

## **Strengthening long-term growth in Argentina<sup>1/</sup>**

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## I. Introduction

The decline of Argentina per capita GDP relative to developed and other developing economies has been documented by many analysts. The deterioration started during the 1930's but became evident during 1975-1990 when per capita GDP declined at an annual pace of 0.7% in real terms. Extreme macroeconomic volatility was one crucial factor as the country suffered three hyperinflation episodes during that period (1975-76, 1989 and 1990).

In 1991 the country adopted several market-oriented reforms together with a Currency Board. Argentina enjoyed several years of relative high-growth despite the 1995 economic recession triggered by the Tequila crisis. However, inconsistencies between fiscal decisions and the rigidity of the Currency Board became evident when the country suffered two negative external shocks: a decline in commodity prices and the 1999 sharp depreciation of the Brazilian Real. At the beginning of 2002 the country abandoned the hard peg and defaulted on the sovereign debt after a bank run forced the government to introduce restrictions on deposit withdrawals. GDP contracted almost 11% in 2002 and poverty reached a record-high of 52% of the population.

After the crisis many of the reforms of the 1990's were reversed. For example, a) energy and transport prices were virtually frozen in nominal terms and thus fell sharply in real terms. Some utilities were nationalized and public investment in infrastructure became more important, compensating in part for sluggish private investment related to poor investment incentives; b) private pension funds that were responsible for administering contributions of about 90% of formal workers were nationalized at the same time that a generous tax amnesty increased substantially the number of pensioners by allowing the elder to retire even if they had made no contributions to the Social Security System. This decision reduced the worker/pensioner ratio from 2.7 to 1.5; c) labor regulation became more restrictive starting from an already relatively inflexible regime; d) government expenditures climbed by more than 10% of GDP in a few years financed mainly by soaring revenues obtained from new taxes on exports and on financial transactions; e) annual inflation increased to around 20-25%; f) price controls and non-tariff restrictions on imports were introduced either by law or by moral suasion. Finally, official and private sector estimates of inflation have increasingly diverged since the end of 2006. More recently, the private sector has also raised doubts about official income, poverty and unemployment statistics.

In spite of these relatively dirigiste economic policies investment increased to over 21% of GDP and the country has enjoyed high growth rates since 2003. The macroeconomic fundamentals improved, especially after the restructuring of the public debt in default that reduced the total size of the debt and extended its maturity. For many years Argentina showed fiscal and external surpluses favored by an important improvement in its terms of trade due to the world recovery in commodity prices. But many countries in the region have benefited by more favorable terms of trade and their growth performance is not much better than Argentina's even though they seem to apply better-designed macroeconomic and growth policies.

In this paper we will explore: a) the recent growth performance with an analysis of the income gaps with OECD and other developing countries, broken down into labor resource utilization and

labor productivity; b) whether or not macroeconomic fundamentals have improved; c) if the climate for growth is adequate compared to other countries (e.g. by analyzing Argentina's strength and weaknesses in the World Bank and World Economic Forum rankings) complemented by an analysis of the current status of infrastructure and the tax system and some indirect analysis of the efficiency of a relatively large government participation in the economy; d) labor markets reasons for the relatively low labor resource utilization, including labor market rigidities (e.g. employment protection, working time regulations, the quality of education) and informality (role of the large informal sector in Argentina for productivity growth); e) an empirical assessment of growth taking into consideration the slack in 2002 and gains in Terms of Trade since then. Finally we conclude.

## II. Argentina's growth performance

### *Recent studies*

Sanchez and Butler (2007) mention three phases in Argentina's medium run growth trajectory: 1960-1974 when average growth annual rate per worker was 2.3%, 1975-1990 when it contracted at an average annual rate of 0.7% and 1991 to 2006 when it increased to a mediocre 1.5%. This was accompanied by an equally lackluster TFP growth. Stagnation was not followed by a period of catch-up growth. Moreover, "the periods of growth spurts are mainly explained by factor utilization, and relatively little by TFP and investment, especially the latter...". The Argentine case fits relatively well the framework of Edwards (2007) for Latin America: Positive Terms of Trade shocks lead to a short-run acceleration in growth, but later current account reversals (triggered either by external factors or inconsistencies in the domestic policy mix) have a significant negative effect on short-term growth. Chisari et al (2007) point out that growth interruptions in Argentina have been explained by fiscal imbalances, financial distress or sudden changes in external conditions.

From 2003 to 2007 Argentina enjoyed fiscal and external surpluses that according to Sanchez and Butler (2007) and Chisari et al (2007) should reduce the risk of a current account reversal. However, both surpluses have deteriorated since then and the consolidated fiscal position of the federal and provincial governments shows a moderate deficit since 2008 and the current account surplus is likely to disappear by the end of 2011 (see FIEL FMF forecasts).

Sanchez and Butler (2007) conclude that the most binding constraints to growth<sup>1</sup> are poor protection of property rights that lead to low appropriability of investment returns and a poor investment climate,<sup>2</sup> coordination and information failures that prevent and adequate exploitation of modern export activities,<sup>3</sup> and poor infrastructure.<sup>4</sup> They also point to macroeconomic risks if

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<sup>1</sup> In a Hausman, Rodrik and Velasco (2005)'s framework.

<sup>2</sup> As suggested by Argentina's relative poor position in indicators of institutional quality (especially in rule-of-law and control of corruption), and the difficulties that Argentine firms have to pass their investments in intangible assets to a bigger market value.

<sup>3</sup> The authors find evidence that Argentina has opportunities for developing more valuable export activities but fails to do that because there is little diffusion of new export activities and private entrepreneurs are more ready to discover when they can introduce barriers to entry. Moreover, low research and innovation seem to be a constraint

there is a reversal in the terms of trade. If this were to happen domestic savings would be reduced and investment financing might be affected. Aside from that, they found some evidence that the 2002 devaluation together with the public debt restructuring allowed for an increase in public savings.<sup>5</sup>

Chisari et al (2007) argue that macro instability tends to induce growth collapses in Argentina, which often induces abrupt changes in property rights and increases in public spending as the government seeks to limit the damage for the population. Basically, macro shocks end in abrupt changes of relative prices and in large redistributions of income increasing the chances that some economic agents are close to bankruptcy. Large parts of the population then demand ex-post social insurance that worsens the fiscal position; then large portfolio shifts occur when investors perceive that the rules governing contracts will be changed to protect debtors, banks or the state. Therefore, binding constraints to growth are “low returns to economic activity caused by poor protection of property rights and, on the other hand, high costs of finance caused by poor local intermediation”. There are no important constraints in human capital and while infrastructure is a constraint, those arising from weak protection of property rights are more binding.

The current acceleration of growth (after 2003) was triggered by improvements in savings and investment and a more stable macro environment. Investment is higher than in the 1990’s and the country still has a current account surplus. Lower macro risks resulted in external and fiscal surpluses. The improved macroeconomic stability has also improved the appropriability of investment returns. However, the authors point out that there are weaknesses like the high reliance on distortive taxes, latent social conflicts, pending adjustments in relative prices, the risk of a terms of trade deterioration, and a reduction in self-generating funds due to an appreciation of the (weak) real exchange rate.

Summing up, these studies argue that the main growth impediment in Argentina consists in poor investment incentives due to macroeconomic instability and poor protection of property rights, with the rules of the game frequently changing after crises. We will confirm below that poor protection of property rights and inefficient regulations did not improve even after the economy and employment recovered from the 2001-2002 crisis; positive external factors were powerful enough to more than offset their negative effects on growth.

### ***Growth and income gaps***

Table 1 compares Argentina’s growth performance from 1960 to 2008 with other countries in South America and with a sample of 95 countries of different levels of development with available information since 1970 (86 countries since 1960). It follows from Table 1 that:

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to TFP growth (e.g., barriers to diffusion of new technologies because the country failed to acquire the levels of trade and FDI integration with high knowledge countries as a consequence of protectionist policies).

<sup>4</sup> Especially in energy due to artificially low tariffs to end users.

<sup>5</sup> High domestic savings are another explanation for the authors’ finding that international finance is not currently a binding constrain on growth. High domestic savings reduce the risk of a “sudden stop”.

- a) Argentina's long-term per capita growth rate was half of the rate achieved by High-Income countries either if the initial period is 1960 or 1970. Brazil and Chile were able to match the performance of richer countries because they enjoyed some periods of catch-up growth (the 1960's in Brazil and after the mid-1980's in Chile, Figure 1).
- b) Argentina performed better since 1990 with average per capita real growth of 3.2% per year, similar to Peru which is another country that had a dismal performance during the previous decades. However, in Peru the current decade was much better than the 1990's (Figure 1).<sup>6</sup>
- c) During the period 2000-2008 Argentina was able to maintain the 3.2% path of the 1990's recovering from the deep crisis of 2001-2002. Per capita growth from 2002 to 2008 averaged 7.5% a year, although part of the explanation is the effect of the recovery in spare capacity and the reduction of unemployment that peaked 24% in 2002.

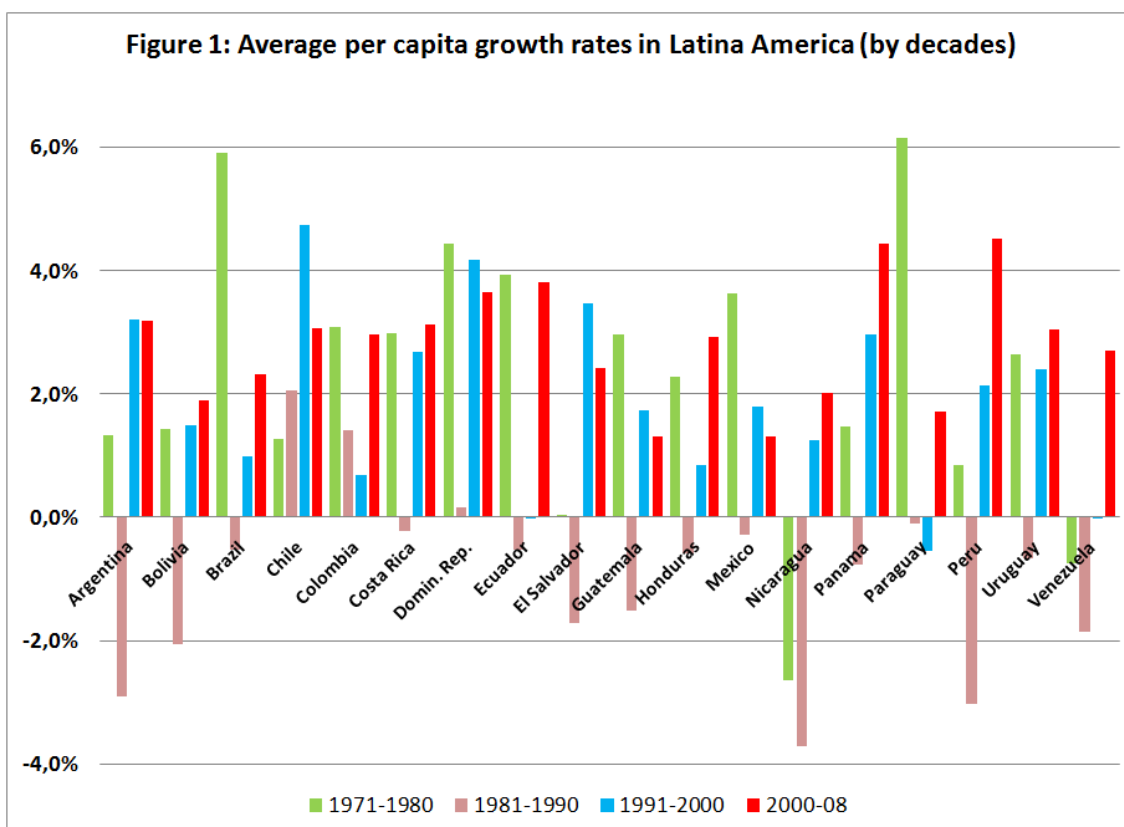
There is still a puzzle because as mentioned above the government adopted many policies that are usually considered negative for growth (see Sections III to V). In Section VI we provide some evidence that strong tail winds contributed substantially to Argentina's recent growth performance.

Groups of countries 1/	No. of countries		Income Range	1960- 2008	1970- 2008	1990- 2008	2000- 2008
	In 1970- 2008	In 1960- 2008					
High Income	30	26	> 11455	2,68%	2,23%	1,88%	1,85%
Upper middle Income	19	18	3706-11455	2,41%	2,14%	2,37%	2,80%
Lower middle Income	28	25	936-3705	1,96%	1,95%	2,51%	3,05%
Low Income	18	17	< 936	0,10%	-0,24%	0,28%	1,61%
All Sample	95	86		1,90%	1,66%	1,86%	2,35%
Argentina	Upper middle Income		7190	1,33%	1,07%	3,21%	3,19%
Bolivia	Lower middle Income		1460	0,56%	0,62%	1,68%	1,89%
Brazil	Upper middle Income		7300	2,37%	2,14%	1,58%	2,32%
Chile	Lower middle Income		9370	2,56%	2,77%	4,00%	3,07%
Ecuador	Lower middle Income		3690	1,59%	1,68%	1,67%	3,81%
Paraguay	Lower middle Income		2110	1,74%	1,78%	0,46%	1,73%
Peru	Upper middle Income		3990	1,20%	0,91%	3,20%	4,53%
Uruguay	Upper middle Income		8260	1,48%	1,78%	2,68%	3,04%
Venezuela, Rep Bol	Upper middle Income		9230	0,20%	-0,14%	1,19%	2,70%
Average South America, excluding Argentina			5676	1,46%	1,44%	2,06%	2,89%

1/ Countries are grouped according to its income level as defined by the World Bank (Atlas method)

Source: Own based on World Development Indicators.

<sup>6</sup> If 1997 is taken as the base year (1997 is the last year before the Asean and Russian crisis affected the region) Argentina's average per capita real growth to 2008 is still 3%.



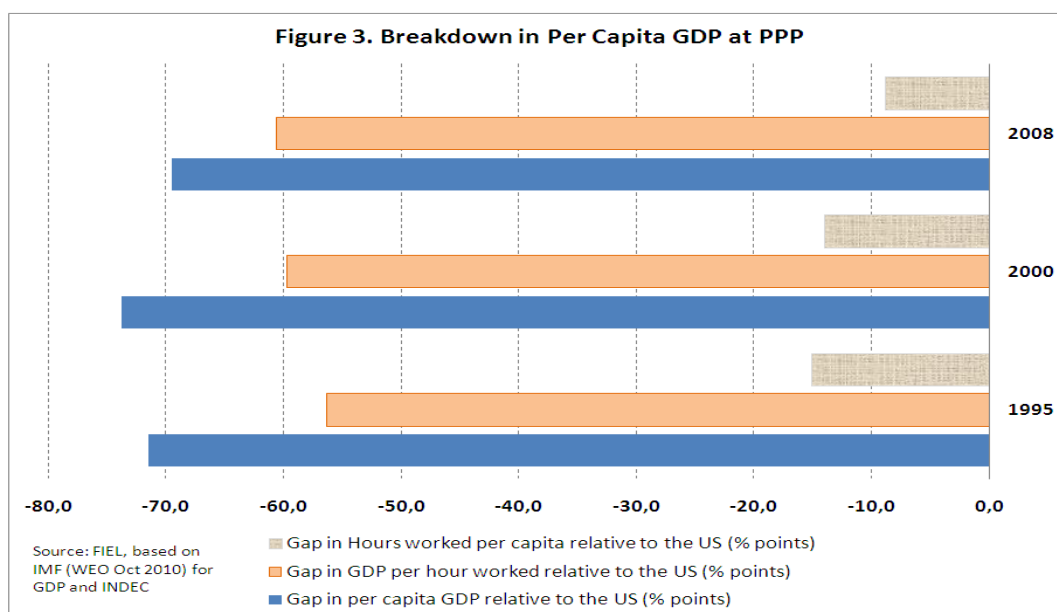
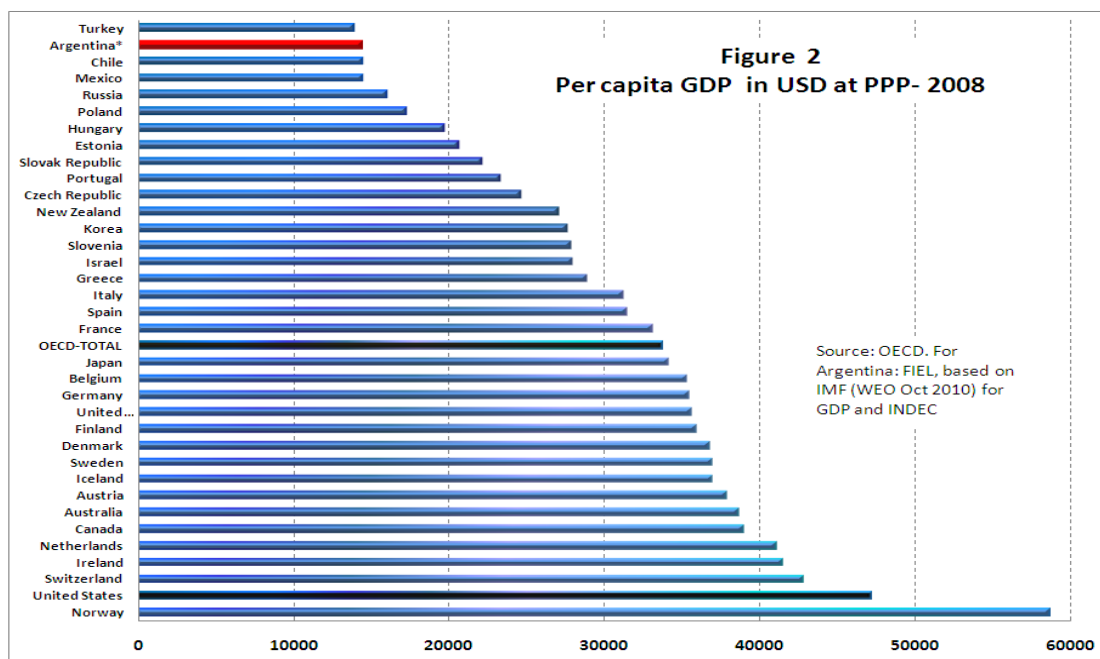
### *Income gaps with OECD countries*

Per capita GDP of Argentina at purchasing power parity (PPP, 14410 USD in 2008) ranks relatively low compared with richer OECD countries (Figure 2), grouping at the bottom of the table with other Latin American countries (Chile and Mexico) and Turkey.

The income gap with the US –calculated at PPP- remained close to 70% (Figure 3) in the past 13 years, as a result of lower productivity and labor utilization. However, labor utilization converged somewhat as the gap in per capita hours worked- declined from 15% in 1995 to 14% in 2000 and to 9% in 2008. In spite of such a reduction relative to 1995, by 2008 the labor force participation rate in Argentina was still 2 percentage points lower than in the US and the average number of hours per worker (about 1530 hours) some 13% lower.

Several factors contributed to the reduction including the halving of unemployment rates in Argentina (from over 16% to 8%), a decline in per capita hours worked in the US (per capita hours worked declined from 877 in 1995 to 853 hours in 2008), and a rise in the same variable in Argentina (from 573 hours in 1995 to 661 in 2008). The rise in hours per head of population in Argentina combines a modest decline in hours per worker (-2.8% compared to 2% in the US in the period), with a rise in employment over population growth (2.4% average compared to just 1%). The modest decline in hours per worker in Argentina is due to a 4 percentage point rise in

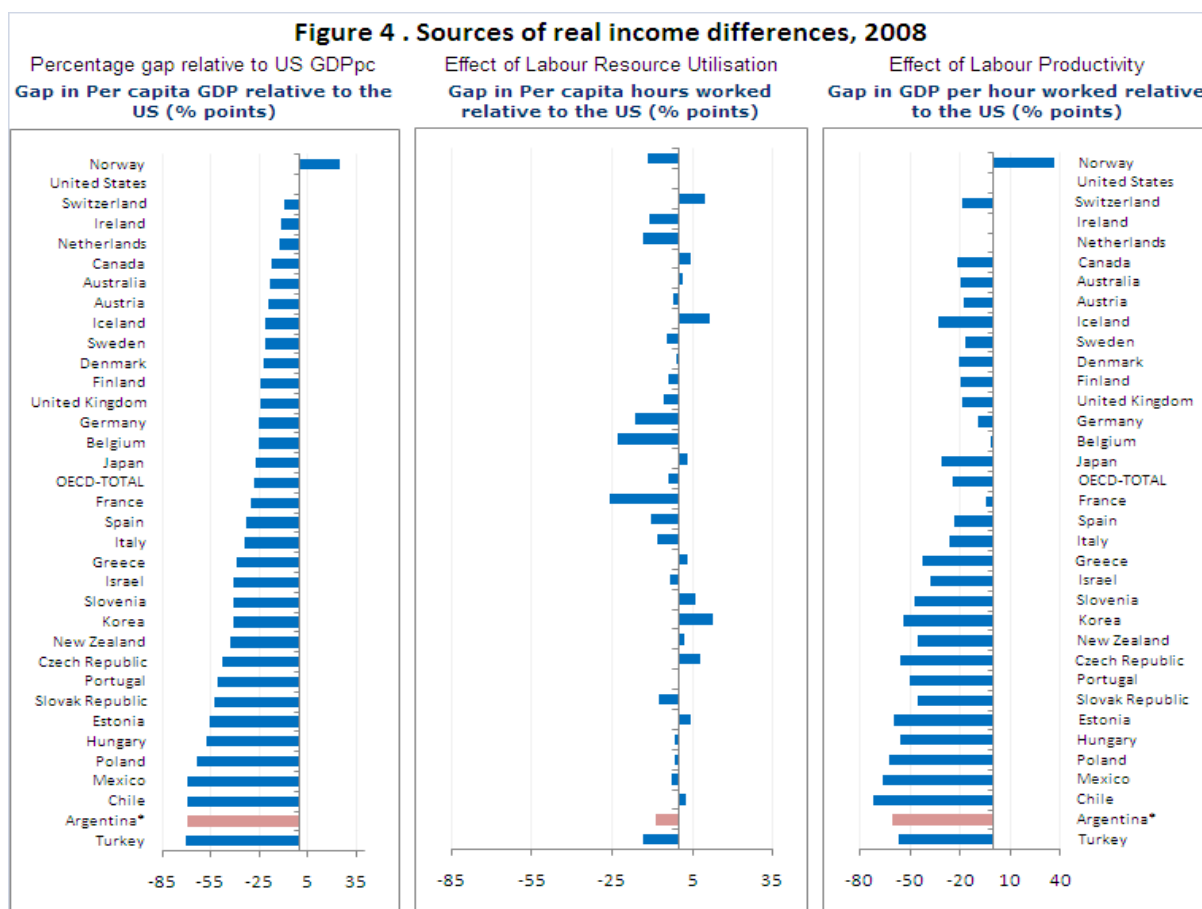
the labor force participation rates of women, who are more likely to work part time than men (about half of women worked part time in 2008, up from 46% in 1995, relative to 22% for men).



Differences in productivity –as measured by the gap in GDP per hour worked- widened from 56% in the mid 90’s to over 60% in 2008. The contribution of productivity differences to explain income gaps increased from 79% (1995) to 87% (2008). The relative position of Argentina in 2008 vis-à-vis OECD countries in labor utilization and the productivity gap is depicted in Figure



4. The gap in labor resource utilization (9%) is relatively high, compared with the average for all OECD countries (4%).



Source: OECD and FIEL for Argentina (IMF and INDEC)

Although the activity rate of Argentina (the ratio between economically active population and total population) is similar to the average OECD rate, the country has a lower ratio of working age to total population (3 percentage points) and a lower number of hours worked per employee. Other LA countries in the sample, Chile and Mexico, have a lower labor utilization gap (2.6% and -2.9%, respectively). The productivity gap relative to the US (69.5%) more than doubles the average for OECD countries (-24%), although it is close to the one observed in Chile (72%) and in Mexico (66%).

If labor is mobile, distortions in capital allocation should be reflected in distortions in labor allocation too, affecting overall productivity. We study whether we observe major misallocation in the labor market, following a shift-share analysis (see Hopenhayn and Neumeyer (2002) and (2004)). In a shift-share analysis labor productivity decomposes into three components:

- i) within-sector or shift component, which is a weighted average of the increment in labor productivity of each sector, using the initial labor shares (which is a weighted average of TFP-total factor productivity-, capital stock per worker and average human capital in the sector assuming constant returns to scale). This term should explain 100% of the variation in output per capita under balanced growth.

ii) between-sector or share component, that is, the growth in GDP per worker corresponding to the reallocation of labor across sectors. If labor goes from sectors with low to high labor productivity, the term should be positive; and

iii) an interaction effect, which is negative if labor goes from a sector with growing average productivity to sectors where output per worker is falling.

The information needed to perform this analysis is time series evolution of GDP at sector level and employment at sector level. The analysis is constraint to a relatively short period of time (1986/2008), and this is a limitation for the study. We split the sample period (1986-2008) into five periods: 1986/90, 1990/95, 1995/00, 2000/05 and since 2005 to the present (2009).

<b>Average annual contributions</b>						
	<b>1986-1990</b>	<b>1990-1995</b>	<b>1995-2000</b>	<b>2000-2005</b>	<b>2005-2009</b>	<b>2000-2009</b>
<b>Shift (within sector)</b>	-4,40%	2,85%	1,36%	-0,04%	2,78%	1,28%
<b>Share(between sectors)</b>	0,94%	1,19%	-0,02%	0,04%	0,66%	0,33%
<b>Interaction</b>	-0,30%	-0,51%	-0,54%	-0,20%	-0,11%	-0,25%
<b>Total</b>	-3,77%	3,53%	0,80%	-0,21%	3,33%	1,36%

Fuente: Own based on Indec and FMF FIEL for 2008-2009

The 80's were a decade of strong decline in productivity, as measured in the period 1986/90 by a -3.8% yearly fall in the "total" index, the main factor being a strong decline in every sector –as indicated by a -4.4% fall in the "within sectors" component- in spite of some positive impact of structural changes in employment (0.9%, "between sectors" component) (Table 3). Productivity recovered in the first part of the 90's both by changes in productivity at the sector level and by structural changes that modified the composition of employment. The "between sectors" component is usually lower in developed countries (US) and higher in emerging economies (Chile). In the case of Argentina the "between sectors" factor declined to relatively low levels after 1995.

With the crisis in 2001/2 sending most activities to very low utilization rates and the strong recovery in demand (and use of capacity) since 2003, the "within sector" component became the main factor to explain productivity growth in the 2000's, although at a rate below the one observed in the US (over 2.2% in 2000-06). The interaction effect was negative in all periods, pointing to the reallocation of labor to sectors with relatively lower growth in productivity.

If we focus on the period 2005-09 the results are similar to those observed during the first part of the 1990's.<sup>7</sup> The "within-sectors" component accounts for most of the growth observed in labor productivity suggesting a common driver to most of the economic sectors. This is consistent with

<sup>7</sup> However, the first part of the 1990's was characterized by important transformations in the economy, while in the period 2005-09 the key driver were improvements in external factors. More favorable terms of trade (like TFP gains) that benefit the economy should be reflected in a large participation of the "within-sectors" component.

a recovery in exports prices that favored agricultural activities, a boom in Brazil that favored manufacturing and a positive spillover effect to non-tradable activities.

### **III. Macroeconomic policies adopted during and after the 2001-2002 crisis**

The 2001-2002 crisis included the conflictive departure from a Currency Board with the mandatory renegotiation of contracts denominated in foreign currency, the default on the Federal Public debt and a financial crisis with restrictions on deposit withdrawals and government support to the financial institutions through bonds that compensated the banks from the consequences of the government decision to convert deposits denominated in foreign currency at a rate of 1.4 pesos per US\$, while loans denominated in foreign currency were converted to pesos at a 1 to 1 ratio.<sup>8</sup>

Capital flight soared and the peso lost about two thirds of its value but the macroeconomic conditions stabilized because: a) the government was able to run a primary surplus thanks to the introduction of taxes on exports in 2002 and the erosion of wages and pensions in real terms. Moreover, other tax revenues also improved as the economy was recovering.<sup>9</sup> A better fiscal outlook allowed the government to restore public expenditures at the levels observed previous to the crisis by 2003, b) the large reduction in the value of the peso in real terms favored tradable activities that received another push from the increase in export prices and the recovery of the Brazilian economy (especially when valued at current US\$). By the end of 2005 actual GDP was similar to potential GDP. In spite of this fast recovery and unlike many similar episodes in its recent history, Argentina enjoyed a solid external surplus because of the improvement in the terms of trade.

Official and private estimates of inflation differ, but both show high inflation since 2005 onwards. Negative real interest rates are a signal of expansionary monetary policies. However, the risk of repeating another episode of hyperinflation is low in Argentina, at least in the short-run. Previous episodes of hyperinflation were associated to high government deficits that were monetized and to capital flight that forced a sharp reduction in the value of an overvalued Argentine peso. This is not the case today. The government is running a moderate deficit and the peso is still undervalued.

Summarizing, there was an “excessive” adjustment during the 2001-2002 crisis when panic (capital flight at about 10% of GDP) aggravated the decline and contributed to a large overshooting in the real exchange rate. At the same time, more favorable external conditions allowed the economy to maintain twin surpluses, both in the fiscal and external fronts, in spite of the rapid recovery.

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<sup>8</sup> During the Currency Board, most deposits and loans were denominated in US dollars.

<sup>9</sup> There were other tax increases: in 2001 the reintroduction of a tax on financial transactions and since 2002 the lack of indexation of the income tax that was positive for the government because of bracket creep and because most investment was financed with equity.

But the fiscal surplus was gradually reduced to become a deficit in the provinces since 2007 and in the Federal government since 2009.<sup>10</sup> Although it was logic to run a deficit in 2009 amidst a recession, the fiscal position should gradually return to equilibrium as the economy recovers. The fact that this is not happening is one explanation for the expected reduction in the current account surplus (Figure 5).

However, in the case of Argentina it is necessary to dig more in the fiscal numbers to evaluate the fiscal stance. Traditional estimates using the IMF methodology suggest that actual policies did not depart much from a structural balance.<sup>11</sup> The problem with this definition is that is not prepared to address cases when the size of government suffers important changes. In other words, to qualify as prudent a fiscal policy that maintained a surplus but at the same time encouraged an expansion of the size of government in about 10% of GDP (compared with what was the norm before the crisis) requires additional analysis. For example, the boom in tax revenues that financed the expansion of government expenditures could have been used to reduce high-distortive taxes.<sup>12</sup>

In spite of the return of deficits the fiscal picture is not too problematic (at least compared with the situation in developed countries). The restructuring of the Federal government debt reduced both its size and extended its maturity. As of June 2010 the Federal debt was 48.6% of GDP, but when the holdings of other public agencies (Central Bank, the public pension system and public banks) are net off, the gross debt with the private sector and bilateral and multilateral agencies is reduced to only 24.2% of GDP.<sup>13</sup> Assuming a “genuine” primary balance from 2012 onwards and a gradual decline in the inflation rate the public debt has a downwards trajectory that is likely to be sufficient to absorb the one-off effects of several unsettled claims.<sup>14</sup>

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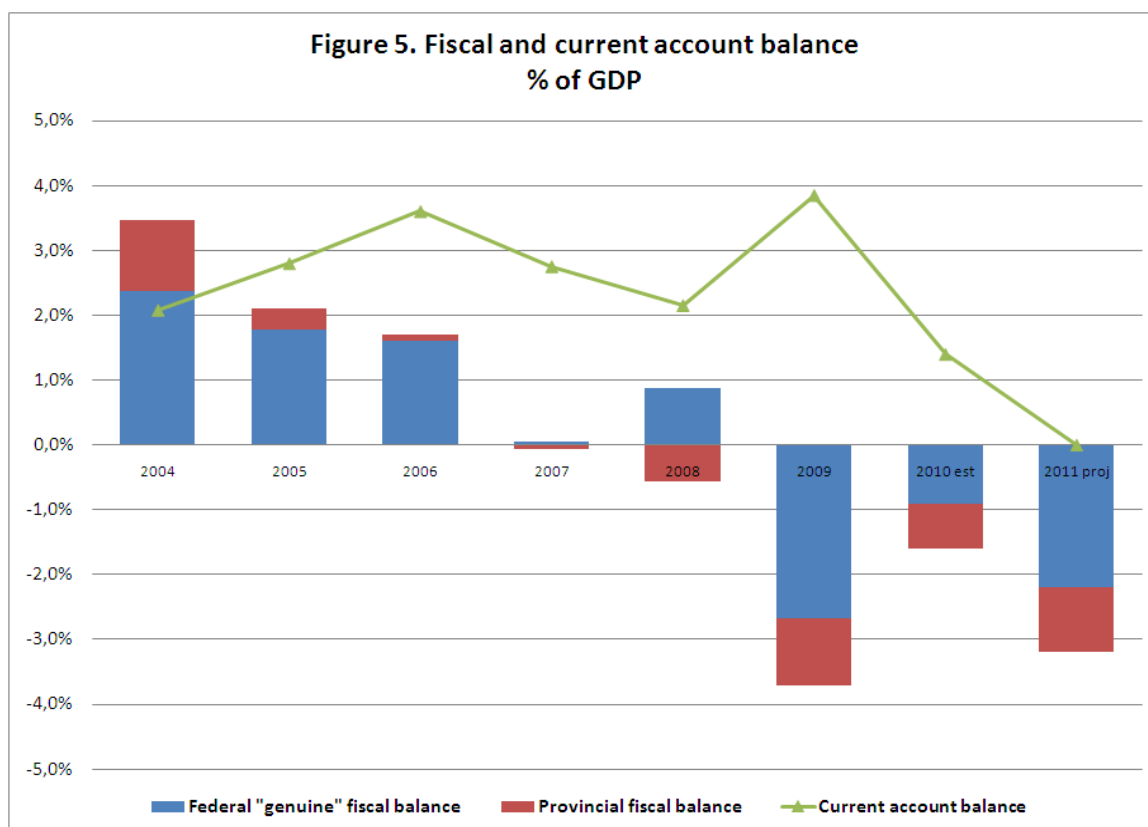
<sup>10</sup> A “genuine” fiscal balance is estimated by subtracting from the official information some revenues that should be classified as financing sources: i) the transfer received from the IMF in 2009 because of its enlargement of capital, ii) transfers received from the Central Bank that mostly reflect the collection of the inflation tax, and iii) valuations gains in the assets of the public pension system that are mostly explained by its holdings of public bonds.

<sup>11</sup> When commodities make a visible contribution to tax revenues as is the case of Argentina where taxes on export contribute with about 3% of GDP (and this ignores the secondary effect of high prices on other taxes), it is necessary to add to the traditional definition of the fiscal stance the creation of a savings fund (like the Chilean copper fund) where temporary increases in prices are saved. This requires the estimate of long-term prices. This can be based on experts’ opinion (as it is done in Chile) or on moving averages of past prices.

<sup>12</sup> Argentina’s tax mix relies more than other countries on distortive taxes. For example, the financial transaction tax (that is not used in advanced economies) is 120 basis points, three times larger than Brazilian tax that was repealed in 2008. Export taxes also hit exports of manufacturing products. The VAT rate at 21% and the company income tax rate at 35% are higher than the average of Advanced Economies.

<sup>13</sup> This figure includes the debt in arrears with the Paris Club but excludes the hold outs that did not participate in the debt swaps of 2005 and 2010.

<sup>14</sup> For example, there are pending claims from pensioners that include payments of past years that are likely to be settled with bonds and the government has lost some cases in International Arbitral Tribunals that may also be settled with bonds.



#### IV. The business climate and government efficiency

Box 1 summarizes the findings of a study about revenue effort. The characteristics of each economy may help the government in raising revenues. For example, when financial deepening is high the tax agencies can trace evaders more easily, or when transparency is low it is more likely that corruption may reduce the government take. In a previous study<sup>15</sup> we estimated what are the relevant variables that explain revenue effort in a cross-section of developed and developing countries. We use the econometric results to forecast what revenues would be according to each country's characteristics. We found that Argentina was collecting in 2009 about 50% more than what its characteristics would suggest. In the region only Brazil and Bolivia have similar "excesses". This suggests that either tax rates in Argentina are higher than in other countries or that the country relies more on taxes less used by others. There is evidence of both, which is consistent with the complaint of firms that point out that taxes are an obstacle for investment (see below).<sup>16</sup>

<sup>15</sup> See Artana and Templado (2010).

<sup>16</sup> Argentina's tax system changed substantially in recent years and collections soared. When the three levels of government are included total revenues (i.e. tax and non-tax) reached 37.5% of GDP in 2009 about 50% higher than in the 1990's. Most of the increase in revenues is explained by new taxes introduced during the macroeconomic crisis of 2001-2002 (e.g. taxes on exports and on financial transactions) and by increases in effective tax rates (e.g. the lack of indexation of the income tax in an economy with annual inflation over 20%, or rate hikes in sub-national taxes).

Government expenditures of the General Government increased pari passu with the large jump in revenues from 27.5% of GDP in 2003 to 36.2% of GDP in 2008 (Table 4). About 50% of the increase is explained by higher social expenditures<sup>17</sup> and about 40% by higher public investment in infrastructure and assistance for the development of target economic sectors. Part of the increase was a “normalization” of the drastic reduction than inflation forced in 2002 and 2003, but the level of 2008 was more than 6% of GDP over the average of the period 1990-1999. The rising trend in government outlays continued during 2009 and 2010 but detailed information of those years is not available yet.

<b>Table 4: General Government Expenditures in Argentina (% of GDP)</b>					
	1980-1989	1990-1999	2000-2008	2003	2008
Total Government Expenditures	33,2%	29,6%	30,8%	27,5%	36,2%
Interest on Public Debt	4,1%	2,3%	2,9%	2,4%	2,4%
Total Primary Expenditures	29,2%	27,3%	27,9%	25,1%	33,8%
General Administration, Justice and Defence	5,7%	6,0%	5,9%	5,4%	6,3%
Social Expenditures	15,1%	18,2%	18,9%	17,2%	21,8%
Education, culture and science	3,7%	4,2%	4,9%	4,1%	6,0%
Primary and secondary	2,4%	2,8%	3,3%	2,6%	3,9%
Tertiary	0,6%	0,7%	0,9%	0,8%	1,1%
Other expenditure in education	0,3%	0,3%	0,4%	0,3%	0,6%
Health 1/	2,1%	2,7%	2,6%	2,4%	2,9%
Welfare 2/	1,3%	1,7%	2,7%	3,0%	2,7%
Pensions	6,3%	8,1%	7,2%	6,6%	8,3%
Other	1,7%	1,6%	1,5%	1,1%	1,9%
Infrastructure and support to economic activities	8,4%	3,1%	3,1%	2,5%	5,6%
Energy	3,2%	0,9%	0,8%	0,3%	2,3%
Transport	2,2%	1,0%	1,3%	0,8%	2,2%
Other	3,0%	1,1%	0,9%	1,4%	1,1%
1/ Health excludes expenditures done by mandatory health insurance provided by the unions					
2/ Welfare excludes expenditures done by unions					
Memo items					
Health expenditures by unions	2,2%	2,0%	2,1%	1,9%	2,4%
Welfare expenditures by unions	0,3%	0,2%	0,1%	0,1%	0,1%
Share in total Expenditures					
Federal government	63%	50%	47%	50%	51%
Provinces	31%	40%	44%	41%	42%
Municipalities and other local	6%	10%	9%	9%	7%
Source: Own based on data elaborated by MECON					

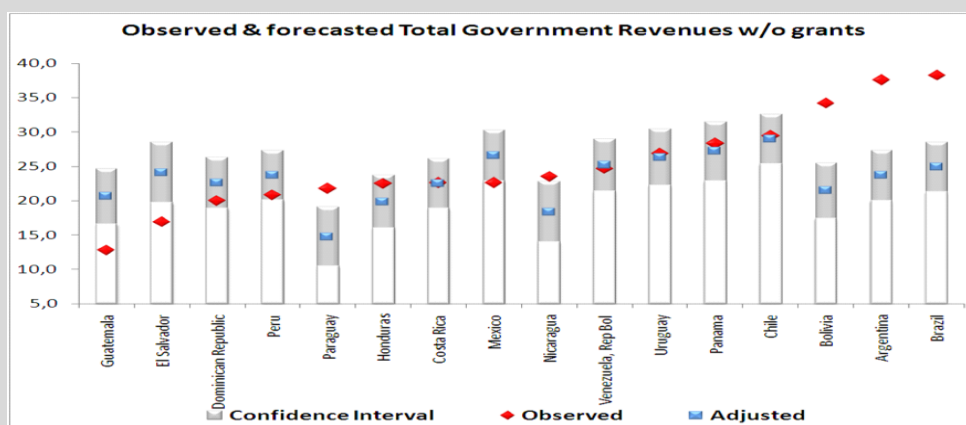
<sup>17</sup> Education and pensions explain more than 80% of the change in social expenditures.

### Box 1: Is Revenue Effort “Too” High in Argentina?<sup>1</sup>

Governments may collect revenues more easily if the country characteristics help them to do so. For example, it is accepted that more financial deepening, high per capita income, better institutions or better income distribution ease the collection of taxes, while a larger share in the economy of agriculture, a high rate of population growth and less transparency make it more difficult.

Improving the data used in previous studies we estimated what revenue efforts (total revenue excluding grants and their main components) would be according to each country’s characteristics using a sample of 118 countries of different levels of development. The results were in line with what is expected in theory.

The estimates show that Argentina is collecting much more than what its characteristics suggest. For example, in Total Revenues (excluding grants) Argentina collects 37.5% of GDP, 13% of GDP more that the point forecast and way above the forecasting range of 21.5 to 27.6% of GDP. In Latin America, only Brazil and Bolivia collect more than the forecasted revenues.



How can Argentina collect much more than what its structural characteristics allow? The answer for this question is simple: Argentina uses a poor tax mix but that is easy to collect as shown by taxes on exports (3% of GDP) and a very high tax on financial transactions (2% of GDP). Also, the income tax rate is relatively high for companies (35%), the labor tax wedge at 48% is also high, and the equivalent-VAT tax rate on consumption of adding the VAT and the turnover provincial and municipal taxes is about 30%, also very high.

<sup>1</sup> This box is based on Artana D. and I. Templado (2010).

Table 5 shows that this large size of government did not contribute much to a more equal income distribution (although the Gini coefficient improved compared to the 1990’s, similarly to what happened in other countries in Latin America). In fact, there are no countries in the sample of 62



included in Table 5 with higher government size and worse Gini coefficient than Argentina.<sup>18</sup> Apparently government expenditures are inefficient in Argentina. For example, PISA scores deteriorated between 2000 and 2006 (see section V below) while public expenditures in education as a fraction of GDP were similar in both years. And part of the increase in expenditures in Infrastructure and Support to Economic Activities include universal subsidies to energy and transport that are unlikely to improve income distribution. Cont et al (2009) estimated transfers to households in Buenos Aires and its suburbs between 2003 and 2009 originated in subsidies to the consumption of electricity and natural gas. On average, every household in the AMBA received an equivalent annual subsidy of about US\$ 2,500. The distribution of the subsidies until mid-2008, was not pro-poor or pro-low income households but rather benefited relatively more the higher deciles of income distribution. This is unsurprising given the fact that subsidies were uniform and proportional to consumption until mid-2008. In the case of natural gas, the unfair distribution against low income households was compounded by the fact that many of them (about 25% of total households, but close to 50% in the three lower deciles) did not receive a subsidy at all given that they were not connected to the natural gas network and used LPG at opportunity costs values.

Therefore, part of the “boom” in revenues could have been used to reduce or eliminate some taxes, at the same time that more efforts were devoted to improve the efficiency of government.

	No. of countries	Gini		General government expenditure (% of GDP)	
		Weighted by:		Weighted by:	
		population	GDP (PPP)	population	GDP (PPP)
OECD	26	34,8	35,4	41,9	41,5
Latin America	19	53,0	52,1	28,8	29,7
Non-Japan Asia 1/	9	41,6	42,3	18,2	19,5
Other Emerging 2/	8	40,6	40,7	31,7	31,2
Argentina	1	46,9	46,9	39,0	39,0

Source: Own based on WDI. Data are averages for 2007 and 2008 except for Argentina that correspond to 2009

1/ China, Hong Kong, India, Indonesia, Korea, Malaysia, Philipines, Singapur & Tahiland

2/ Croatia, Israel, Romania, Russia, Serbia, South Africa, Turkey & Ukraine

The World Economic Forum (WEF) includes Argentina in its Global Competitiveness Report. The last World Bank survey on firms in Argentina was done in 2006. Transparency International

<sup>18</sup> The following table shows that the share in social benefits in total primary expenditures is similar to Advanced economies and is higher than in other emerging economies.

	Wages	Social Benefits	Investment	Other
Average of Advanced Economies	25,2%	40,2%	5,5%	29,1%
Average of 19 Emerging Economies	26,7%	31,3%	15,0%	27,0%
Argentina	33,2%	41,4%	12,5%	12,8%

Source: Own based on IMF (2010).



includes Argentina on its annual Index of Transparency. With these sources of information it is possible to compare Argentina's position in several dimensions that may influence the decision to invest in the country. It is worth noting that Foreign Direct Investment is barely 1% of GDP.<sup>19</sup>

Argentina's position in the WEF Overall Index is 85 slightly worse than the Latin-American (LA) average (82) and worse than the average of High-Middle Income (HMI) countries (70).<sup>20</sup> However, its rank is supported by relative better grades in some pillars:<sup>21</sup> Macroeconomic Stability (rank 48) and is estimated using the distorted official data, Health and Primary Education (rank 59), Higher Education and Training (rank 55) and Market Size (rank 23). Argentina is in a very bad position in Institutions (rank 126, LA 99 and HMI 81), Infrastructure (88, LA 82, HMI 76), Goods Market Efficiency (124, LA 89, HMI 77), Labor Market Efficiency (123, LA 98, HMI 76), Financial Market Sophistication (116, LA 84, HMI, 68).

Consistently, in the World Bank Doing Business Argentina is ranked 118 (LA 102 and HMI 77). This is explained by poor rankings in Starting a Business, Dealing with Construction Permits, Employing Workers, Registering a Property, Protecting Investors, Paying Taxes (because of high tax rates) and Trading Across Borders.

In the Transparency Index Argentina has a bad grade, similar to African countries.

The infrastructure sector suffered a major change after the 2001-2002 macroeconomic crisis. Price controls to end users deteriorated incentives to invest and in spite of growing subsidies from the Treasury and the expansion in public investment, the capital stock deteriorated (see Box 2).

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<sup>19</sup> In 2008 net FDI flows were 0,9% of GDP in Argentina, 1.5% of GDP in Brazil, 3.4% of GDP in Colombia, about 4.5% of GDP in Chile and Perú and 2.1% of GDP in Mexico.

<sup>20</sup> Countries were grouped according to the World Bank classification.

<sup>21</sup> The WEF Overall Index is an average of 3 Sub indexes: Basic Requirements, Efficiency Enhancers and Innovation and sophistication factors. The first sub index has 4 pillars (Institutions, Infrastructure, Macroeconomic Stability and Health and Primary Education), the second has 6 pillars (Higher education and training, Goods market efficiency, Labor market efficiency, Financial market sophistication, Technological readiness and Market size), and the last sub index has 2 pillars (Business sophistication and Innovation).

## ***Box 2. Investment in infrastructure in Argentina<sup>1</sup>***

The government decision to freeze most utilities' rates in nominal terms when cumulated inflation reached 200% since 2001 and the intervention to isolate the prices received by upstream producers of petroleum and natural gas from the trend in international prices discouraged private investment in infrastructure. Based on the financial statements of 20 infrastructure firms we compared what happened with investment and its financing in the periods 1998-2000 (previous to the crisis) and 2004-2007 (after the recovery). The most salient factors are:

- Investment in the 20 firms declined from 0.9% of GDP to 0.3% of GDP.
- Profits declined from 0.5% of GDP to 0.2% of GDP. Distributed earnings that averaged 0.4% of GDP in 1998-2000, practically disappeared in the second period. Firms were repaying debt probably as a consequence of several debt restructurings of foreign debt.
- Infrastructure firms were compared with a control group of 47 firms. A dif in dif analysis showed statistical significant differences with infrastructure firms having a larger decline in the ratios EBITDA/Sales and Investment/Sales and in Dividends.
- Unlike what happened in Chile, infrastructure firms in Argentina suffered from a reduction of about half on their return on assets and reduced investment by more than in the control group of Chilean infrastructure firms.

Part of this reduction of private investment in infrastructure was compensated with more public investment. The share of private investment was 40% in 1993-2001 and declined to only 18% from 2002-2008. Public investment increased from an average of 2.3% of GDP in the first period to 3% in the second with a peak of 4.3% of GDP in 2007. The Treasury also decided to pay part of the subsidy to consumers with a budget cost of around 2.5% of GDP in recent years (another part was "paid" from suppliers' sunk capital).

Price controls and the natural depletion of the largest natural gas field reduced reserves of natural gas from 15 years of production in 2002 to 8 years in 2010. In spite of the government decision to cut exports of natural gas to neighbor countries and growing imports from Bolivia and LNG (that account for 15% of total supply), manufacturing and electricity generators suffered from periodic cuts in supply. More recently, the government recognized that the average price received by producers of about US\$ 2 per million BTU was not enough to encourage new investments and through tax breaks and other incentives allowed higher prices (in the range of US\$ 3,5 to 5 per million BTU) to new exploration projects. It is uncertain if this separation of "old" and "new" capital will be able to restore a sustainable equilibrium in the natural gas market at those prices that are much lower than the US\$ 8.5 paid to Bolivia or the US\$ 12 that cost to import LNG. Even though the government introduced differential increases in prices to end users, no consumer in Argentina is paying the long-term marginal cost of energy. For example, manufacturing is paying US\$ 3 per million BTU of natural gas and US\$ 40 per MWh of electricity.

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<sup>1</sup> This Box is based on Artana D. and R. Moya (2008), FIEL (2009) and FIEL Energy Report (several issues).

## V. Labor market institutions and education

### a) Labor regulation

Labor force underutilization -measured by open unemployment rates- rose from very low levels in the late 70's (below 4%) to a maximum in the mid 90's (17.4%) and with the 2002 crisis (22.2%), recovering to (high) one digit levels since 2007. By the same period labor force participation rates rose from less than 42% in the early 80's until it stabilized close to 46% since late 90's (Table 6).

	EAP (active population)		Employment		Unemployment
	Average growth rate	LFPR = EAP/POP (participation rate)	Average growth rate	EMPLOYED/EAP Employment rate	(unemployment rate)
1980/89	2,3	42,1	1,7	39,8	5,4
1990/99	2,4	45,0	1,8	39,6	11,8
2000/09	1,2	46,3	1,8	40,1	13,2
2010	1,1	46,1	2,2	42,5	7,7

Source: FIEL based on Household Surveys (INDEC). FIEL estimate for 2010.

Unemployment was also related –in addition to supply changes- to weak labor demand associated to a negative macroeconomic performance in the 80's, to severe shocks to relative prices and falling public employment in the 90's, and to the macroeconomic crisis in 2002. During 14 years (1993 to 2006) the average unemployment rate exceeded 9%. Labor demand surged with economic recovery in the current decade, but the elasticity of private employment (formal and informal) to GDP declined in the second half below the average in previous decades.

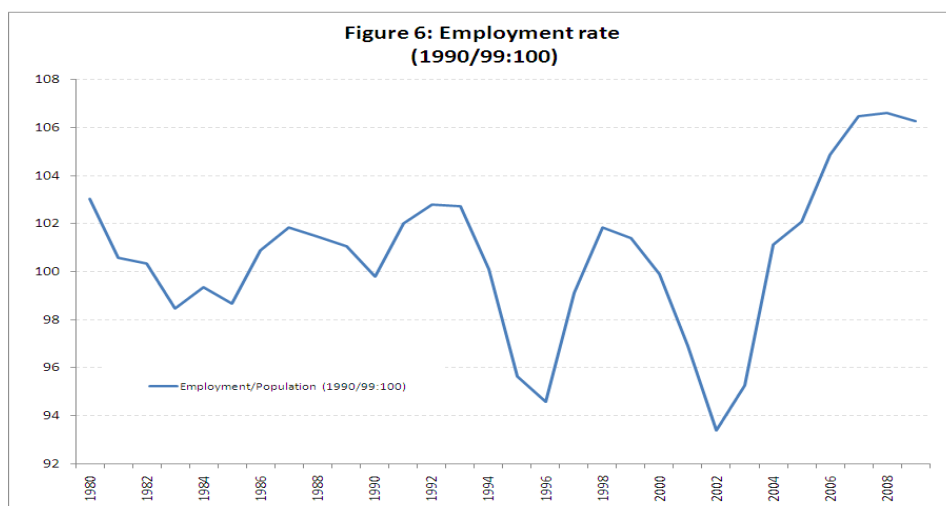
	Total	Public	Private Formal: Wage earners	Informal wage earners	Self Employed
1981/89	1,7	2,8	-1,8	5,4	2,7
1990/99	1,8	-1,1	2,0	5,5	0,3
2000/09	1,8	3,8	3,4	0,1	0,6
2010 <i>fcst</i>	2,2	6,3	1,3	0,5	1,5

Source: FIEL based on INDEC and other official sources. FIEL estimate for 2010.

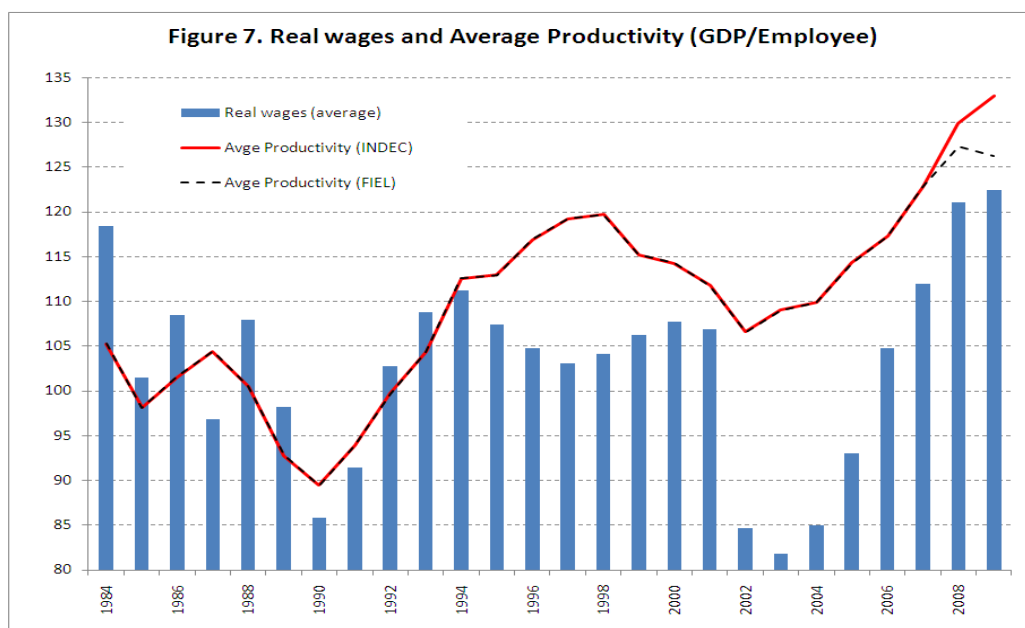
The drivers of labor demand changed from public and informal occupations in the 80's to just informal employment in the 90's, and to private formal employment in the last decade, with a strong rebound in this last period in public employment (Table 7). By 2010, an estimated 19.2% of total occupied persons (21.6% of urban workers) were employed by the public sector, up from a minimum of 14.9% (16.8% of urban employed workers) in 1998.

The employment rate (ER = Employment to Total Population) can be expressed as a function of the rising participation rate (LFPR is the ratio between economically active and total population) and the rising-then-falling rate of unemployment (U),  $ER = LFPR (1-U)$ , so that the ER rate

summarizes the evolution of labor utilization given the distribution of population. Figure 6 suggests a recovery in the rate of use of labor in the current decade, from lower levels in the 80's and 90's.



Real wages<sup>22</sup> declined with falling productivity and high inflation in the 80's (Figure 7).



In this high inflation scenario of the 80's (even excluding the year 1989 with a hyperinflation, the yoy inflation during the decade averaged 300%), wages and labor costs followed a negative trend in real terms in spite of frequent and sizeable nominal hikes. Firms were able to adjust costs in real terms by delaying payments a few days or wage hikes a few weeks. When hyperinflation stopped in the 90's after the introduction of a tough monetary rule firms loose this degree of

<sup>22</sup> FIEL estimates based on nominal wages (INDEC) and CPI inflation by INDEC (until 2006) and FIEL since 2007.

freedom to delay the impact of rising labor costs given by inflation. Labor costs and wages recovered in pesos and in dollar terms, until the huge currency devaluation in 2002 reduced real wages again to hyperinflation levels.

To assess the relative strength of labor legislation in Argentina and its impact on labor market outcomes, we calculated an Employment Protection Legislation (EPL) index following the OECD methodology.<sup>23</sup> The index summarizes employment protection described along 21 basic items grouped in three main areas: a) protection of regular workers against individual dismissals, b) regulation on temporary contracts, and c) specific requirements for collective dismissals. The index EPL1 (for EPL version 1) is the unweighted average of sub-indicators for regular and temporary contracts, except for three sub-indicators introduced since 2008 (items 9 –time to make a claim for unfair dismissals-, 16 and 17 –both on temporary contracts-). The EPL2 index is the weighted sum for the sub indicators in Version 1. Version 3 of the EPL, EPL3, is the weighted version available from 2008 incorporating all the sub indicators, and the one currently used as the main indicator for labor protection legislation. However to compare over time changes in EPL indexes one has to refer to previous versions (EPL1 and/or EPL2).

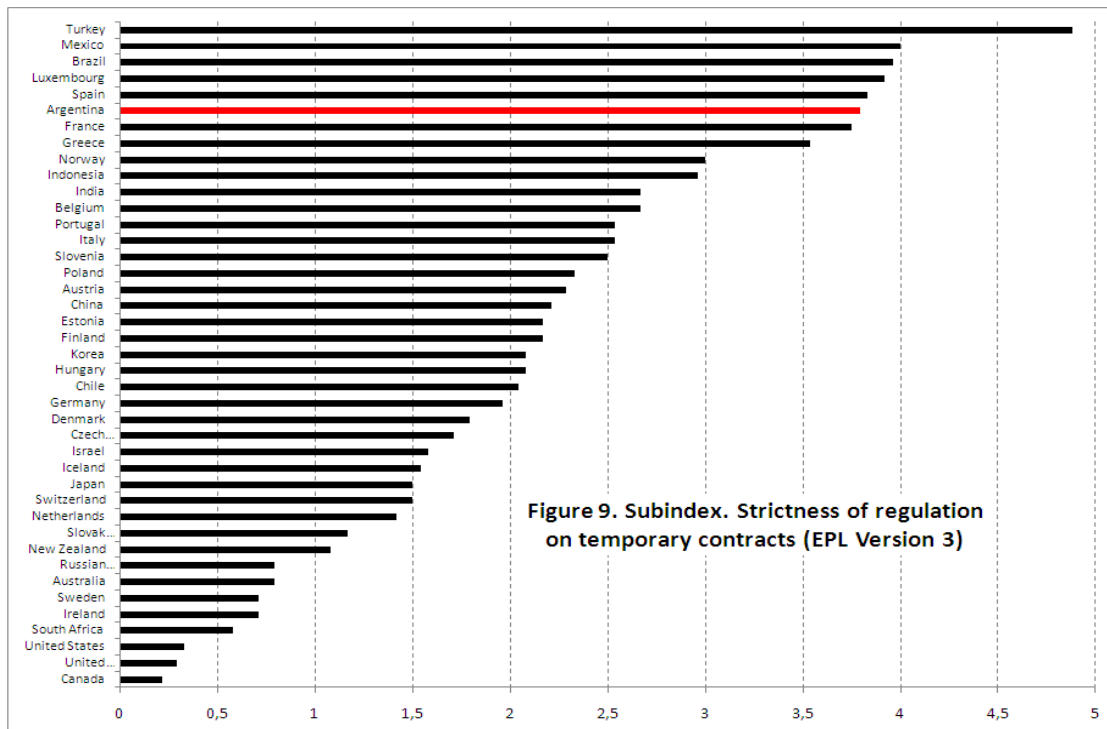
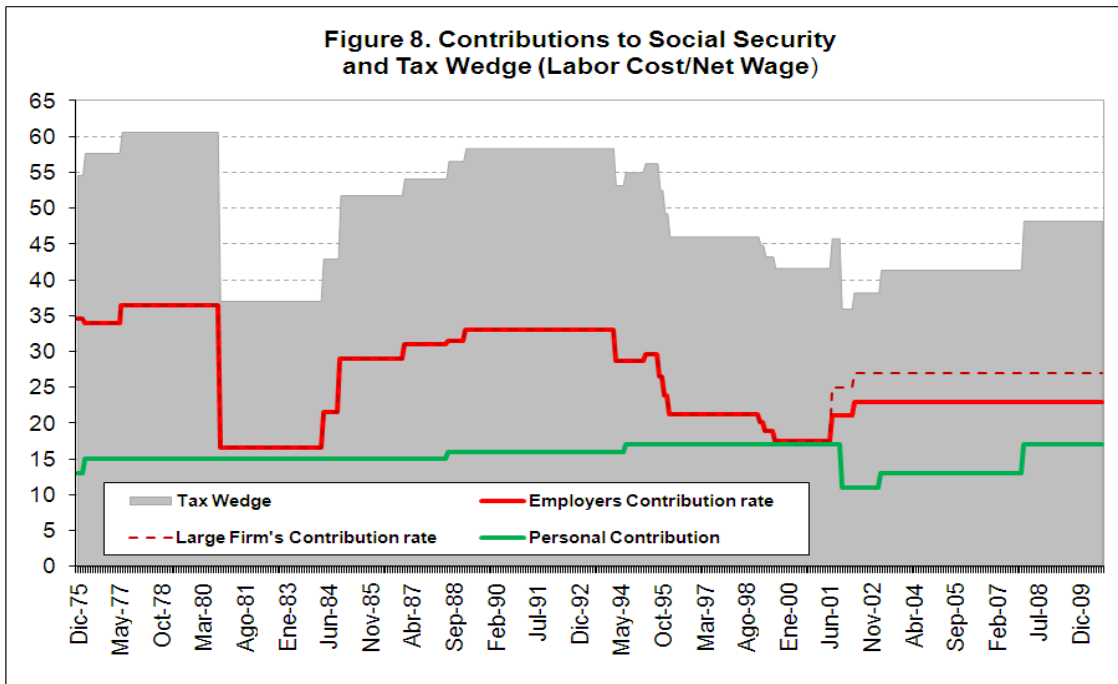
Over the past three decades the main labor market institutions included in the Version 1 of the EPL index remained unchanged except for the temporary doubling of severance payments after the macroeconomic crisis of 2002. The main changes took place in temporary contracts affecting the updated EPL3 version of the index.

Before considering the main changes observed on regular and temporary labor contracts, we focus the analysis on labor taxes –a dimension not included in protection legislation indexes-.

Payroll taxes and contributions experienced frequent changes over the period, with firm contributions oscillating in a range of 16.5 to 36.5% of gross wages. Tax policy was extremely volatile as shown in Figure 8. Changes in payroll taxes lead to changes in the tax wedge (the ratio of labor costs to net wage), even excluding other changes in income tax policy. The tax wedge ranged from 40 to 60%, until it stabilized in 48% for most firms. Taxes may vary according to several dimensions: the largest firms in services sectors –basically, regulated public utilities- face a 53% wedge as firm's contributions are higher (27% relative to 23% for the rest). Differences in location (the farther the region from Buenos Aires the lower the tax) and between activities were used in the past to differentiate payroll taxes since 1994 (the so called *competitiveness plans*). Most of these plans faded out since mid 2000's, although for some regions and sectors they still hold, reducing the tax wedge below 35%, so that the current range of the tax wedge (for formal firms) goes from this lower bound up to 53%.

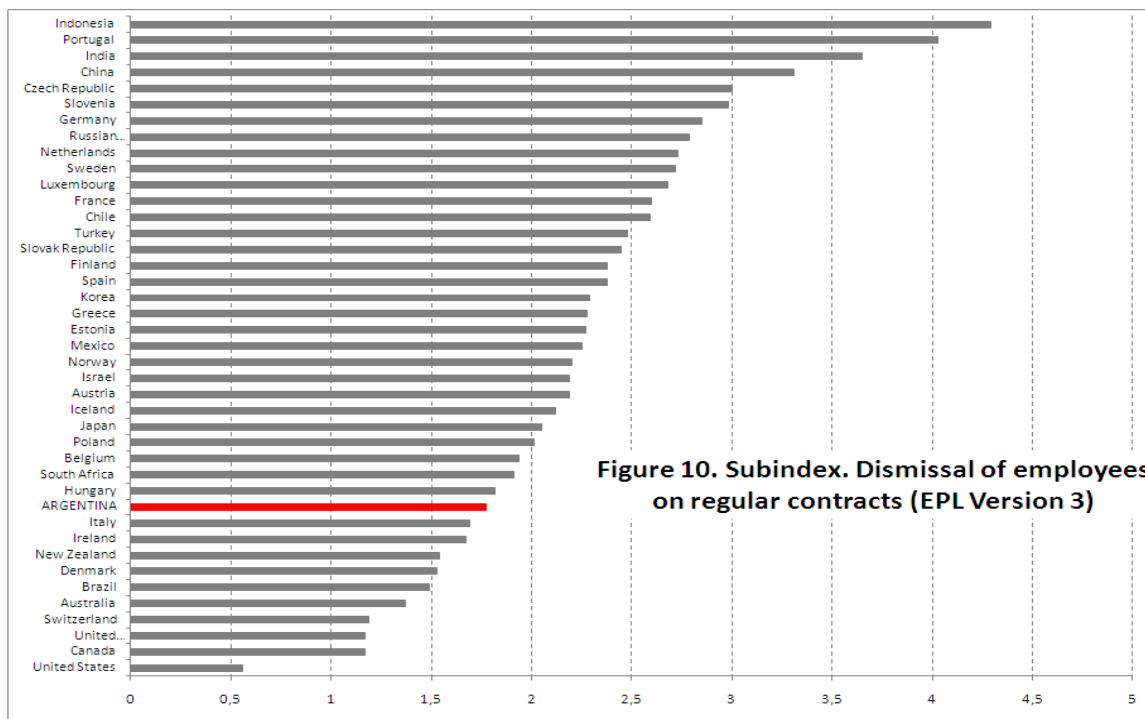
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<sup>23</sup> Detailed information about the methodology is available at [www.oecd.org/employment/protection](http://www.oecd.org/employment/protection).



Temporary contracts were given incentives in the 90's, and then subject to severe restrictions since early 2000's. During the 90's, flexible contracts were introduced in 1991 until they were generalized for a short period (1996/99) following the recession of 1995 (Tequila). In the current decade (since 2006) temporary contracts were assimilated to regular contracts in most aspects,

including payment and severance pay provisions. First contracts (apprenticeships) followed a similar evolution -with a shortening of the period of contracts and the assimilation to regular workers-.



These restrictions give the country a high position in protection (sub) indexes for temporary employment (as shown by the country ranking 6<sup>th</sup> according to the corresponding index EPL3). Strictness of regulations is particularly high concerning restrictions for opening temporary agencies and regulations ensuring equal treatment of regular and agency workers.

Protection on regular contracts is –as different from protection to temporary employment- relatively low, as shown by the (sub) index on Dismissal of employees on regular contracts (EPL3).

Although severance compensation payments rank among the highest in comparison with other countries –especially for medium term and long run contracts- there are very low restrictions on dismissals, notification is almost immediate, and reinstatement is not common practice, except for some isolated recent judicial decisions. Regular contracts are then characterized by a low EPL index for procedural and dismissal difficulties but a relatively high index for monetary compensation (notice and severance).

In spite of such relatively low protection level for individual contracts, protection is comparatively high for collective dismissals. The reason is that the definition of “collective dismissal” can start – according to legislation- from a very low level of workers involved (as low as 10), and the procedure requires additional notifications (other than councils and authorities).

Summarizing the findings, employment protection is on average relatively high when considering the more comprehensive index (EPL3), and the country ranks in 9<sup>th</sup> place out of 41 countries. Only Mexico in Latin America shows a higher EPL score (Brazil is 20<sup>th</sup> and Chile 13<sup>th</sup>). However this high protection level combines a flexible environment from the point of view of individual contracts (Argentina ranks 31<sup>th</sup>) with a high protection level for temporary contracts (rank 6) and for collective dismissals (rank 14). Flexible legislation for individual contracts is challenged by a protective legislation and procedures on collective dismissal and by strong limitations to temporary (and apprenticeship) contracts.

Moreover, the tax wedge on labor is high and the wage setting mechanism is highly centralized. Tax reductions to specific groups of workers contributed in the current decade to a reduction in informality (domestic service, small firms, self employed) while average labor growth (formal and informal) was similar to previous decades. Tax reductions do not necessarily reflect in a rise in labor demand as they may be offset by changes in other components of labor costs (wages and non wage costs). During the early 90's wage hikes led to a strong rise in the price of labor that could not be compensated by tax reductions. On the other hand the reversal of tax cuts since 2003 took place after the currency devaluation abated unit labor costs by one third in constant pesos and by two thirds in US dollar terms. By early 2010 unit labor costs had recovered to their pre-devaluation levels, and the employment to GDP elasticity declined from over 0.50 in mid-2000's to about 0.25 (2010).

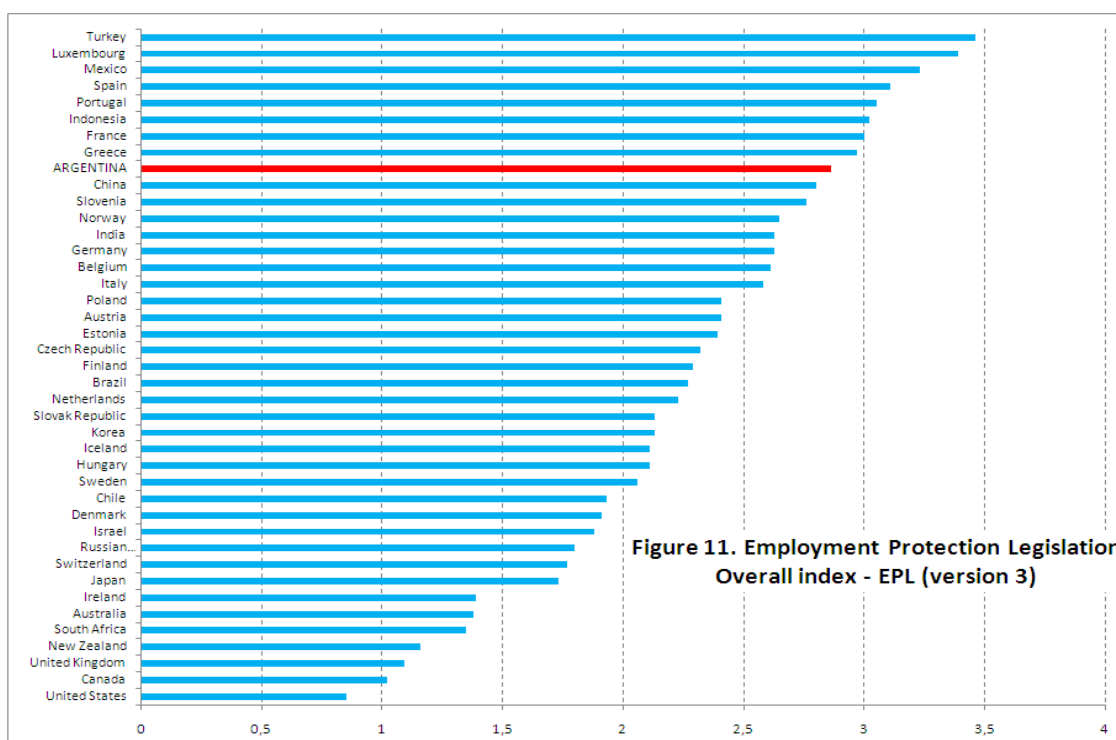


Figure 11. Employment Protection Legislation Overall index - EPL (version 3)

Flexibility of individual contracts has limited impact on labor market flexibility, as dismissals involving 10 or more workers are usually defined as collective dismissals with stricter provisions. Given the volatile macroeconomic context of the country, flexibility at the individual level hinders the inflexibility of labor contracts for medium and large size firms in the formal sector (most small size firms remain informal). Labor provisions do not contribute to strong employment

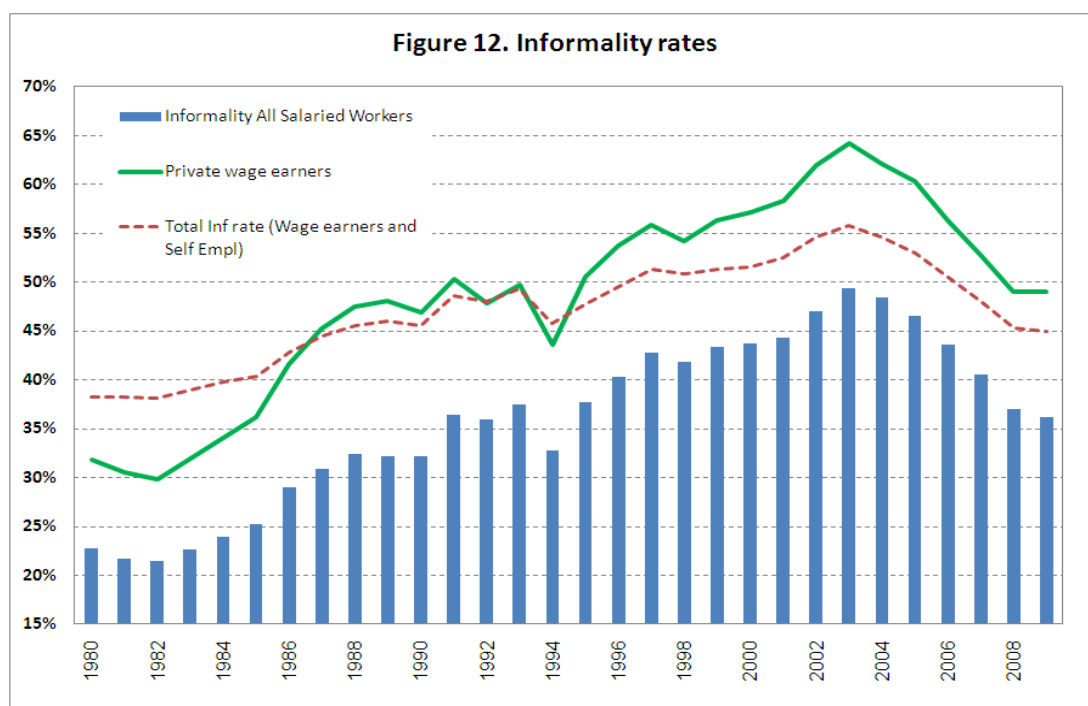


growth in the recovery phase of the cycle both because of restrictions to new employment (temporary, apprenticeship) and restrictions to collective dismissals in the case of a downturn in economic activity.

**b) Labor informality and productivity**

The Argentine economy has developed over time with high rates of labor market informality. The proportion of informal contracts surged from relatively low levels in the early 80's (below 25% of total wage earners) to stay above 35% since 1991 to present. These ratios are calculated following the labor market approach –percent of workers covered by social security-<sup>24</sup>. If all informal workers were imputed as being hired by the private sector –this may not be the case, as there is evidence of workers not covered by social security in the public sector- the informality rate for “wage earners in the private sector” would raise just over 50%.

A wider labor market definition of informality, adding to wage earners not covered by social security those autonomous workers not contributing to social security, would give for the last two decades an average informal rate for all urban employed oscillating between the current minimum (close to 45%) to the maximum of 56% during the aftermath of the crisis (2003).



Changes in legislation and in labor taxation over time favored the expansion of informal workers, both wage earners and self employed, during the 80's and the 90's. By late 90's and early this decade several reforms were introduced to curb this evolution. The common factor in the different

<sup>24</sup> The “productive definition” for informality –percent of those employed by small firms- would give a fairly stable rate for the last two decades around 50% of all wage earners.

reforms (covering self employed, domestic service employees, and workers in small firms) was a substantial cut in labor taxation and some additional social security benefits for workers. The reduction in the tax wedge was effective in the current decade (when the economy rebounded from the 2002 crisis), and informal rates stabilized close to the levels observed by early 90's.

The average net wage accruing to an informal worker is lower than the one going to an average formal worker. The hourly wage gap was estimated to be 48.6% for 1999-2001<sup>25</sup>. However, once age, gender and education are taken into account the hourly wage gap is reduced to just 11.4%. When additional controls are made for branch and size of the establishment the "unexplained gap" between formal and informal wages almost vanishes to 1.5%. That is, once controls are introduced for these five dimensions the net wage accruing to formal and informal workers is about the same.

Given that the cost for a firm of a formal worker is 72.2% higher than his net wage<sup>26</sup> (the difference being individual and firm contributions to social security, and other costs), while the cost for a firm of an informal worker is about 8% higher than his net wage (basically assuming full coverage for work insurance and severance pay), the "almost equalization" of net wages suggests that the value of marginal productivity of formal workers could be up to 55% higher than the value of marginal productivity of informal workers, after controlling for differences in human capital, sector and size of the firm.

This result is consistent with the findings in section VI. Combining the differences between formal and informal sectors (given the distribution of human and physical capital between activities, differences in hours worked per capita in formal and informal activities, and the individual differences in marginal productivity once other factors have been controlled for), the average marginal productivity of labor in the formal sector is well above the one observed for informal workers.

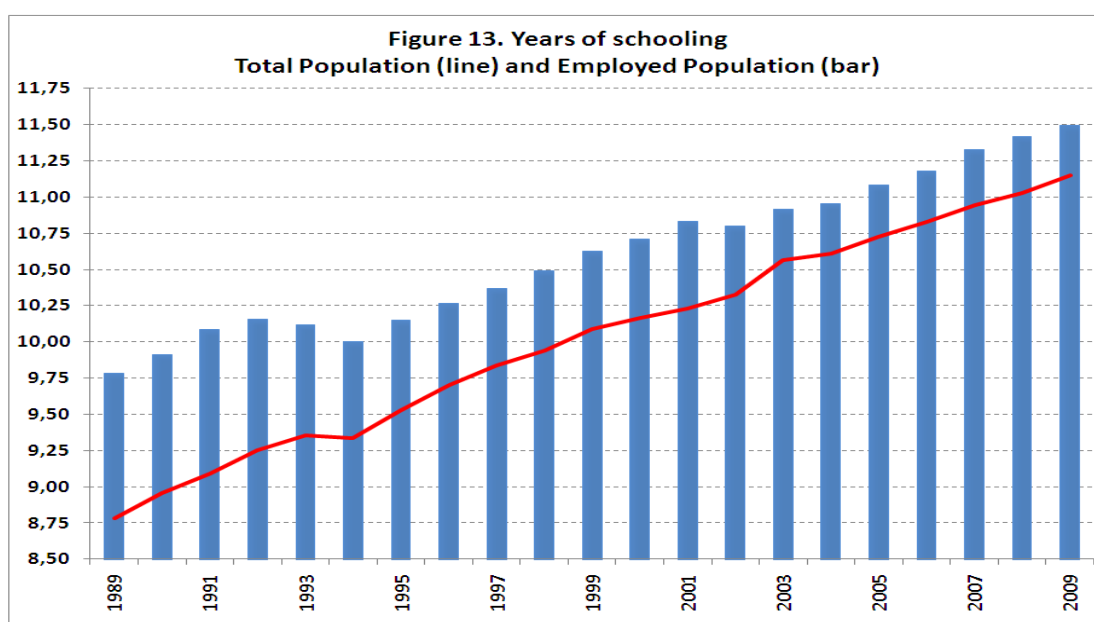
### *c) Education and training policies*

Average years of schooling for employed population rose from about 8 years in early 80's to 10 years in the early 90's and to the current 11.50 average (2009) (Figure 13). The steady evolution shown for the employed population is similar to the one observed for the whole population (11.2 years in 2009). The difference in years of schooling between the two groups has narrowed from about 0.65 years in the 80's and 90's to less than 0.4 years in the past 10 years.

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<sup>25</sup> See Bour et al (2010).

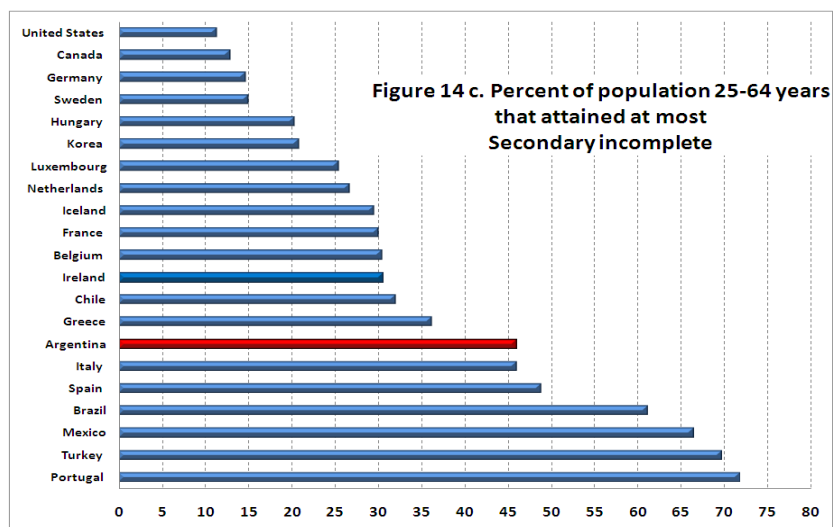
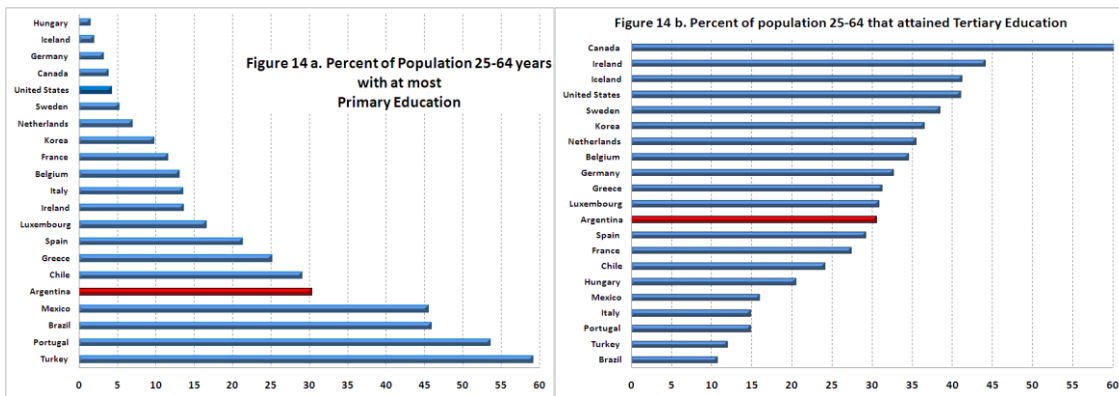
<sup>26</sup> Bour et al (2010), Table 6.



Enrollment rates in 2009 were 98.5% for the population between 6 and 12 in Primary, 67.5% for those between 13 and 17 in Secondary, and 33% for those between 18 and 24 years in Tertiary education. The percent of population with some tertiary education substantially increased in the past two decades, reaching 30.6% in 2008 (Figure 14b). This rate is well above the average for other Latin American countries, and is even higher than the rate for some OECD countries (France and Spain).

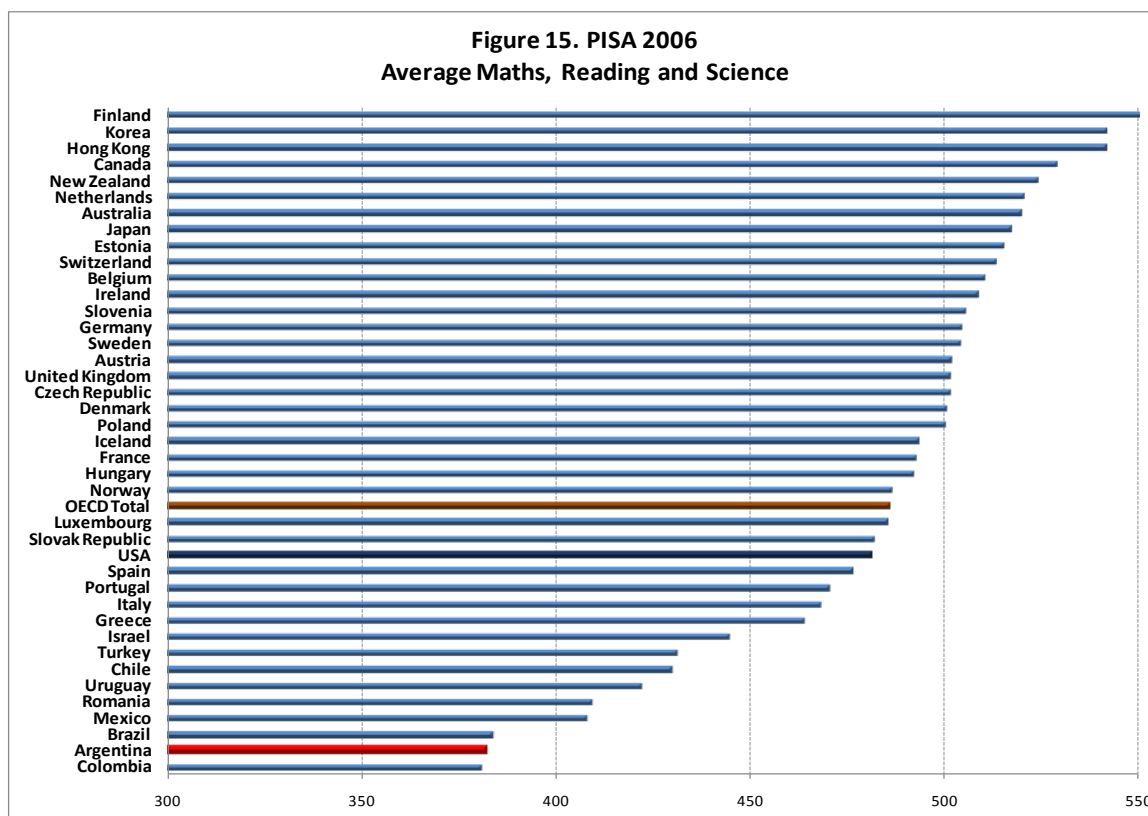
These relatively high levels of education –in terms of years of schooling and of population in a third level- contrast with the relatively high proportion of total population with an absolute low level of education: 30.3% of those aged 25 to 64 years reached at most some Primary education. This ratio is one of the highest in comparison countries as shown in Figure 14 a, only better than the ratio in Turkey, Portugal, Brazil and Mexico.

One can characterize the education level of the working population (25 to 64 years) in the country as being split in thirds: one with a rather low level of formal education, one third with high levels of schooling (Tertiary, whether complete or not), and the rest with an intermediate level of schooling. Adding to the first group with just Primary education, the portion of those with an incomplete secondary level, would give some 46% of prime age working population with a relatively low education level (Figure 14c). Although the figure is still close or below the one observed in Brazil and Mexico, and in some European countries (Portugal, Spain and Italy), it is well above Chile's ratio (32%) and the one in the benchmark country (11.3% for the US).



An alternative quantitative measure to the education embodied in prime age working population can be obtained by assigning a number of years to each level of education attained. An exercise for all countries in the sample is made by assigning the following years of education to each level: 6.5 years for Primary, 9.5 for Secondary incomplete, 12 for Secondary complete, and 15 for Tertiary (complete and incomplete). Under these assumptions the average of schooling of the prime age working population estimated for Argentina (10.9) is close to the one observed in the same year (11.0). Using a similar approach for the rest of the countries, the average of years of schooling of working age population in Argentina would be 5.4% below the simple average for the rest of the countries, but 15% below the average for the US and 19% below Canada.

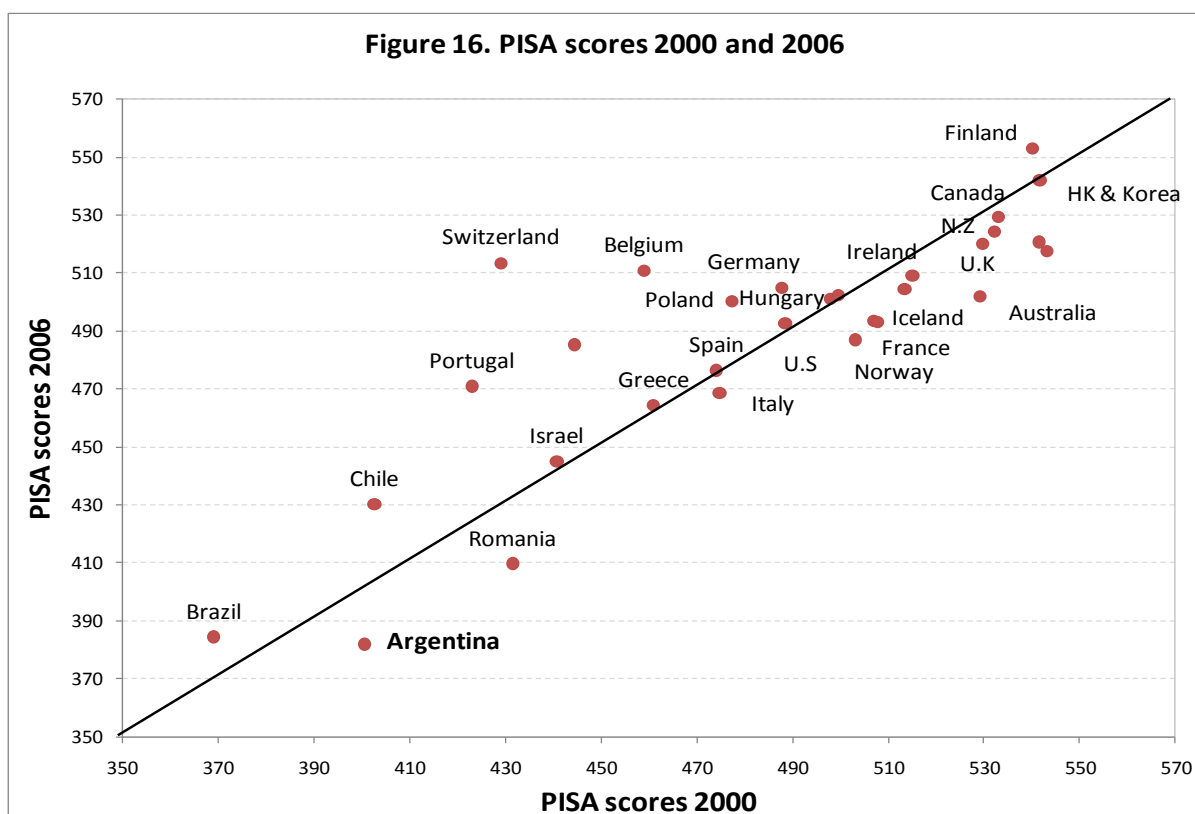
We turn now to the quality of education. According to the 2006 evaluation of the Program for International Student Assessment (PISA) performed in 39 countries, Argentina ranked 38<sup>th</sup> with an average score of 381.86 (out of 600 points) in the three areas (Mathematics, Reading and Science), very close to worst performer (Colombia with an average score of 381.18).



In the same year the average for OECD countries was 486.08, while the average for all participating countries (including Argentina) was 486.65. It follows that the score for Argentina was 78% of the average for all countries and 79.2% relative to the US. As shown in Figure 15, the distance with the countries that show a better achievement is much larger than the distance to the US (in the case of US, excluding Reading because there are no data for 2006), or to the average of the OECD. Considering the group of the five top countries (Finland, Korea, Hong Kong, Canada and New Zealand) with an average score of 538, the distance is even larger (156 points, 41% higher than the Argentine score).

Relative to previous PISA results there is a consistent deterioration in the three areas of evaluation. Argentina participated in the first (2000) evaluation, obtaining an average score of 400.5, 18 points higher than in the second evaluation in 2006 (-4.6% change). In the same period the result for OECD countries improved 14%, although there were changes in participating countries.

In order to control for these changes, we restrict the comparison to countries participating in both evaluations. Argentina ranks in the group with the highest decline relative to the 2000's evaluations: UK, Romania, Japan and Argentina averages fell some 5%. Figure 16 shows the change in PISA scores between both years and the score in 2000. Other countries with relatively low marks in 2000 (like Brazil and Chile) showed improvements while Argentina deteriorated even further.



Efficiency of Government spending in education can be approximated by computing a technological frontier taking into account inputs –financial and technical- and outputs –including PISA scores-. Calculations by OECD (2007) using PISA scores and expenditure in education in year 2000 indicate that spending in education has low efficiency in Argentina<sup>27</sup>. The country ranked among the four (out of all OECD and some LA countries) worst performers, including in this group Italy, Greece and Chile. As PISA scores have strongly declined in 2006 both in absolute terms and relative to Greece, Italy and Chile, it is highly probable that the country has fallen close to the bottom of the table.

Recently -since November 2009- the Federal Government introduced a subsidy (the Universal Subsidy for Children, USC) for families with children up to 18 years. The subsidy is targeted to unemployed, domestic service and informal workers and low income self employed. It amounted to 180 pesos per month (46 USD at that time), later adjusted to 55 USD (august 2010). A 20% of the subsidy (currently 11 USD per month) is credited to families once a year, after demonstrating that children went to school and were vaccinated according to the official health plan. The plan was designated to supplement income to poor families, and although focalization is not assured, it may have increased school assistance at the Secondary level<sup>28</sup>. The USC is the main program in place to support school attendance and completion.

<sup>27</sup> A frequently mentioned explanation for this result is that it may be difficult to attract qualified personnel to the teaching profession. While this may have been the case for some time in Argentina (total expenditure as a fraction of GDP significantly rose in the past 5 years), wide differences between the quality of education between private and public schools –both sharing similar hourly wage levels- suggest that problems are of a different nature.

<sup>28</sup> School attendance is close to 99% at the Primary level

## VI. Terms of Trade and Economic Growth in Argentina: The Recent Experience

Given that external conditions were favorable to Argentina since 2003 it is important to estimate the contribution of this positive effect to growth performance.

Following Kohli (2004) and Diewert (2008) GDP in period  $t$ , evaluated at period  $t$  real output prices and period  $t$  input vector, gives period  $t$  real income. Thus, the growth of real income over time can be decomposed into three main factors: Technical Progress or Total Factor Productivity, growth in real output prices and growth of primary inputs (capital and labor).

Following Kehoe and Ruhl (2007) we define the terms of trade (of both goods and services) as an index of Price of Imports ( $P_M$ ) divided by the Index of Export Prices ( $P_X$ ). Then, following the usual approach, foreign trade is a sort of technology in which inputs of the country are exports ( $X$ ) and products are imports ( $M$ )<sup>29</sup>. Inputs are processed into products at a rate determined by the relationship between the price of exports and imports, which is the inverse of the terms of trade. From such a point of view, declining terms of trade (that is, a fall in import prices relative to export prices), as experienced by Argentina in recent years, act exactly as a technological shock, since a given quantity of exports can produce a greater volume of imports.<sup>30</sup>

There is some evidence that the correlation between changes in the terms of trade and real GDP is significant. Kehoe and Ruhl (2007), for example, have pointed that this number ranges between -0.30 for the U.S. and -0.73 for Mexico. It seems that the correlation with changes in the TFP has been even stronger (amounting to -0.54 and -0.71, respectively). However, the same authors have stressed that this effect is not a first order effect when the product is measured as a chained index, because if the GDP is measured using a fixed base year (as in Argentina) the effects are ambiguous, even when they may have an impact on consumption and welfare.

Kehoe and Ruhl identify here a puzzle: the increase in the terms of trade is frequently accompanied by declines in productivity, so that, "If there is a causal mechanism that links shocks to the terms of trade to movements in productivity, researchers need to identify it."

This section will measure the magnitude of the potential gains associated with the decrease in the terms of trade in terms of productivity, and seek to find a theory compatible with the observed

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<sup>29</sup> See for example, Kohli (2004) "An improvement in the terms of trade (defined as Price of exports over price of imports) unambiguously increases real income and welfare. Yet, unlike a technological progress, the beneficial effect of an improvement in the terms of trade is not captured by real GDP, which focuses on production per se. In fact, if real GDP is measured by a Laspeyres quantity index, as it is still the case in most countries, an improvement in the terms of trade will actually lead to a fall in real GDP." Similarly, in Diewert (2008b), "many observers have noted that an improvement in a country's terms of trade has effects that are similar to an improvement in a country's productivity growth."

<sup>30</sup> Becker and Mauro (2005) have computed for a sample of several countries that the costlier shocks correspond to the terms of trade. Easterly and others (1993) express that "shocks, especially those to terms of trade, play a large role in explaining the variance in growth," thereby contributing to its unstable character.

facts that could be used to explain a first-order effect on GDP measured, as in Argentina, according to a fixed basket of goods and services.

*a. Towards an explanatory theory*

The results of the literature generally involve some assumptions that must be reviewed in the case of Argentina.

First, one might assume that the starting point for the recovery of Argentina in 2002 was not a situation of full employment but of deep unemployment of labor (not only open but also through workfare plans named *Jefes y Jefas*). There was also a low use of the installed capacity of capital according to statistics kept by FIEL, successfully used in an earlier project to represent a usage rate of productive capital (excluding capital in housing)<sup>31</sup>. Therefore, increases in public spending and in monetary supply did not have a significant impact on inflation and – in a context of favorable expectations of consumers – allowed an important expansion of production. But more recently the situation has changed.

Second, it must be remembered that the expansion of domestic absorption took place without significant changes in utilities' prices (which deteriorated in real terms by about 70% in the period December 2001-December 2009). Normally, with higher world prices of crude oil, prices of transport, electricity and of other services would have increased in real terms. The Federal government opted to subsidize all consumers with a budget cost that rose from 1% of GDP in 2005 up to 3% of GDP in 2009, and by reducing the price received by domestic suppliers of crude oil, natural gas and electricity. However, large consumers had to pay higher prices and since 2008 onwards high-consumption residential users face additional energy costs, but in any case prices are much lower than long-term marginal costs.

Third, it should be noted that Argentina's trade balance has been positive and growing continuously, thanks to the "tail wind" of the global context. Therefore, there were no shortages of foreign exchange to import capital and intermediate goods.<sup>32</sup> This could help to improve factor productivity, but quantitative restrictions on imports, which aggravated during the 2009 recession, may have eroded this positive effect, although so far, most controls were applied to imports of consumer goods.<sup>33</sup>

In this section we intend to present a theory of the behavior of total factor productivity and terms of trade along the past decade in Argentina, and subject it to an econometric test. Our *a priori* belief is that a significant portion of recent economic growth can be attributed to an exogenous factor, that is, the more reduced and favorable terms of trade faced by Argentina since 2003.

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<sup>31</sup> INDEC statistics on use of capacity in the Manufacturing sector were initiated on January 2002. The average use of capacity for this year was measured at 57% by INDEC (62.5%, FIEL index).

<sup>32</sup> Note, however, that this trade surplus also financed capital flight.

<sup>33</sup> The negative effect on productivity subsists given the anti-export bias of trade restrictions.



We follow the modern literature on productivity and price indexes as reviewed in Diewert (2005; 2006; 2008b). The economic approach to price indexes relies on the assumption of competitive, optimizing behavior on the part of economic agents (consumers or producers). We will include the whole of the economy – it should be stressed that in FIEL (2002) we considered only the “business sector”, maintaining separate accounts for the agricultural sector<sup>34</sup>. It would have been better to focus on the business sector but the available data did not allow us to do it. For example, for owner occupied housing, output is equal to input and hence no productivity enhancements can be generated in this sector according to SNA conventions. There are similar problems to measure productivity in the government sector.

Technology Growth and Efficiency are regarded as two of the biggest sub-sections of Total Factor Productivity, the former possessing "special" inherent features such as positive externalities and non-rivalness which enhance its position as a driver of economic growth. Total Factor Productivity is often seen as the real driver of growth within an economy and studies reveal that whilst labor and investment are important contributors, Total Factor Productivity may account for up to 60% of growth within economies.

Recently, there has been new research on the channels through which terms of trade and TFP interact. In an Appendix to this paper we present the basic statistics to be used in the case of Argentina as well as some description of the elementary relations holding between them<sup>35</sup>.

### ***b. Approaches to measuring TFP and econometric estimation of coefficients***

There are two broad approaches to measuring TFP growth: a) the growth accounting or index number approach and b) the econometric estimation approach.

There are problems with both approaches to the measurement of productivity: the growth-accounting approach assumes a constant-returns-to-scale technology and competitive price taking behavior (in fact, the growth-accounting approach can be justified from an axiomatic perspective.) However, the growth-accounting approach cannot give us estimates of the degree of returns to scale nor can it determine the effects of externalities or of noncompetitive pricing behavior; econometric estimation is required in order to obtain estimates of these effects. Moreover, the growth-accounting approach does not generate standard errors for key parameters as does the econometric approach.

On the other hand, the coefficient on the time trend is a measure of productivity growth. But a regression equation for the production function of a set of industries cannot deal adequately with a large number of inputs and outputs (multicollinearity becomes a problem under these conditions) and the results that the econometric approach generates are often fragile and are generally not reproducible.

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<sup>34</sup> In fact, we will include the entire residential housing stock and the consumption of residential housing services in the data. This is an important difference with our previous treatment in FIEL (2002).

<sup>35</sup> The Appendix also includes a more complete discussion about the literature.

The latter approach, however, provides a basic starting point to estimate the basic relationships, so we will begin with it.

Following a similar approach as in FIEL (2002), we estimated first the parameters of an aggregate production function, expressed in differences in logarithms. If no restriction is placed on its parameters, the general specification is as following:

$$[1] y' = c[1] * (utci * kato_{-1})' + c[2] * (hrs * nt)' + c[3] * \log(ri) + c[4]$$

In [1] we denote by  $y'$  the logarithmic change of GDP (official data), by  $utci$  an approach to the capacity utilization factor of the industry (a *proxy* for the total economy, produced by FIEL), by  $kato_{-1}$  the total capital (including housing) of the previous year<sup>36</sup>, by  $hrs$  the total number of worked hours by employee in the global economy (an official data complemented before 1993 by FIEL's database), by  $nt$  the total yearly employment (in persons), and by  $ri$  the terms of trade of the economy. A “ ‘ ” after each variable denotes a difference in logarithms (a rate of change). We obtain a better fit when we ran a regression between 1982<sup>37</sup> and 2009 with FIEL estimate of GDP and total capital (called *katd*), measured after applying a time-varying exponential decay<sup>38</sup>. We also introduced a measure of country risk *crisk*<sup>39</sup> measured in natural units in the *explanans* because we suspect that the cost of capital is not well-taken in the implicit share of capital<sup>40</sup>. We will continue calling  $y'$  the change of the logarithm of total GDP. Our best estimate (standard errors under the coefficients) is:

$$[2] y' = 0,24 * (utci * katd_{-1})' + 0,65 * (hrs * nt)' - 0,23 * \log(ri) + 0,016 - 0,000025 * (crisk) \quad SE = 0,008$$

(0,09)            (0,10)            (0,05)            (0,008)            (0,000007)             $R^2 = 0,90;$

$DW = 2,29 \quad SE = 0,008.$

Of course, the parameters change frequently and unstably with changes in data and variables and we cannot pretend to have reached a final explanation (in particular, we have disregarded the stock of human capital from the causes of growth).

What are the messages coming from eq. [2]?

a.- First of all, total GDP seems to follow a constant returns to scale production function, as stressed in FIEL (2002). The sum of the elasticities of production of capital (0,37) and labor (0,64) is not one but it is not significantly different from unity. A Wald-test on the constraint that the sum=1 is an F-statistic with 1 and 22 degrees of freedom, with a probability of 26%. So, we

<sup>36</sup> This is a series produced by the technical staff of the Ministry of Finance.

<sup>37</sup> We lose two observations: one because *kato* begins in 1980, and a second because of differencing.

<sup>38</sup> The reason for this substitution is basically because the latter data are a longer series and can be easily separated into different components according to need.

<sup>39</sup> This variable has been worked out by Schefer (2004).

<sup>40</sup> Exclusion of *crisk* produces no great alteration of the coefficients: it raises both elasticities of capital and labor, and maintains the incidence of the terms-or-trade, but makes non-significant the constant of the equation. However, its standard error rises abruptly to 0,014.

must reject the difference as non-significant. These elasticities are within the range of international practice.

b.- The terms-of-trade relationship ( $ri$ ) is an important factor to explain economic growth. The GDP elasticity with respect to ( $ri$ ) is -0,23. One must note that a lower  $ri$  makes for a higher growth rate. That is, it is the level of ( $ri$ ) and not its rate of growth what makes a difference in terms of total production. A possible explanation here is in terms of inertia by locking incentives to producers and savings. For example, a decline by 10% of the terms-of-trade would accelerate the growth rate of GDP by 2,3 percentage points. In other terms, external relative prices act as a cumulative force.

c.- Growth explained by TFP is about 1,6% a year. It seems that use of the corrected GDP by FIEL and the own estimate of total capital allow some technical progress at a positive rate, while when we use the official data we obtain a technical regress (see Appendix).

d.- Country risk, that is, the price that must be paid over the US Treasury rate to invest in Argentina, is very significant and its coefficient has been increasing since 2007 on (see Appendix). On the other hand, the coefficient of  $ri$  has been stable since 1995. A pair wise Granger causality test with two lags suggests that we should reject the one-sided causality statement  $crisk$  does not Granger cause  $vyd$  with a confidence of 99%.

### ***c. Growth-accounting in Argentina, 1980-2009***

The first step in the derivation is to express the production function in growth rate form (Hulten, 2009):

$$[3] \dot{Y}/Y = \dot{Y}/K * K/Y * K'/K + \dot{Y}/L * L/Y * L'/L + \dot{A}/A$$

We use a dot “.” to denote time derivatives, so that the corresponding ratios are rates of change. This form indicates that the rate of growth of output equals the growth rates of capital and labor, weighted by their output elasticities, plus the growth rate of the Hicksian shift parameter. These elasticities are equivalent to income shares  $s_t^K$  and  $s_t^L$  when inputs are paid the value of their marginal products ( $\partial Y/\partial K = c_k/p$ ;  $\partial Y/\partial L = w/p$ ) leading to:

$$[4] R_t = (\dot{Y}/Y_t) - s_t^K * K'/K_t - s_t^L * L'/L_t = \dot{A}/A_t$$

This equation is an expression where, in the left-hand, the “residual”  $R_t$  of the growth of output is defined as the growth not explained by the share-weighted growth rates of the inputs (the residual is the growth-accounting estimate of  $TFP_t$ , also called Multifactor productivity (MFP) as the name given to the Solow residual in the BLS productivity program).

As mentioned by Hulten, although linked to an underlying production function, the residual itself is a pure index number because it is based on prices and quantities alone (actually, [4] is a form of the Divisia index). By implication, the shift in the function can be measured without actually having to know its exact form. The trick is that the slope of the production function along the growth path of the economy is measured by real factor prices.

Table 1 in the Appendix includes the figures used in the calculation of Argentina's TFP. We can clearly see that periods of general distrust in economic policy are associated with breaks of TFP (1988-1990 and 1999-2003). We can now test this causality with the new variable.

We began by testing the possible influence of the terms-of-trade relationship, a trend and the country risk. We found that the relation can be modeled as a moving average model of first order (Eq. [5]):

$$[5] A_t = 0,27 - 0,27*ri - 0,0000018*crisk + 0,0004*trend$$

$$(0,02) \quad (0,02) \quad (0,0000003) \quad (0,0001)$$

$$R^2=0,79; DW=1,93; MA(1)=1,00$$

So that, in the end, Total Factor Productivity moves according to a model such as the following:

$$[6] A_t = m_t + \varepsilon_t + \varepsilon_{t-1}.$$

In [6],  $m_t$  stands for the mean of the series,  $\varepsilon_t$  stands for a white noise error term and the (non-stationary) mean is given by  $0,27-0,27*ri-0,0000018*crisk+0,0004*trend$ . The random shocks at each point come from the same distribution, assumed to be a normal distribution, with location at zero and constant scale. The special feature in this model is that these random shocks are propagated to future values of the time series. This is an interesting property of the series of Total Factor Productivity. The sample correlation between the terms-of-trade and the index of productivity  $A_t \approx -0,58$ .

This implies that the estimation of TFP in the Argentina economy should consider a variant of the Box-Jenkins ARMA model, where it is assumed that the time series is stationary.<sup>41</sup>

In the Appendix we tried other specifications. Three main conclusions emerge from this analysis: 1) Marginal productivity of both factors stand in spite of changes of specification and sample, in particular the marginal productivity of labor is higher than that of capital; 2) The influence of the variable  $ri$ , representing the terms-of-trade factor, also stands without change at -0,19. 3) The influence of other factors other than these is more problematic, in particular the influence of total factor productivity and of country risk.

#### ***d. The particular impact of the terms-of-trade on growth***

We'll make an ex post exercise aiming at understanding what would have been the growth of the economy if no external impact from the terms-of-growth had been present. We use equation S6 in the Appendix to take into account the influence of the lagged effects of the endogenous variable.

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<sup>41</sup> In fact, Box and Jenkins (2004) recommend differencing non-stationary series one or more times to achieve stationarity, as we did in this section.

In this case we obtain that the increase in the price of exports relative to the price of imports accounts for about 50% of the growth observed from 2003 to 2009. The same exercise can be done in terms of the residual (see Appendix). Contribution of the terms of trade is even larger, rising to 73% of the cumulated growth from 2003 to 2009.

### *e. The informal economy*

The Argentine economy has developed over time in a context of high informality in the labor market. As we expect productivity to be higher in the formal sector it is necessary to separate formal from informal employment. We will approach this problem by observing the statistical association between the rate of growth of GDP and total amount of (formal) wage earners<sup>42</sup>. We obtain Graph N° 11 in the Appendix, where it can be seen that total GDP and Total Wage Earners (Formal) are highly associated. In fact, sample correlation between the two variables is  $\approx 0,57$ , and reaches 0,92 for the period 1998-2009. On this basis, we obtained an alternative estimate where *inf* is the percentage of informal workers in the economy:

[Eq 7 ]

$$y' = 0,45 * (katd_{-1} * utci)' + 0,42 * (hrs * nt * (1 - inf))' - 0,16 * \log(ri) + 0,0019 - 0,00002 * crisk + 0,09 * (hrs * nt * inf)'$$

(0,08)                      (0,04)                      (0,03)                      (0,004) (0,000004)                      (0,03)

$$R^2 = 0,95; SE = 0,004; DW = 1,84; MA(1) = 1,00$$

$$R^2 \text{ adjusted for degrees of freedom} = 0,94.$$

The elasticity of GDP with respect to capital is 0,45. And the marginal productivity of formal workers is much higher than that of informal ones. This follows from the following identities:

*Marginal Productivity of L*  $\equiv$  *Elasticity of GDP w.r.t. L / Average Product of L*  
*Marginal Productivity of K*  $\equiv$  *Elasticity of GDP w.r.t. K / Average Product of K*

Without considering differences of human capital or of hours worked, we found that the productivity of formal workers is 79.7% higher than the productivity of informal workers<sup>43</sup>. The estimate of TFP growth (1.9% a year) is somewhat smaller than our previous estimates (FIEL (2002)). Country risk has a similar impact than before. All the coefficients are highly significant. In addition, one can not reject the presence of constant returns to scale.

<sup>42</sup> Average data for the whole country on informal workers have been processed by FIEL according to information of Household Surveys of INDEC. In addition, we tried to include a variable to take into account the human capital of the economy through the usual computation of years of schooling of the labor force, but this variable was not significant at all, for both formal and informal workers.

<sup>43</sup> The data set forces us to assume that both types of workers are distributed across the same activities and that schooling and hours worked by each employee in each category are the same.

With these results we estimated that the contribution of terms of trade to growth in Argentina in the period 2003-2009 was 32%.

### *f. Conclusions*

Now we can posit the main conclusions from this section:

1. Terms-of-trade had a great influence on Argentina's recent growth performance. The change in terms of trade explains between one third and two thirds of the cumulated growth from 2003 to 2009.
2. If we use official data for GDP (for 2008/9) or for capital and we introduce changes of specification and sample, we do not alter in a significant manner the marginal productivities of capital and labor or the coefficient of the terms-of-trade variable. This robustness does not extend, however, to TFP and country risk.
3. Finally, we partitioned wage-earners between formal and informal ones, and re-estimated the coefficients of the production function obtaining that the productivity of formal workers is about 80% higher than the productivity of informal workers.

## **VII. Concluding remarks and policy options**

After the severe macroeconomic crisis of 2001-02, Argentina changed its economic policies both at the macro and micro level. Helped by a substantial improvement in external conditions (better commodity prices and a large increase in the size of the Brazilian economy measured in US dollars) the country was able to maintain high growth rates in spite of the adoption of several distortive decisions at the micro level like the politicization of the prices paid for the use of infrastructure, high and distortive taxes, inefficient government expenditures and the use of selective price controls and restrictions on exports.

In this paper we showed some evidence that there is no growth paradox in Argentina. The improvement in the terms of trade was a key factor to explain the high growth rates observed since 2003. Although the external conditions are likely to continue benefiting Argentina in the future there is less room to maneuver and some actions are needed to avoid other macroeconomic crisis in the future. In fact, the economic recession of 2009 (a 2.7% decline in GDP according to FIEL estimates) was a signal of what may happen if the external conditions deteriorate.

Growing distortions at the micro level were not as visible as in other times because a relatively weak real exchange rate and the favorable external conditions provided tradable activities with comfortable profits. However, the real exchange rate is likely to get closer to its equilibrium level by the end of next year when a new administration will take office. Similarly, the federal government is likely to show a moderate primary deficit and the external surplus that provided calm to anxious Argentine savers is not going to be as abundant as in the past. There will also be a need to launch a credible stabilization plan to reduce the inflation rate to low levels, both for efficiency and equity reasons.

A gradual fiscal tightening of about 2 to 3% of GDP will be needed and the challenge is to achieve this goal by containing the growth rate of government expenditures given that taxes are high, particularly for formal activities. A gradual increase in prices of energy and transport may provide some relief to the Treasury but, given the need to reestablish adequate incentives to suppliers and the protection of poor families through a well-designed lifeline tariff; this is unlikely to be the solution to the fiscal problems.

Regulation and competition policies should move from discretion to a professional analysis of cases, and price controls should be eliminated together with ad-hoc restrictions on exports. Lower taxes on labor and more flexibility in temporary contracts may provide better incentives to formal employment.

But the most challenging task ahead is to improve the efficiency in service delivery by all levels of government. A record-high state participation in the economy did not produce a significant reduction in poverty compared to the end of the 1990's, income distribution is only slightly better and the quality of education has deteriorated. This will require actions in several areas, with more rules and less discretion in procurement, social cost-benefit evaluation of projects and the introduction of incentives to improve efficiency in social sectors.

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## Appendix

### 1. Some assumptions and stylized facts in the literature about Terms of Trade and Economic Growth

We follow the modern literature on productivity and price indexes as reviewed in Diewert (2005; 2006; 2008b). The economic approach to price indexes relies on the assumption of competitive, optimizing behavior on the part of economic agents (consumers or producers). We assume that the market sector of the economy produces several (net) outputs, which are sold at positive producer prices. If a particular commodity is an import into the economy, we will follow Feenstra (2004) in assuming that imports flow through the domestic production sector and are “transformed” (perhaps simply by adding transportation, wholesale and retailing margins) by the domestic production sector.

It is customary to assume constant returns to scale on the technology sets of the economy. We successfully tested this hypothesis in 2002, which implies that the value of outputs will equal the value of inputs in every period. Our focus will be total output. Since total production is distributed to the used factors of production, nominal sector GDP will be equal to nominal sector income. As an approximate welfare measure that can be associated with production, one can choose to measure the real income generated by the sector in period  $t$ , in terms of the number of consumption bundles that the nominal income could purchase in period  $t$ . This definition is not sensitive, moreover, to the distribution of income generated by the sector. Following Kohli (2004) and Diewert (2008), one obtains that GDP in period  $t$ , evaluated at period  $t$  real output prices and period  $t$  input vector, gives period  $t$  real income. Thus, the growth of real income over time can be decomposed into three main factors: Technical Progress or Total Factor Productivity, growth in real output prices and growth of primary inputs (capital and labor). We will concentrate on the first and last drivers, for the following reason: As is well known, Technology Growth and Efficiency are regarded as two of the biggest sub-sections of Total Factor Productivity, the former possessing “special” inherent features such as positive externalities and non-rivalness which enhance its position as a driver of economic growth. Total Factor Productivity is often seen as the real driver of growth within an economy and studies reveal that whilst labor and investment are important contributors, Total Factor Productivity may account for up to 60% of growth within economies. During the Convertibility period in Argentina, TFP grew 58% from 1992 up to 1998 and 113% cumulative when compared with 1990, the year of lowest productivity of the decade. This implied eight years with a cumulative growth of TFP at 9.9% a year.

As stressed by Stiroh (2001) both neoclassical and “new growth” theories explain the recent rise in U.S. productivity growth. While TFP is a methodological construct essentially exogenous for the former theory, within the second strand there are several contributions: If aggregate technology is specified as  $Y_t = A(R_t) \cdot f(K_t, L_t, R_t)$  where  $R$  is aggregate “stock of knowledge”, Arrow (1962) emphasizes “learning-by-doing” in which investment in tangible assets generates spillovers as aggregate capital increases; past gross investment proxies for experience and determines  $A(\cdot)$ . Romer (1994) essentially models  $A(\cdot)$  as a function of the stock of R&D, Lucas (1988) models  $A(\cdot)$  as a function of the stock of human capital, and Coe and Helpman (1995) argue that  $A(\cdot)$  also depends on the R&D stock of international trading partners.

Recently, there has been new research on the channels through which terms of trade and TFP interact. A recent paper by Cavalcanti Ferreira et al. (2010), has two objectives. The first one is to estimate the structural changes in TFP for a sample of 77 countries between 1950(60) and 2000. A substantial part of the disparities in output levels can be partially explained by physical capital and education, but the largest part of these differences are explained by the Solow residual, that is, the TFP. The second one is to identify possible explanations for breaks. Two sources were analyzed: (i) episodes in political and economic history; (ii) changes in international trade - a measure of absorption of technology. The results suggest that about one-third of the TFP time-series present at least one structural break. Downwards breaks are more common, indicating that after a break the TFP has much difficulty to recover; developing countries' breaks are more spread along the decades. Last, the relevance of international trade, measured by trade share percentage of GDP, does not explain abrupt changes in TFP. Using structural breaks technique, Ben-David and Papell (1998) proposed a test for determining the significance and the timing of slowdowns in economic growth, showing evidence that most industrialized countries experienced postwar growth slowdowns in the early 1970s, and that developing countries, in particular Latin American countries, tended to experience even more severe slowdowns.

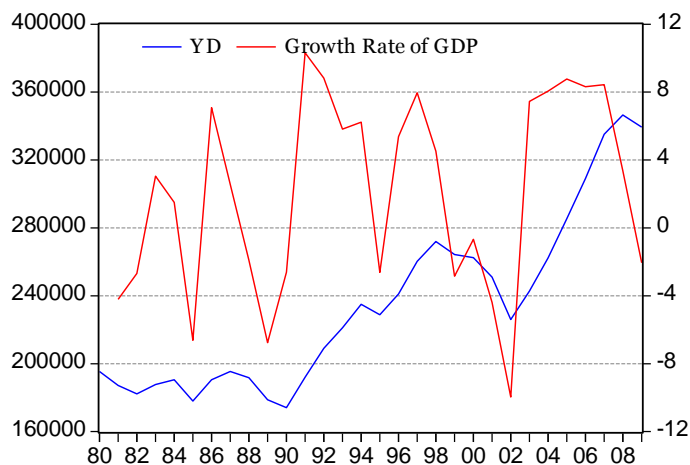
Another paper by Mendoza (1995) is more concerned with the relationship between terms of trade and economic fluctuations. According to his findings, terms-of-trade shocks account for nearly half of actual GDP variability. But what can be said about the structure of trade and growth? Lederman and Maloney (2003) have addressed this question through an examination of the empirical relationships between trade structure and economic growth, particularly the influence of natural resource abundance, export concentration and intra-industry trade. The paper tests the robustness of these relationships across proxies, control variables and estimation techniques. They find trade variables to be important determinants of growth, especially natural resource abundance and export concentration. In contrast to much of the earlier literature, natural resource abundance appears to have a positive effect on growth whereas export concentration hampers growth, even after controlling for physical and human capital accumulation, among other factors. They find that regardless of estimation technique, trade structure variables are important determinants of growth rates and hence probably should be in the conditioning set of growth regressions. But they also find that many of the stylized facts, particularly those surrounding natural resource specializations, are not robust to estimation technique or conditioning variables.

## 2. The Basic Picture

As can be seen in the attached graph (N° 1), the behavior of GDP at constant prices experienced since 1980 sharp fluctuations. A simple regression of the logarithm of GDP against time, using official data, yields an annual growth rate of about 2.2% in the whole period, but it will be useful to distinguished several sub-periods:

1) In period 1980-1993, the economy grew at an average rate of 0.6%;

2) In 1994-98, growth was at a 2.3% a year;



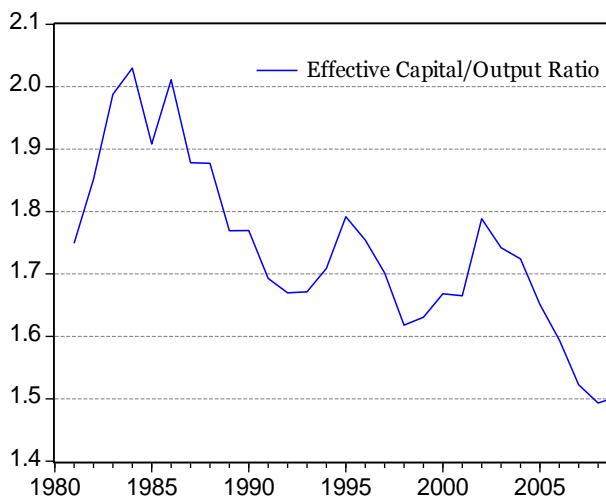
Graph N° 1. Recent evolution of GDP (YD) according to FIEL estimate

3) In 1999-2002 there was a regress at an annual rate of -5.1%;

4) Between 2003 and 2007 growth rate reached 8.1% a year;

FIEL has obtained a new estimate of GDP for 2008 and 2009, implying a GDP lower than the official one in those years, by a relative amount of -2.8% (2008) and -5.7% (2009). These data are plotted in graph N° 1, tilting the expansion of the economy into a lower level than the official data.

Graph N° 1 also exhibits the annual behavior of the growth rate. It should be mentioned that after the breaking-up of Convertibility (2001) and the ensuing crisis, the Argentine economy faced a period of negative external shocks.



Graph N° 2

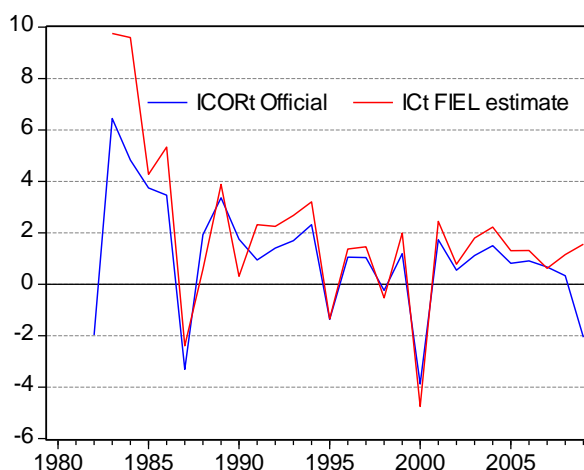
Graph N° 2 depicts one of the factors traditionally considered as a growth factor of an economy: the accumulation of capital. We plot the capital-output relation, after correcting the stock of capital by an index of utilization of capital<sup>44</sup>. We call it the *effective* capital-output ratio of the economy. We have 29 data available for extracting some information from this series; the mean reaches 1.73 pesos for every peso

<sup>44</sup> This index is elaborated by FIEL according to a permanent survey of the industrial sector.

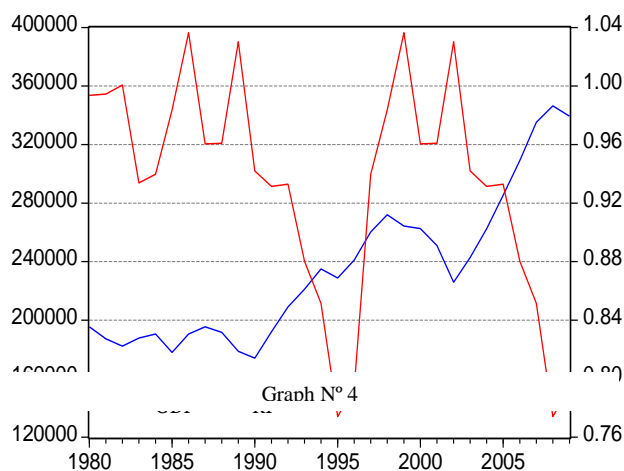
produced in the economy. A more significant concept is the Incremental Capital-Output Ratio (ICOR), the ratio of investment to growth which is equal to 1 divided by the marginal product of capital. The higher the ICOR, the lower the productivity of capital. The ICOR can be thought of as a measure of the inefficiency with which capital is used. In most countries the ICOR is in the neighborhood of 3.

There are some critical points to be mentioned about this ratio: (i) Growth in output can be due to

several factors other than investment in physical capital, e.g., growth in productivity, hours employed by worker, human capital, and (ii) The 'investment - increase in output' lag will vary. Thus, to obtain a reliable relationship the measurement of ICOR should be estimated for a longer period, perhaps three or four decades<sup>45</sup>. In the case of Argentina, high instability – and even hostility from the public sector - towards the private sector has meant that ICOR is highly unstable. In Graph N° 3, we plot the ICOR using official data on GDP and capital, while  $IC_t$  stands for data by FIEL. The main difference is not only at the end of the series of GDP, but a lower estimate of the total capital stock of the country. As for ICOR, it reaches a maximum of 6.44 (1983) and a negative minimum value of -3.87 (2000), with a mean value of 1.07 throughout the whole period. In general the IC series exhibits lower values, with a maximum of 9.75 in 1983 and a minimum of -4.75 in 2000, and a mean value of 1,97.



Graph N° 3



Graph N° 4

At first sight, one finds here a paradox: is Argentina so productive that production of goods and services can be sustained with such a low ICOR? Given that there has been in practice a modest increase in the labor input<sup>46</sup>, we will center our analysis on an external factor, the sharp decrease of the terms of trade experienced in this period (in particular since 2003 on), as shown in Graph N° 4, as a possible “cause” of an increasing GDP.

Before analyzing this, we should be careful that the unit of measurement of both variables is the right one. We have to analyze if the correct consideration here is in terms of absolute levels, or in

<sup>45</sup> World Bank, Statistical Manual.

<sup>46</sup> In period 1980-2009, use of labor increased at a mean rate by 1.54% a year, with 2002 exhibiting the higher decrease (-5.6%) followed by four years of strong recovery.

terms of first or higher differences. As for this question, the statement rate of growth of *ri* does not cause (in the Granger sense) the GDP is rejected at a 99%. The obverse statement, *GDP* does not cause rate of growth of *ri* is rejected at a 98%. It seems that we are in presence of bi-directional phenomena, a question that should be solved through more sophisticated methods. Consider now a redefinition of units: the statement *ri* does not cause rate of growth of *GDP* can not be rejected, as well as the statement *rate of growth of GDP does not cause ri*.<sup>47</sup> [Table03 and Table04] In Bour (2000) the influence of the *change* of the terms-of-exchange on GDP was emphasized; but presently, as we shall see, data strongly support the second definition, with *ri* causing growth of GDP.

Additionally, as we have a moderate correlation (-0.47) between terms of trade and a simple trend, there is also an “identification problem” of the terms-of-trade effect in face of disembodied technological enhancements of the productive sector, that could also explain growth in the medium and long term. But as can be seen in Graph N° 4, co-movement is more acute since from 2003, but sharply differed before that year, so it is expected that standard errors in econometric research will be sufficiently accurate.

### 3. Approaches to measuring TFP and econometric estimation of coefficients

Following a similar approach as in in FIEL (2002), we estimated first the parameters of an aggregate production function, expressed in differences in logarithms. If no restriction is placed on its parameters, the general specification is Eq [1] in the main text:

We ran a regression between 1982<sup>48</sup> and 2009 with the available data, using official data on GDP and total capital of the economy, to obtain [this is our equation E12 in EViews file, with standard errors under the coefficients] the following estimate:

[S1]

$$y' = 0.31*(utci*kato_{-1})' + 0.70*(hrs*nt)' - 0.23*\log(ri) - 0.011 \quad SE=0.015$$

(0.10)            (0.12)            (0.06)            (0.007)     $R^2=0.82; DW=2.08$

According to this estimate, the Argentine economy behaves approximately as a constant-returns-to-scale economy (as  $0.31+0.70 \approx 1.00$ ), with an elasticity of 0.23 of the terms-of-trade variable on the rate of growth<sup>49</sup>, and a negative TFP amounting to 1.1% a year. This equation has a moderately high coefficient of determination and a good behavior of residuals. However, the standard error of the equation and the unexpected sign of the TFP term lead us to search for a change in variables.

A preferable specification is obtained by a substitution of the official data on GDP for the FIEL estimate; in a similar manner, we opted to substitute total capital for a FIEL estimate, called *katd*,

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<sup>47</sup> In fact, an F-statistic on the statement *ri* does not cause rate of growth of GDP is only 0.2944 (with a probability of 75%); while the statement rate of growth of GDP does not cause *ri* has an F=0.64 with probability of 54%.

<sup>48</sup> We lose an observation because of *kato* begins in 1980, and a second one because of differencing.

<sup>49</sup> This estimate is in line with those obtained for other countries.

measured after applying a time-varying exponential decay<sup>50</sup>. We also introduced a measure of country risk *crisk*<sup>51</sup> in the *explanans* because we suspect that the cost of capital is not well-taken in the implicit share of capital<sup>52</sup>. We will continue calling  $y'$  the change of the logarithm of total GDP. After re-estimation, the first option is:

[S2]

$$y' = 0.27*(utci*katd_{-1})' + 0.63*(hrs*nt)' - 0.20*log(ri) + 0.18 - 0.027*log(crisk) \quad SE=0,006$$

$$(0.08) \quad (0.10) \quad (0.05) \quad (0.05) \quad (0.007) \quad R^2=0.90;$$

$$DW=2.56; SE=0.008.$$

This specification is white noise, in spite of a somewhat high Durbin and Watson coefficient. However, the constant of the equation is very high. Returning to our previous variable *crisk* in natural units produces Eq [2] in the main text which is our best econometric estimate.

The elasticities of Eq [2] are within the range of international practice. E.g., Cobb and Douglas (1928) used the method of least squares to fit the data of a C-D function to data between 1899 and 1920, obtaining the following estimates:

$$P(L,K) = 1.01 (L^{0.75})(K^{0.25}). \text{ On Cobb-Douglas production functions, see Border (2004).}$$

These elasticities have remained the same as those estimated in the previous project<sup>53</sup>, in spite of the elapsed time.

The terms-of-trade relationship (*ri*) is a significant one at explaining economic growth. The GDP elasticity with respect to it is about -0.23 and very significant. One must note that, according to these equations, a *lower ri* makes for a higher growth rate. That is, it is not its rate of growth what makes a difference in terms of total production, but its level. A possibly explanation here is in terms of inertia by locking incentives to producers and savings. For example, a decline by 10% of the terms-of-trade would *accelerate* the growth rate of GDP by 2.3 percentage points. In other terms, external relative prices act as a cumulative force.

<sup>50</sup> The reason for this substitution is basically because the latter data are a longer series and can be easily separated into different components according to need.

<sup>51</sup> This variable has been worked out by Schefer (2004).

<sup>52</sup> Exclusion of *crisk* produces no great alteration of the coefficients: it raises both elasticities of capital and labor, slightly maintains the incidence of the terms-or-trade and makes non-significant the constant of the equation. However, its standard error rises abruptly to 0.014. [This is Eq. N° 0]

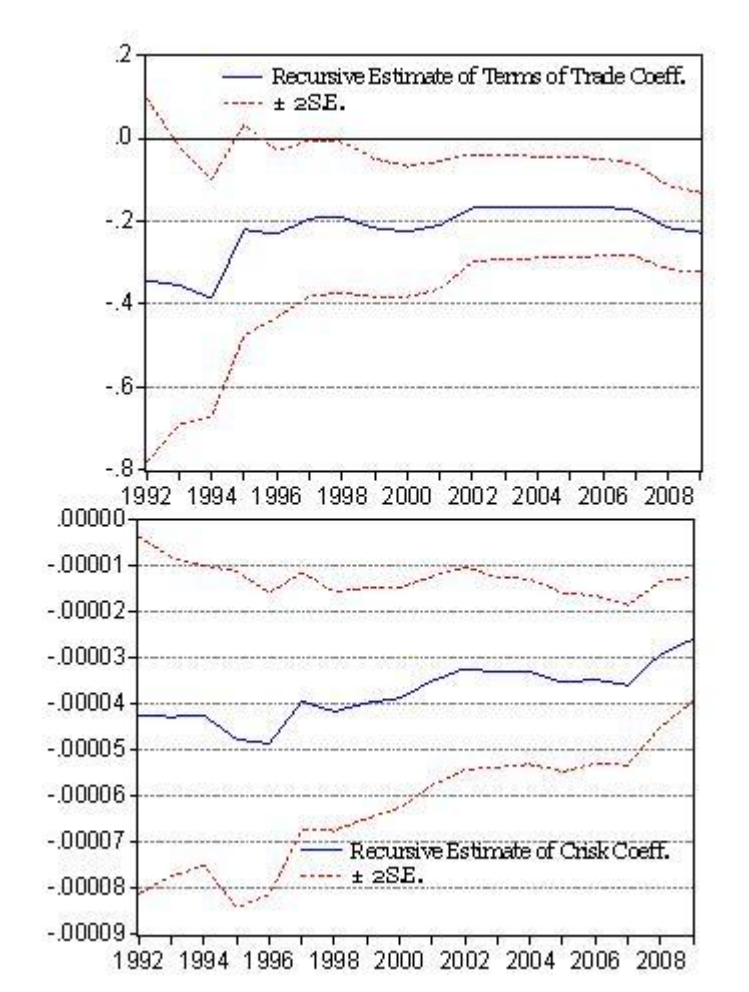
<sup>53</sup> Eq. [3] of Table A4 included the following, “preferred” estimate for the aggregate production function:

$$y' = -0.019 + 0.65*(hrs*nt)' + 0.35*(utci*kat-1)' + 0.04*S_{91} \quad R^2=0.86; F=47.3; DW=2.36.$$

In this equation, variable  $S_{91}$  was a dummy with zeroes everywhere, excepting the Convertibility period when it was set at 1 during 1991-1999 (page 51). Therefore, “net” TFP in this period is to be calculated as 0,04-0,019=0,021.



Country risk is very significant and its coefficient has been increasing since 2007 (See Graph 5).



Graph N° 5

### 3. A prelude to growth accounting

As a first step, we redefined our variables in terms of arithmetical annual rates of growth so that  $vyd=yd/yd_{-1}$  and so on. With such a definition, dropping the constant because of non-significance we approached the specification of [3] to obtain:

$$[S3] \quad vyd = 0.34*(vu*vk_{at,-1}) + 0.67*(vh*vn) - 0.19*ri - 0.000014*crisk + 0.18*vyd_{-1}$$

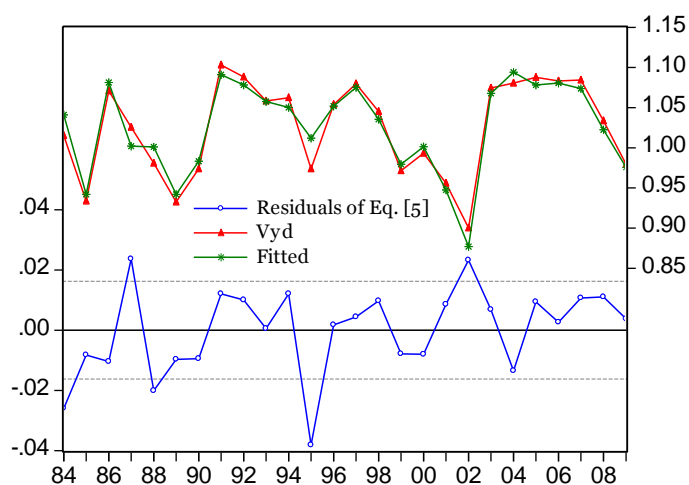
(0.06)
(0.07)
(0.02)
(0.000004)
(0.04)

$SE=0.005 \quad AR [1]=-0.50 \quad R^2=0.94; \quad DW=1.99.$

Eq. [S3] [corresponding to Eq. S2] is a very good alternative to Eq[2] in the main text in terms of finite changes. As before, the first three coefficients stand in terms of stability. Terms-of-trade and country risk exhibit some reduction in absolute terms, and the lagged endogenous variable was included as a means to account for positive auto-correlation. The standard error of this equation is even smaller than in equation [2], reaching 0.5%. Only 3 years over 26 observations exhibit a higher significant deviation than 0.5%: 1987 (the equation is unable to follow the exceptional rise

of GDP), as well the exceptional decreases in 1995 and 2002. The only turning-point error appears to be in 1995. (See Graph N° 6)

Eq. [S3] can be interpreted as a partial-adjustment equation, where the short-run coefficient of  $ri$  is  $-0.19$  but the long-run coefficient reaches  $-0.23$ , as a shock to the terms-of-trade is distributed over several periods<sup>54</sup>. The same could be done with other explicative variables, including capital and labor. In this case, the production function would no longer be constant-



Graph N° 6

returns-to-scale – but one of increasing ones in the long run. But since no TFP is present, a possible interpretation is that in the finite approach, productivity enhancements come through the factors of production (incorporated technical change).

Summing-up, our preferred equation [2] in the main text delivers the following parameters:

Elasticity of rate of growth of GDP w.r.t. the average  $ri$  in the period=  
 $=-0.23*(-0.07)=1.6$

Elasticity of rate of growth of GDP w.r.t. the average  $crisk$  in the period<sup>55</sup> $=-2.3$

Elasticity of production w.r.t. capital $= 0.27$ <sup>56</sup>

Elasticity of production w.r.t. labor $= 0.73$

Total Factor Productivity growth  $= 0.016$ .

Under the assumption of perfect competition the capital share is a measure of the elasticity of production w.r.t. capital. The actual capital share for a country should be easily found in national income and product statistics; in most industrialized countries, the capital share is between 0.3 and 0.4, with the labor share varying correspondingly between 0.7 and 0.6. Not surprisingly, our estimate of the capital share is near this range, as should be expected because of the opportunities of transferring *know-how* between different countries through international trade and foreign investment. This means that, without having resort to data at current prices on national statistics (very distorted in Argentina) we can extract a series of TFP using the calculated parameters of the production function. Once the capital and labor shares have been found, the following definition can be used to compute productivity values for any given year:

<sup>54</sup> As usual, the long-run coefficient is obtained as the quotient of the short-run coefficient and one minus the coefficient of the lagged variable  $vyd$ .

<sup>55</sup> This variable has a mean equal to 1031, but in 2009 reached 2837.50.

<sup>56</sup> We have forced the assumption of constant-returns-to-scale, by distributing the shares of the two factors in proportion to their contributions in Eq. [2].

$$[S4] \quad A_t = GDP_t / (K_t^{0.27} N_t^{0.73})$$

In this equation, we are assuming that technical change has a Hicksian neutral form.

#### 4. Growth-accounting in Argentina, 1980-2009

Table 1 includes the figures used in the calculation of Argentina's TFP:

Table 1. Rates of growth of variables<sup>57</sup>

	<i>vyd</i>	<i>vu</i>	<i>vkata<sub>t-1</sub></i>	<i>vh</i>	<i>vn</i>	<i>vri</i>
1981	0.957941	0.876289		0.958685	0.993066	1.000885
1982	0.973128	1.007843		1.016094	1.017274	1.006211
1983	1.030462	1.105058	1.020968	1.018712	0.990280	0.933180
1984	1.015032	1.035211	1.020906	0.981999	1.028074	1.006387
1985	0.933801	0.877551	1.017570	0.957878	1.001819	1.046788
1986	1.070811	1.139535	1.008755	1.048021	1.034831	1.053589
1987	1.025618	0.962462	1.015594	0.994460	0.997552	0.926690
1988	0.980992	0.975390	1.020840	1.011404	1.018846	1.000427
1989	0.932452	0.883188	1.019005	0.973333	1.010317	1.072267
1990	0.973926	0.989949	1.006917	1.017959	1.010469	0.914242
1991	1.103139	1.090299	1.001705	1.033140	1.050830	0.988856
1992	1.088299	1.066071	1.010775	1.031978	1.024344	1.001589
1993	1.058224	1.039874	1.020726	0.997241	1.010986	0.943568
1994	1.062250	1.048274	1.028631	1.004330	0.985057	0.967309
1995	0.973788	0.983063	1.031073	0.991691	0.970714	0.909178
1996	1.053715	1.006521	1.020691	0.972253	1.018032	1.025424
1997	1.079567	1.019670	1.024088	1.020721	1.058470	1.183785
1998	1.045159	0.959553	1.032434	0.994358	1.040663	1.046788
1999	0.971578	0.944924	1.033353	0.991647	1.009427	1.053589
2000	0.993249	0.991777	1.021664	0.987133	1.001562	0.926690
2001	0.956066	0.939077	1.018408	0.986920	0.977481	1.000427
2002	0.900343	0.959693	1.009084	0.943449	0.944335	1.072267
2003	1.074535	1.057600	0.993214	1.069558	1.050480	0.914242
2004	1.080615	1.063162	1.005662	1.007394	1.072193	0.988856
2005	1.087676	1.024546	1.019533	1.004526	1.045329	1.001589
2006	1.083135	1.014232	1.029666	0.999100	1.055594	0.943568
2007	1.084335	0.993761	1.028573	0.998249	1.036087	0.967309
2008	1.033601	0.972320	1.046325	0.985484	1.004957	0.909178
2009	0.979442	0.943958	1.043981	0.976360	0.986743	1.025424

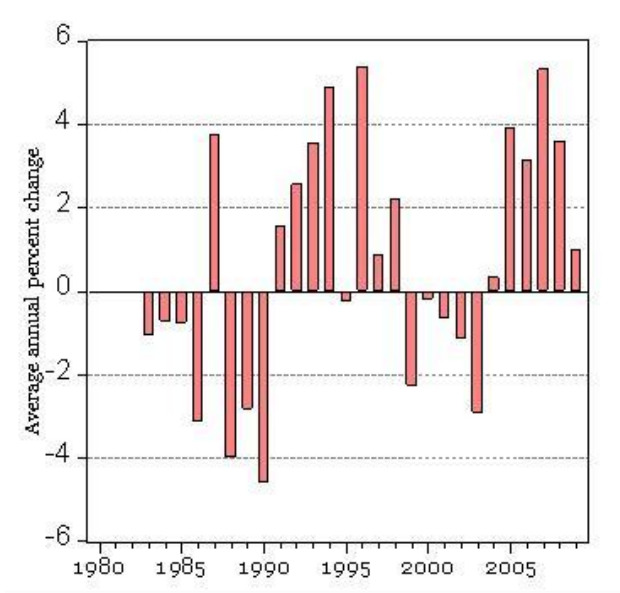
The resulting estimate of the residual  $A_t$  is as follows (Table 2):

<sup>57</sup> We have not included in this table the series of depreciation of capital, which depends on the composition of the capital stock and oscillates between 3.5% and 3.0%, with a mean value equal to 3.2%.

Table 2. The residual  $A_t$

1983	-0.010591
1984	-0.007303
1985	-0.007824
1986	-0.031260
1987	0.037523
1988	-0.040091
1989	-0.028404
1990	-0.046099
1991	0.015728
1992	0.025675
1993	0.035656
1994	0.048908
1995	-0.002620
1996	0.053789
1997	0.008931
1998	0.022279
1999	-0.022787
2000	-0.002066
2001	-0.006379
2002	-0.011508
2003	-0.029270
2004	0.003447
2005	0.039101
2006	0.031278
2007	0.053334
2008	0.035944
2009	0.010070

Graph N° 7 is a plot of this variable. We can clearly see that periods of general distrust in economic policy are associated with breaks of TFP (1988-1990 and 1999-2003). Eq. [4] also submits that the variability of TFP can be explained by the terms of trade, a rising trend and country risk.



Graph N° 7

### 5. A Sensitivity Analysis

We performed a sensitivity analysis of Eq. [S3], given the need to obtain a reliable estimate of parameters. First, we substituted the official variables for the previous ones, so:

Table 3. Rates of growth of official variables

	<i>vydo</i>	<i>vu</i>	<i>vkato<sub>-1</sub></i>	<i>vh</i>	<i>vn</i>	<i>vri</i>
1981	0.957941	0.876289	1.022239	0.958685	0.993066	1.000885
1982	0.973128	1.007843	1.000898	1.016094	1.017274	1.006211
1983	1.030462	1.105058	1.001290	1.018712	0.990280	0.933180
1984	1.015032	1.035211	1.000357	0.981999	1.028074	1.006387
1985	0.933801	0.877551	0.990335	0.957878	1.001819	1.046788
1986	1.070811	1.139535	0.995223	1.048021	1.034831	1.053589
1987	1.025618	0.962462	1.005225	0.994460	0.997552	0.926690
1988	0.980992	0.975390	0.995134	1.011404	1.018846	1.000427
1989	0.932452	0.883188	0.984026	0.973333	1.010317	1.072267
1990	0.973926	0.989949	0.967893	1.017959	1.010469	0.914242
1991	1.103139	1.090299	1.006848	1.033140	1.050830	0.988856
1992	1.088299	1.066071	1.018612	1.031978	1.024344	1.001589
1993	1.058224	1.039874	1.036189	0.997241	1.010986	0.943568
1994	1.062250	1.048274	1.038543	1.004330	0.985057	0.967309
1995	0.973788	0.983063	1.025038	0.991691	0.970714	0.909178
1996	1.053715	1.006521	1.027016	0.972253	1.018032	1.025424
1997	1.079567	1.019670	1.035647	1.020721	1.058470	1.183785
1998	1.045159	0.959553	1.036192	0.994358	1.040663	1.046788
1999	0.971578	0.944924	1.024480	0.991647	1.009427	1.053589
2000	0.993249	0.991777	1.016261	0.987133	1.001562	0.926690
2001	0.956066	0.939077	1.007585	0.986920	0.977481	1.000427
2002	0.900343	0.959693	0.989728	0.943449	0.944335	1.072267
2003	1.074535	1.057600	1.005918	1.069558	1.050480	0.914242
2004	1.080615	1.063162	1.016662	1.007394	1.072193	0.988856
2005	1.087676	1.024546	1.031213	1.004526	1.045329	1.001589
2006	1.083135	1.014232	1.041873	0.999100	1.055594	0.943568
2007	1.084335	0.993761	1.042708	0.998249	1.036087	0.967309
2008	1.063442	0.972320	1.044611	0.985484	1.004957	0.909178
2009	1.009833	0.943958	1.031774	0.976360	0.986743	1.025424

The equivalent equation to [S3] is Eq. [S6]. This equation was estimated in period 1982-2002 for the purpose of the simulation exercise. After dropping *crisk* and the constant because of non-significance, the resulting equation is the following one:

$$[S6] \quad vydo=0.38*(vu*kato_{-1})+0.55*(vh*vn)-0.14*ri+0.20*vydo_{-1}$$

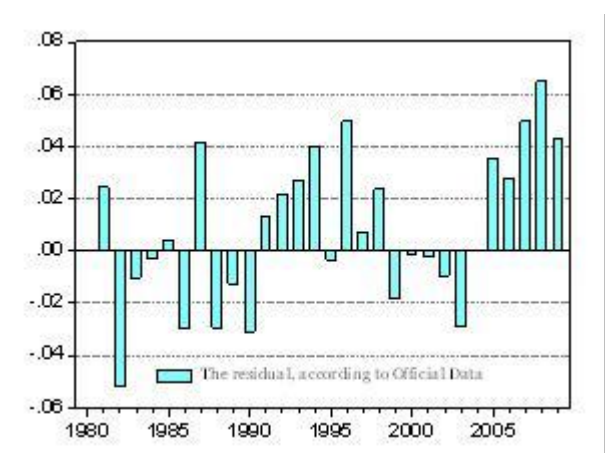
$$R^2=0.89; SE=0.021; DW=2.69$$

If marginal productivities are adjusted so as to obtain a constant-returns-to-scale production function (a Wald Test has a F-Statistic (1,17)=0.41, so we can not reject this alternative), coefficient  $c[1]$  becomes 0.41; coefficient  $c[2]=1-0.41=0.59$ , and with these data we can calculate the residual  $AO_t$  in Table 4:

Table 4. The residual, according to Eq. [S6]

1981	0.027283
1982	-0.051057
1983	-0.015464
1984	-0.004421
1985	0.008590
1986	-0.032549
1987	0.042916
1988	-0.026741
1989	-0.007490
1990	-0.027919
1991	0.012882
1992	0.020250
1993	0.023690
1994	0.035173
1995	-0.005972
1996	0.047237
1997	0.008431
1998	0.025762
1999	-0.016900
2000	-0.002734
2001	-0.001601
2002	-0.012972
2003	-0.029316
2004	0.000244
2005	0.035482
2006	0.027812
2007	0.049425
2008	0.064715
2009	0.042941

We plot ([this is Graph04]) these residuals in Graph N° 8, where one can note that, in general, the incidence of the factors behind the TFP is not much different than in graph N° 7. However, it must be noted that residuals are slightly distinct from those of graph N° 7.



Graph N° 8

Three main conclusions emerge from this analysis: 1) Marginal productivity of both factors stand in spite of changes of specification and sample, in particular the marginal productivity of labor is higher than that of capital; 2) The influence of the variable  $ri$ , representing the terms-of-trade factor, also stands without change at -0.19. 3) The influence of other factors other than these is more problematic, in particular the influence of total factor productivity and of country risk.

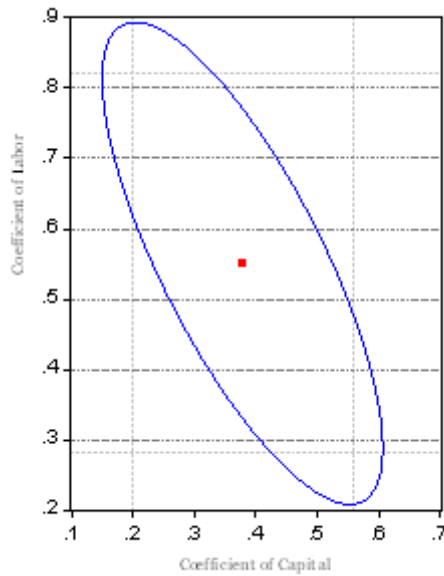
#### 6 - The particular impact of the terms-of-trade on growth

We'll make an *ex post* exercise aiming at understanding *what would have been the growth of the economy if no external impact from the terms-of-growth had been present*. This is the answer given in Graph N° 8 by the vertical bars in period 2004-2009. We will call *GrwSim* and *CumGrw* the resulting annual growth factor and the cumulative growth factor of GDP between 2004 and 2009. Table 8 in the main text shows the main results<sup>58</sup>.

Graph N° 9 is the confidence ellipse at 5% of both coefficients of capital and labor. This is an alternative approach to displaying the results of a Wald test. For a given test size, say 5%, we display the one-dimensional interval within which the test statistic must lie for not to reject the null hypothesis. Comparing the realization of the test statistic to the interval corresponds to performing the Wald test. In the case of two variables (capital and labor), the confidence ellipse is the region in which the realization of two test statistics must lie for us not to reject the null. As the coefficients of Eq. [S3] fall within the ellipse, we can safely assume that equations [S3] and S6 depict the same interrelatedness of inputs and output.

<sup>58</sup> Table N° 5 has been elaborated taking into account the influence of the lagged endogenous variable, using Eq [S6].





The same exercise can be done with Eq. [5] in the main text in terms of the residual. Maintaining the same specification for an equation using official data, for a restricted sample since from 1982 until 2003, gives the following equation:

$$[S7] \quad AO_t = 0.18 - 0.000016 * crisk - 0.16 * ri - 0.0001 * trend$$

$$(0.019) \quad (0.000004) \quad (0.02) \quad (0.0001)$$

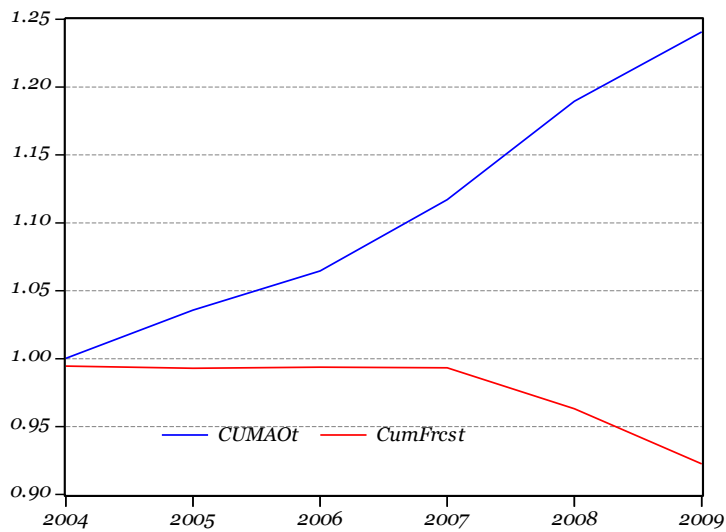
$$R^2=0.80; SE=0.002; DW=2.67; MA(1)=0.97.$$

Now, we'll keep variable  $ri$  at the same level reached in 2003 (setting 2003=1) and we'll forecast the residual using Eq. [S7]. Table 5 exhibits the result:

Table 5. Forecasting the residual with terms-of-trade staying at 2003-level

	$AO_t$	$Forecast_t$	$CUMAO_t$	$CumForcst_t$
2004	0.000244	-0.005471	1.000244	0.994529
2005	0.035482	-0.001550	1.035735	0.992987
2006	0.027812	0.000733	1.064541	0.993715
2007	0.049425	-0.000507	1.117157	0.993212
2008	0.064715	-0.030270	1.189454	0.963147
2009	0.042941	-0.042083	1.240530	0.922615

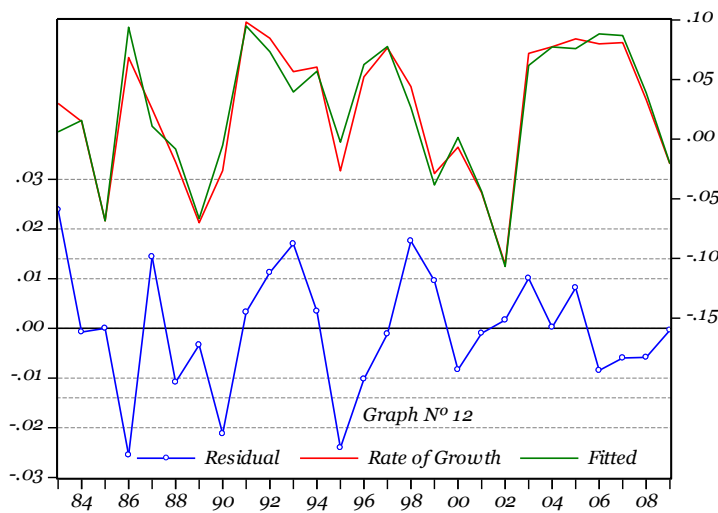
The resulting estimate deepens the previous one. The difference in percentage in 2009 reaches almost 35 percentage points, explaining 73% of growth of GDP. In fact, the residual unexplained by the cumulated factors ( $CumForcst$ ) experienced a decrease amounting to 7,8%. Graph 10 illustrates these paths.



Graph N° 10

## 7 The informal economy

Graph N° 11 displays the residuals. As it can be seen, Eq. [7] in the main text seems to give a good track-record of the behavior of GDP.



Graph N° 11