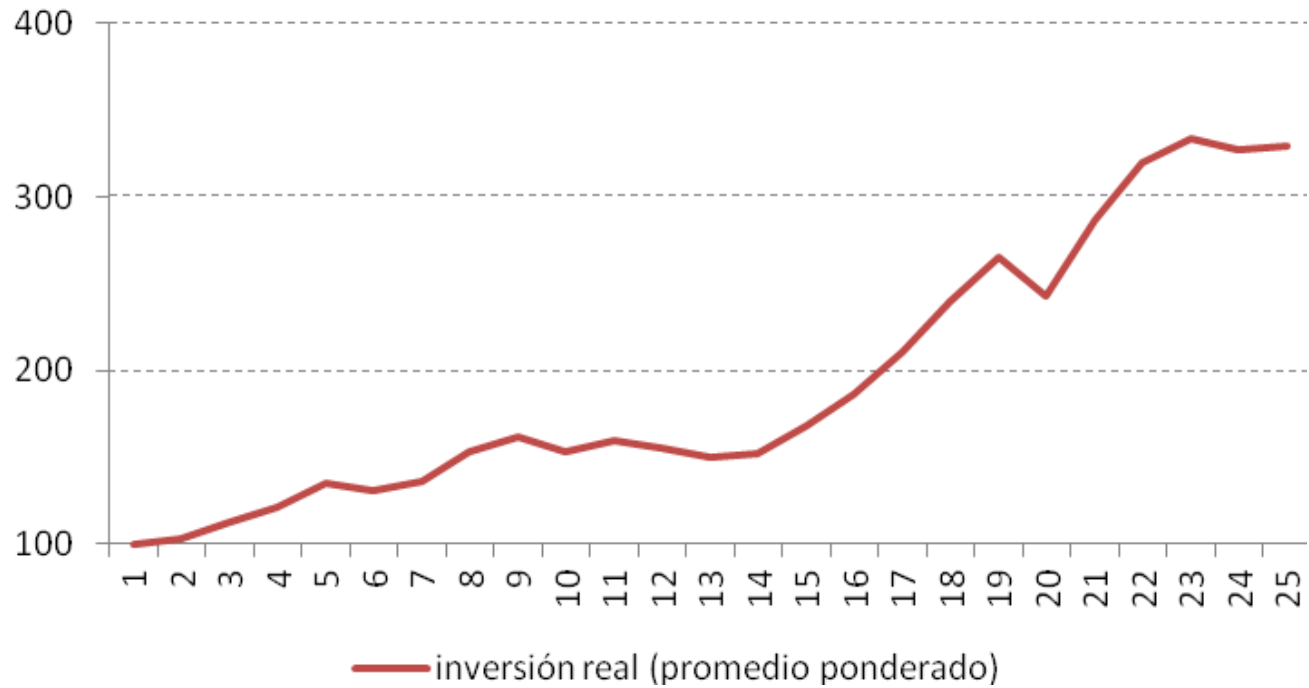
- Decomposing growth of gross domestic product (GDP) with respect to labor, taking in to account the change in hours worked and productivity (GDP per hour), shows that the average growth of 3.8 % of GDP between 1990 and 2013 for all the countries analyzed is mainly explained by the increase in hours worked. Labor productivity increased by 1.1%
- The results show that for fourteen years the contribution of hours worked explains almost entirely the increase in GDP. After 2003 there was an improvement in both GDP growth and labor productivity, where the latter explained about half of GDP growth.

LATIN AMERICA: Occupation and hours growth, 1990 - 2013 (Arithmetic average for 18 countries)



Fixed capital formation

Inversión real 1990=100

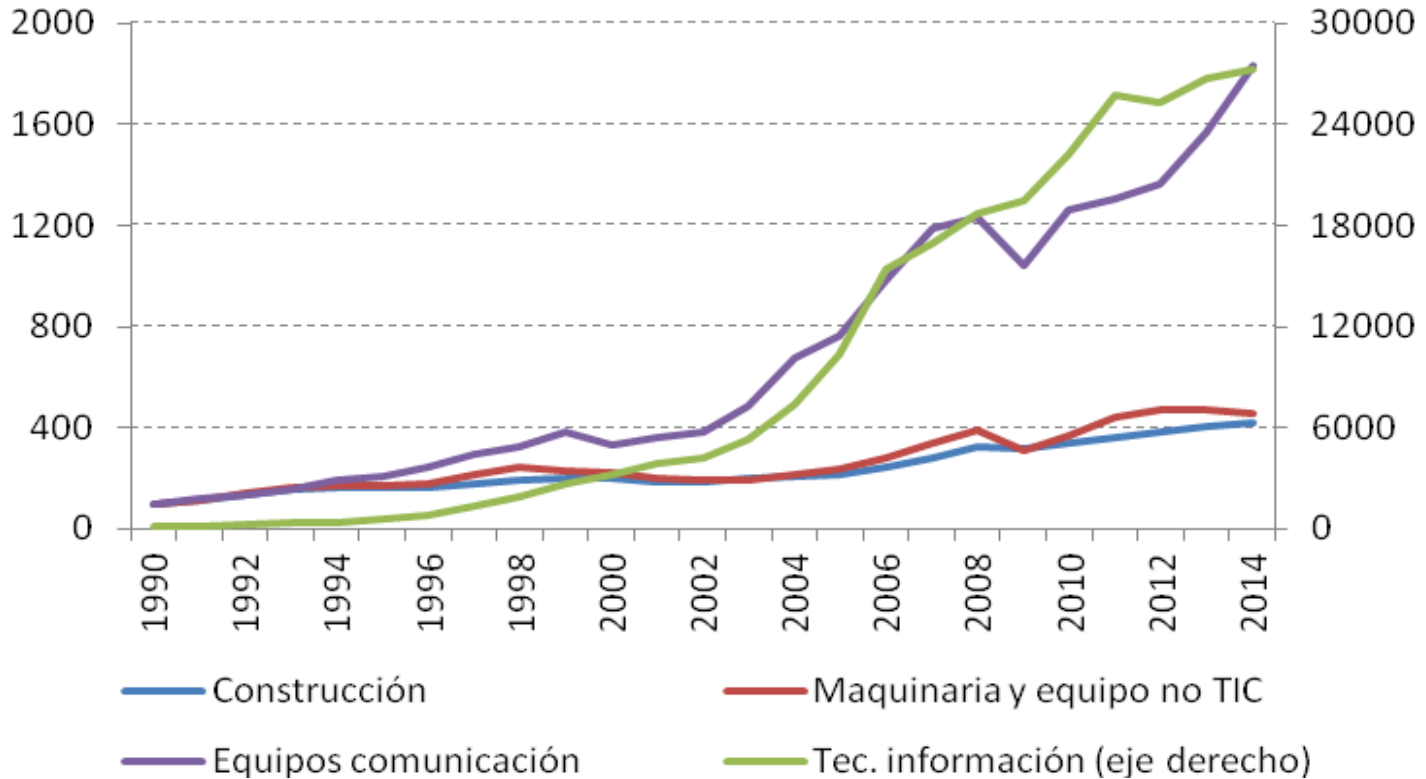


Capital formation

- Gross fixed capital formation in Latin America shows greater fluctuations than GDP in the last 25 years. Figures 9 and 11 show the evolution of investment during that period. Five phases can be identified. In the first eight years investment grew 50%, then stagnated between 1998 and 2003 because of the Asian crisis of 1998. Following the increase in the price of commodities, investment accelerated again but was shut down with the 2009 crisis which had a very negative impact on gross fixed capital formation. After this setback a new, short, phase of expansion, emerged until 2013. But since 2013 real investment growth fell. However, the gross fixed capital formation in 2014 is 3 times higher than the level in the early nineties.

Real investment by asset type

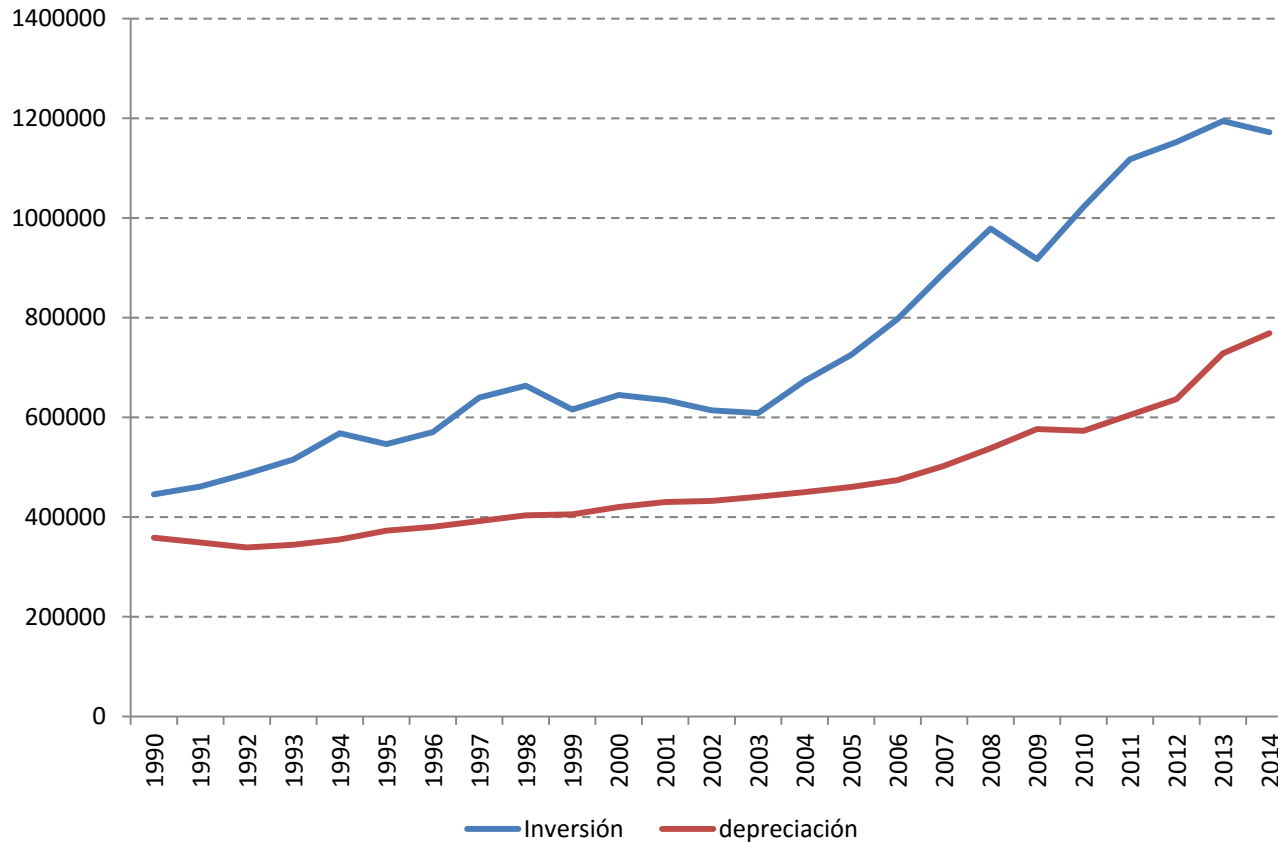
1990 = 100



Capital formation (continued)

- Investment has been dominated by construction and machinery and equipment. Finally, ICT assets, measured in real prices, reach a level of 12% of total gross fixed capital formation. Fixed capital formation in real terms has a weight 3 times higher than in nominal terms. This change is due to the sharp drop of ICT prices experienced since the mid-nineties.

Latin America: investment and depreciation 1990-2014 (Millions of constant 2010 dollars)



Latin America: Determinants of potential GDP 1990-2014



Medium-term potential growth of GDP for Latin America

- GDP medium-term growth measures the ability of an economy without shocks and where production factors are used in "normal " way. Growth theory indicates that the long-term growth depends on the structural characteristics of the economies, average productivity growth and population. In the developing economies we must also consider the effect of convergence, so the rate at which countries accumulate production factors (investment) is also important.
- The estimated medium-term potential for Latin America, 2016-2030 product, is emphasizing the contribution of information technology.

Methodology

Our methodology for analyzing the sources of growth based on the production possibility frontier introduced by Jorgenson (1966). In the production possibility frontier output (Y) consists of IT investment goods (IT), which includes computer hardware, software, and communications equipment, and non-IT output (Y_n), while input (X) consists of capital services (K) and labor services (L). Capital services can be decomposed into the capital service flows from IT capital (K_{IT}) and non-IT capital services (K_n). Input (X) is augmented by total factor productivity (A), so that the production possibility frontier is:

$$Y(y_n, I_{IT}) = AX(K_n K_{IT} L) \quad (1)$$

$$\Delta \ln Y = \bar{v}_K \Delta \ln K + \bar{v}_L \Delta \ln L + \Delta \ln A \quad (2)$$

The change in the capital service flow is the Tornqvist aggregate of the changes in the capital services from IT assets and non-IT assets,

$$\Delta \ln K = \bar{v}_{K_{IT}} \Delta \ln K_{IT} + (1 - \bar{v}_{K_{IT}}) \Delta \ln K_n \quad (3)$$

where (3) gives the average value share of IT assets in capital input and the changes in the capital services from the IT and non-IT assets, respectively.

Methodology (continued)

Information technology contributes to economic growth through two channels - investment in IT assets and productivity growth. Equation (2) can be transformed to present the growth of labor productivity as:

$$\Delta \ln y = \bar{v}_K \Delta \ln k + \bar{v}_L \Delta \ln L_Q + \Delta \ln A \quad (4)$$

where y is labor productivity (defined as Y/H , the ratio of total output Y to total labor hours worked H), k is capital deepening (defined as $k=K/H$, the ratio of capital services to total hours worked), and labor quality (defined as $LQ=L/H$, the ratio of labor input to hours worked). Equation (4) serves as the starting point for our model for projecting productivity growth.

First, capital quality K_Q is defined as the ratio of the capital service flow K to the capital stock index Z . By this definition, a change in the capital quality K_Q reflects a shift of the capital stock towards IT-assets.

$$K_Q = \frac{K}{Z} \quad (5)$$

$$\ln k = \Delta \ln K_Q - \Delta \ln H + \Delta \ln Z \quad (6)$$

Second, we consider the gap between the growth rates of the reproducible capital stock Z_R and output Y .

$$\tau = \Delta \ln Z_R - \Delta \ln Y \quad (7)$$

The gap τ approaches zero in the long term, when the economy is at its steady state. However, for intermediate-term projections, this gap is not necessarily zero. The aggregate capital stock Z consists of the reproducible capital stock Z_R and land, denoted by $LAND$ and assumed to be fixed, which implies the following decomposition:

$$\Delta \ln Z = \bar{u}_R \Delta \ln Z_R + (1 - \bar{u}_R) \Delta \ln LAND \quad (8)$$

Combining equations (6), (7) y (8) gives

$$\Delta \ln k = \Delta \ln K_Q - \Delta \ln H + \bar{u}_R (\Delta \ln y + \Delta \ln H + \tau) \quad (9)$$

With equations (4) y (9) we obtain our model for projecting productivity growth:

$$\Delta \ln y = \frac{\bar{v}_K \Delta \ln K_Q - \bar{v}_K (1 - \bar{u}_R) \Delta \ln H + \bar{v}_K \bar{u}_R \tau + \bar{v}_L \Delta \ln L_Q + \Delta \ln A}{(1 - \bar{v}_K \bar{u}_R)} \quad (10)$$

At equation (10) we add hours worked and obtain the rate of growth of GDP.

Data

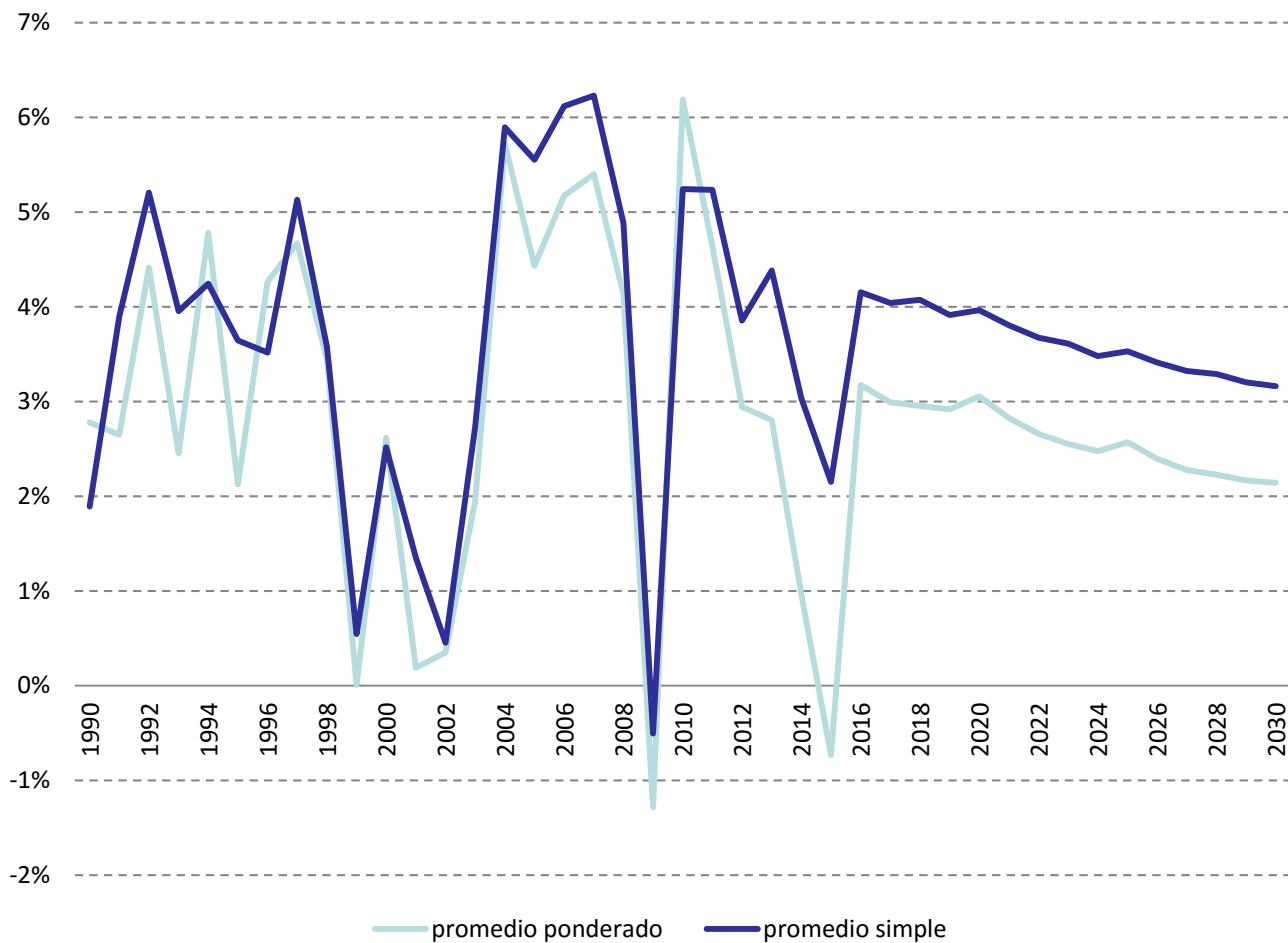
- 18 countries 1990-2014
- GDP, IT capital, non-IT capital, average hours worked, occupied workers, distribution of the population by education, education return rates, proportion of capital in GDP.

Proyection assumptions

- Proportion of capital in GDP, is the historical average of the past 20 years.
- The proportion of reproducible capital, is the US 0.8
- Variation in hours worked, equivalent to growth of the population between 15 and 64 years (CELADE).
- Contribution to the quality of work, based on the proportions of the population with different levels of study of 2015 and trends in their respective rates of return.
- Quality of capital moving average of the last 10 years.
- Total Factor Productivity, average growth rates of the last 5 years, 10 years and 15 years.
- Gap of growth rates of stock of reproducible capital and GDP is estimated by the historical average for the last 10 years.

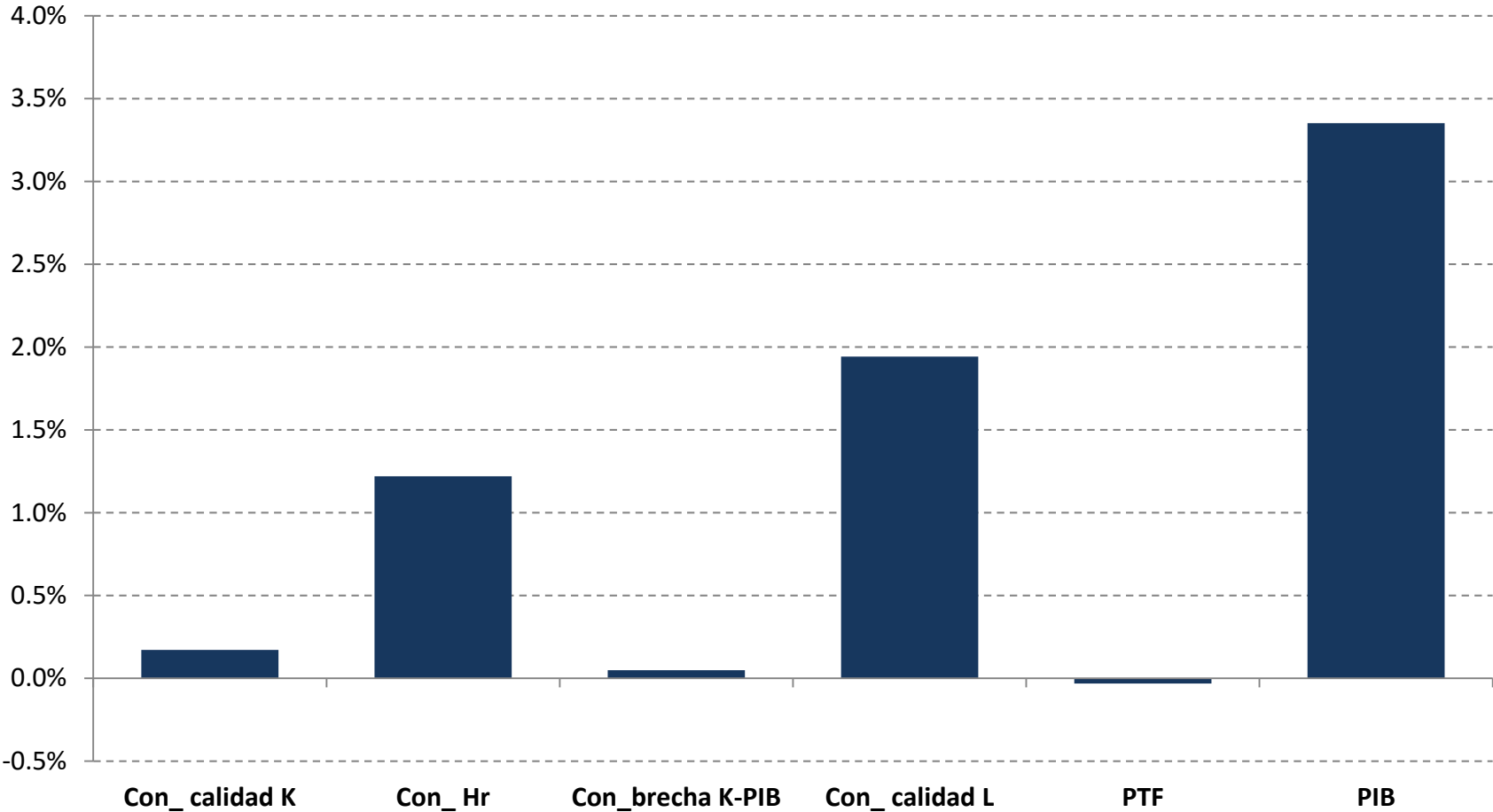
Results (preliminary)

Potential medium-term growth of GDP for Latin America



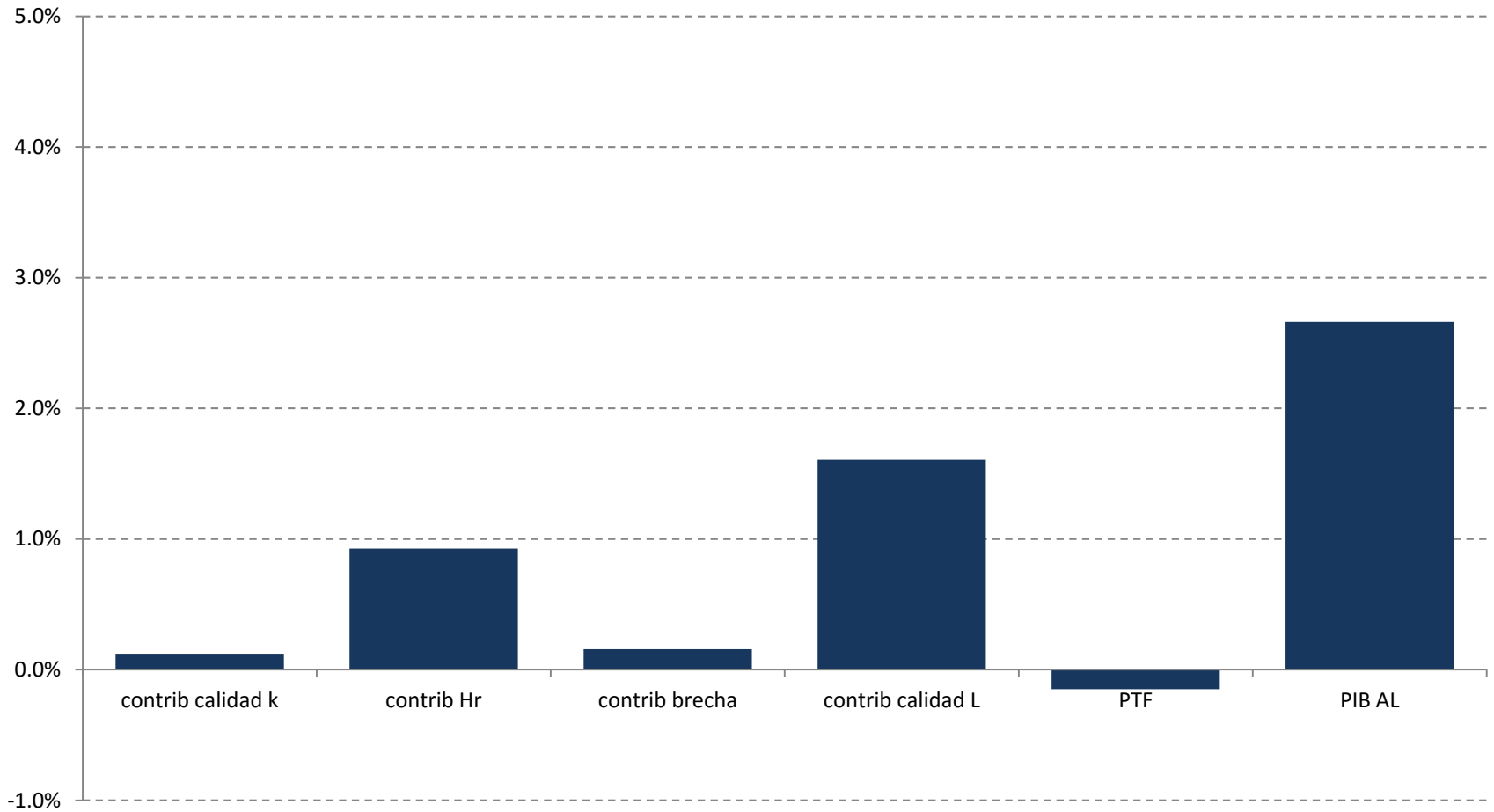
Results (preliminary)

Determinants of potential medium-term growth of GDP in Latin America



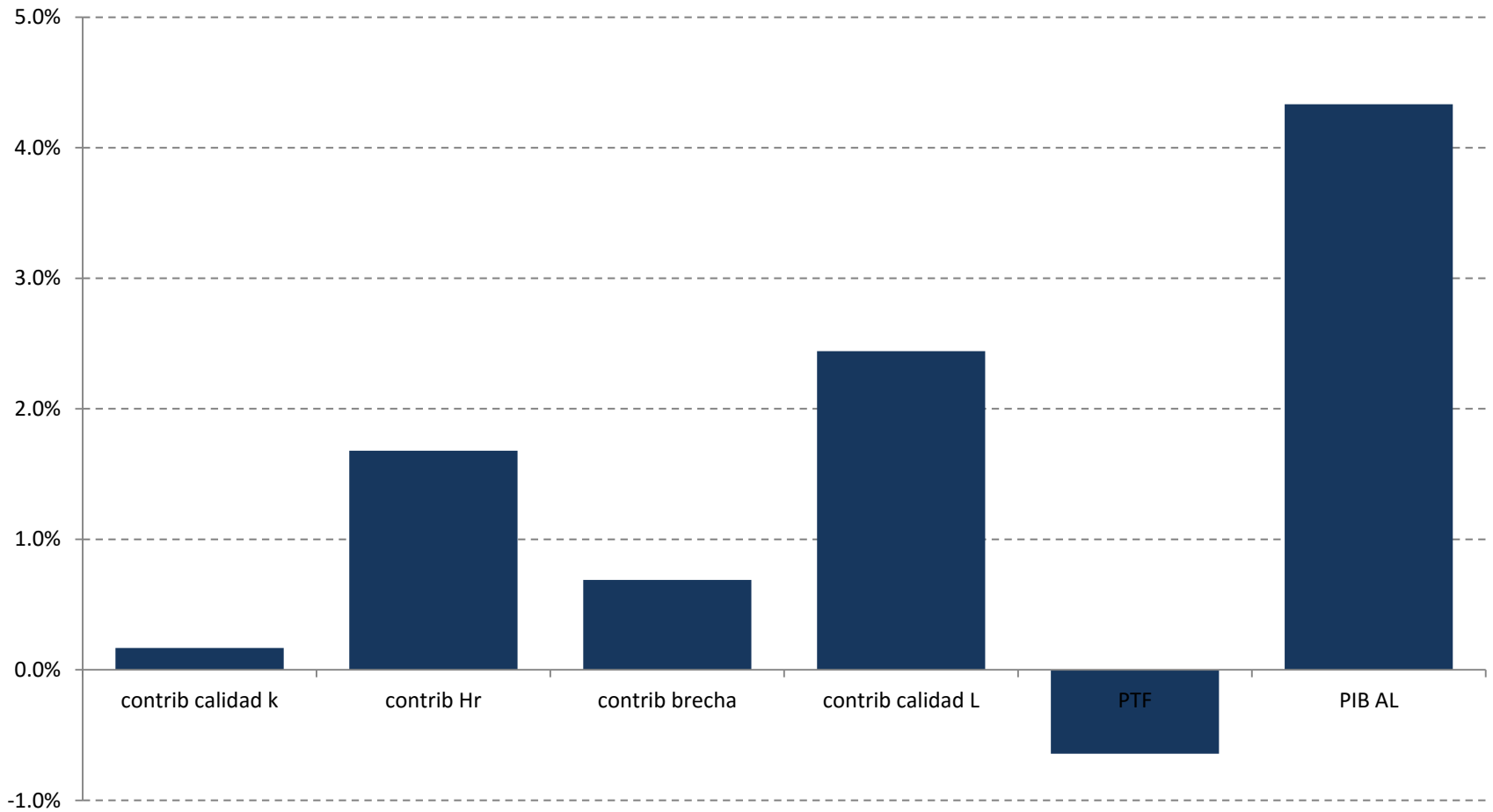
Results (preliminary)

Determinants of potential medium-term growth of GDP in Brazil



Results (preliminary)

Determinants of potential medium-term growth GDP in Mexico



Conclusions

- Potential growth increased in almost all countries of Latin America during the first half of this decade (2010-15), but will probably fade over the next five years for reasons such as the global economic slowdown and China's role in it.
- Some have to do with the accumulation of productive factors. The weakening of investment, due to a further tightening of global financial conditions and a reduction of income related to the raw materials, leading to bleak prospects for capital accumulation.
- In addition, the contribution of labor to growth is being limited by the inability to increase the participation of formal labor, reducing unemployment rates and the aging of the population.
- Finally, as economies slow, growth in productivity may decline because the production factors will be used with less intensity.