

# ***MEASURING ARGENTINA'S GDP GROWTH:***

## ***Just Stylized Facts***

**Ariel Coremberg<sup>\* \*\*</sup>**  
**ARKLEMS**  
**University of Buenos Aires**

Working Paper  
First Draft  
July 2013

---

\* The author is the team leader of the ARKLEMS+LAND project (Sources of Growth, Productivity and Competitiveness of the Argentinean Economy), linked to the WorldKLEMS project at Harvard University, expert on National Accounts for several international and national institutions, and Professor of Economic Growth at the University of Buenos Aires (acorem@econ.uba.ar/arklems@econ.uba.ar). He has been an expert on national accounts and statistics for IADB, UNDP, ECLAC. He was as expert of Argentina Input Output Matrix 1997 and Update of base year of National Accounts 1993 project in Argentina. The main results presented here have already been presented in several workshops and conferences at ECON2011, AAEP, IARIW, IADB, Harvard University and University of Buenos Aires. The opinions expressed herein are the author's, and do not necessarily reflect those of the institutions to which he belongs.

\*\* This paper has been written as a tribute to Alberto Fracchia, recently died, a historic and well recognized expert on national accounts and statistics of Argentina and Latin America. He was the founder of the National Accounts Bureau in Argentina, and expert of several Latin American countries. He transmitted me the "love" for numbers and economic series. After 2007, His pupils had to follow their careers outside the official institutions of Argentina or in other countries.

## **Abstract**

### **English**

The main purpose of this paper is to make an exhaustive revision at 4-5 digit of ISIC of Argentinean GDP methodology in order to reproduce GDP series since 1993; taking into account same traditional series and methodology that had been used for 25 years up to 2007.

ARKLEMS reproducible showed a slower growth than official series. But contrary to several myths, the gap is not related with deflation with distort prices index, directly linked with the abandon of traditional methodology followed by argentinean national accounts.

The paper showed that while Argentina growth was important during recent growth episode, similar to period 1990-1998; and it was not the growth championship of Latin America.

### **Spanish**

El propósito del paper es presentar una revisión exhaustiva a 4-5 dígitos de la CIIU de la metodología del PIB argentino para reproducir las series desde 1993; mediante las mismas fuentes y metodología utilizadas durante 25 años hasta el 2007.

La serie reproducible ARKLEMS muestra un crecimiento menor que la serie oficial. Pero al contrario de varios mitos, la brecha no está relacionada con la deflación mediante índices de precios sesgados sino con el abandono de la metodología tradicional de las cuentas nacionales argentinas.

El trabajo demuestra que si bien Argentina presentó importante dinamismo durante el reciente episodio de crecimiento, este fue similar al período 1990-1998. De su comparación internacional, surge que Argentina no fue el campeón del crecimiento de América Latina.

## **INTRODUCTION**

During the last two decades, Argentina has experienced several structural changes that affected its macroeconomic regime. This context of economic instability had a strong impact on the sustainability of long-run growth.

Since the end of its last economic depression period (1998-2002), the Argentine economy experienced an important recovery in its GDP level, which was particularly strong until 2007. This process was partially due to an initially successful “mega-devaluation” of the domestic currency, and to the “tail-winds” of the most favorable terms of trade of the last decades.

After the exit of the so-called “Convertibility Plan” (1991-2001), at the end of the depression period, the economic policy regime shifted dramatically from trade

openness, privatization, deregulation and supply-side policies to “competitive real exchange rate” and demand driven policies. But since 2006, in spite of positive external tail-winds, some political economy distortions such as the freeze of public utilities tariffs, the restrictions on imports and, later, extreme exchange-rate controls, generated an acceleration of inflation to an annual double-digit rate, and later a black market for foreign currency.

At the beginning of 2007, the administration decided to hide inflation by the intervention of the official Consumer Price Inflation Index (CPI) estimated by the National Statistics Institute (INDEC), and this is still going on nowadays (July 2013). Since the beginning of that intervention, several academic and private analysts have estimated that the actual CPI has been considerably higher than the one reported on the official series. The consequences of that rule opened “the Pandora-Box effects” of accumulating very high gaps between the official estimation of inflation and the alternative ones, and this distorted the measurement of other important economic indicators, such as the poverty rate and income distribution. At present, for example, Argentina has an official poverty rate at a lower level than the ones of many developed countries such as Sweden, Finland and other Nordic European countries with the best well-being indicators of the world.

The intervention began in January 2007 with CPI, few months later, the wholesale price index (WPI) was also modified, and the same occurred with the official Household and Employment, Manufacturing and other Surveys. All these interventions had a profound influence on many Argentine economic indicators, since the estimations of GDP, employment and inflation are linked in several ways. The only exception to this “chain of distortions” is probably the statistics of registered employment, because this statistics come from fiscal records.

The evidence of manipulation on statistics incentives the revision and alternative estimation of GDP with the purpose of an estimating and analyzing more accurately the growth profile, productivity and competitiveness of Argentina for ARKLEMS database.

ARKLEMS +LAND is a research project that we developed on the measurement, analyses and international comparisons of the sources of economic growth, productivity and competitiveness of the Argentinean economy at macro and industry level. The methodology is based on KLEMS framework (Capital, Labor, Energy, Material and Service Inputs) in coordination with WORLDKLEMS Project lead by Pr. Dale Jorgenson (Harvard University), Marcel Timmer (Groningen University) and Bart Van Ark (Conference Board and Groningen University).

The ARKLEMS + LAND project is organized by a team of Argentinean academics and researchers from the University of Buenos Aires, thanks on fifteen years of experience in KLEMS measurements of sources of growth, national accounts and input output matrix, audit by a prestigious academic committee.

The purpose of this paper is to report the estimation of an indicator of economic activity that reproduces the GDP growth of Argentina since 1993 to 2012 at a very high detail (by 4 and 5 ISIC industry), following the same traditional sources of information and methodology followed by the Argentine National Accounts System during the twenty

five years previous to the INDEC intervention. By showing this, we will also be able to measure the distortions induced by the intervention at different macroeconomic levels.

The paper is structured as follows. First, we present the framework of national account in Argentina previous to the INDEC intervention. Then, in Section 3, we explain the usual national accounts methodology. Section 4 discloses the results derived from the correct replication of that methodology during the intervention period and compares it to official figures. Section 5 discusses the differences between our results (the facts) and the myths around Argentina's economic growth. Finally we present the conclusions.

## **INTERNATIONAL BACKGROUND AND NATIONAL ACCOUNTS OF ARGENTINA**

Diewert and Fox (1999) has discussed how measurement error could bias output and productivity measurement, but this measurement errors as mismeasurement of outputs and inputs by official statistics agencies, above all in service sector, the lack of adjustment of financial accounting by inflation or the distortions on price of durables during high inflation are “legitimate” errors not manipulations that are not related to show political results

Problems with official statistics and “Pandora Box effects” of distortions to show political results, mostly on GDP, have been well documented for other countries such as China. Maddison and Wu (2008), for example, have found several biases when they recalculated China's GDP in comparison to official estimations, including a clear positive bias on official GDP for the period 1993-2003 (mostly due to distortions on the measurement of non-material services, based on inconsistencies of labor input indicators). Ren (1997), Jorgenson and Vu (2001) and Young (2000) discuss the problems with the official estimates of real GDP and make their own estimates using alternative deflators, showing a lower relative performance.

Similar issues arise in other countries and are also well known, especially for the case of Greece. Sturgess (2010), for example, reports distortions related to the measurement of public debt and public finance indicators, in order to show a deficit figure below the 3% required to enter the Euro zone. The accumulated consequence of those distortions dramatically impacted later during the European crisis of 2009.

It is very well known the case of Chile, as reported by Streb (2010): Cortázar and Marshall (1980) (1987) detect discrepancies in the last quarter of 1973 and for 1976-78 period and Garcia and Freyhoffer (1970) found underestimations of the official inflation in the period 1964-68, a democratic stage where there were price controls.

Argentinean CPI distortion has been reported in Cavallo (2012)<sup>1</sup>. Many academic opinions share the view that not only the CPI<sup>2</sup> but also real GDP growth has been

---

<sup>1</sup> Another important and methodological consistent alternative estimation have been made by G. Bevaqua, former Director of CPI as CPI GB, which is issue by email distribution.

significantly lower in Argentina than what the official publications report, but up to now these differences have not been systematically estimated, verified and reported.

This paper demonstrates that Argentina is another example of the consequences of the “Pandora Box” effects of applying distortions on economic series to show political results. But in the case of Argentina the problem may be worse, since the country was well-known in Latin America for the quality and skills of its human capital applied to the statistical tasks in its public institutions. The Argentine National Accounts and Statistics Systems background were well recognized by its professionalism, consistency and credibility. Several statistics and national accounts professionals studied and received the experience of the Argentine experts from INDEC and ECLAC Buenos Aires office until the intervention in 2007.

Previous important background on Argentina’s GDP estimation based on several versions of the System of National Accounts (SNA) before the intervention is well documented. Since Alberto Fracchia and Manuel Balboa founded “National Accounts: GDP and Balance of Payments” in the Central Bank of Argentina at the beginning of the 1950s, Argentina was a leader in applying SNA on its official statistics. Several important projects helped to update the base years in the last fifty decades: 1950, 1970, 1986 and, most recently, 1993<sup>3</sup>. Last experience of updating base year of national accounts has been documented in ECLAC (1991), PNUD-BIRF (1992), SNA Argentina (1999), IO97 Argentina (2001), and Coremberg (2009, 2010,2011, 2012a).

The National Accounts Bureau of Argentina has been historically subject to several political pressures. It was born as an office of the Central Bank, but moved to the Ministry of the Economy at the beginning of the 1990s, and finally moved to INDEC at the beginning of the 21st century. But, both the National Accounts Bureau and the INDEC have always been independent until 2007<sup>4</sup>. This independency is recognized by academia in Argentina and in Latin America as a whole till the intervention in 2007.

## **METHODOLOGY AND DATA COMPILATION**

At present, the GDP of Argentina is estimated following an old approach: the Laspeyres volume index at 1993 prices.

National accounts in developed countries, and also in several Latin American countries, have progressively moved to the so-called “chain indices”, such as the Fisher index, the chain Laspeyres index and other superlative index. Tornquist index has been used for the case of productivity measurement OECD (2001), EUKLEMS (2007), Conference Board (Chen et.al. (2010) and ARKLEMS+LAND project, Coremberg 2012a). The National Accounts of Argentina are lagging behind in terms of methodology, update of the base year (it uses an old set of relative prices and weights)

---

<sup>2</sup> After 2007, main consultants and experts has been charge by important fines by government; Argentinean justice has released any penalty only recently after more than four years of trials and judicial conflicts.

<sup>3</sup> See Table A.1 in the Annex for detailed references of the antecedents of National Accounts in Argentina.

<sup>4</sup> CPI intervention began in January 2007. Full Intervention of national accounts bureau began during IV quarter of 2007.

and mostly credibility. The main countries of Latin America, for example, have all updated the base year to more recent post 2000 years; as the case of Chile (2008), Ecuador (2007), Nicaragua (2006), Colombia (2005), Uruguay (2005), México (2003), Guatemala (2001), Brazil (2000), and Honduras(2000). Besides, Brazil, Chile, Colombia and Guatemala have applied chain indices more than five years ago.

However, the official Argentine GDP growth positive bias has neither appeared because the base year is old nor is a consequence of deflation of values by CPI bias price index<sup>5</sup>. ***The main difference is due to having withdrawn the traditional methodology that National Accounts in Argentina followed for more than 25 years.***

As is reported in CEPAL (1991), PNUD-BIRF (1992), SNA Argentina (1999), IO97 Argentina (2001) and its impact on Source of Growth in Coremberg (2002, 2009,2010 2012a), most components of the Argentine GDP are estimated using volume index indicators and not deflating the value of production or the value added at current prices (see SNA Argentina (1999)). This methodology was adopted more than two decades ago, and it is applied to the main basic series that constitute the GDP in Argentina. Those volume index indicators do not belong to INDEC, but mainly to other more representative public and private surveys carried out by different institutions. Checking up the consistency of actual GDP estimations is therefore a possible but difficult task, which demands time and also a detailed knowledge of the data sources and the methodology used for estimating the GDP figures.

In order to do that checking, we reproduce the GDP of Argentina following the traditional and usual methodology followed by National Accounts. We compile published and public series that made up every industry value added volume index of the GDP at 4-5 digit of the ISIC classification from 1993 up to the present. The series are mostly the same that are taken into account by the usual national accounts according to the published methodology (SNA Argentina 1999), as cited in Table A2.

## **REPRODUCING THE GDP OF ARGENTINA: MAIN RESULTS**

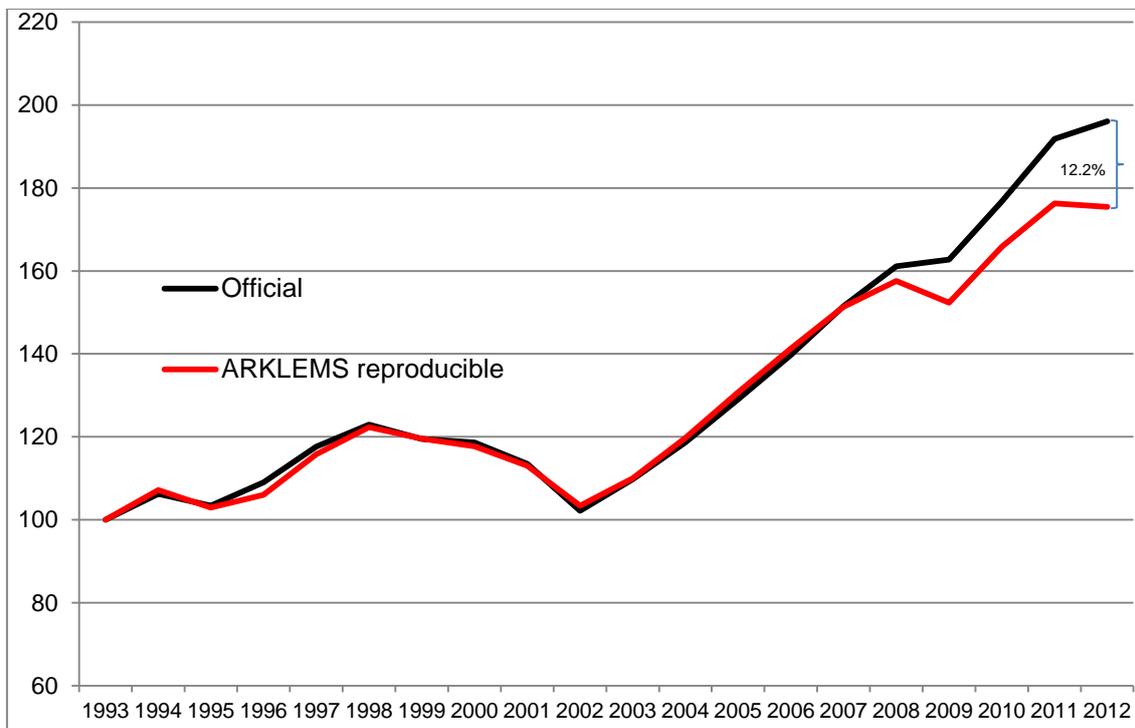
We collect and compile the same basic series by industry that constitute the GDP of Argentina according to published and public indicators before statistics intervention, and apply the traditional methodology to aggregate them.

**The main result of this procedure is a reproducible GDP that replicates almost exactly the official Argentine GDP growth from 1993 to 2007. After that year, however, an important gap appears. This gap accumulates a substantial difference that increases every year since then, as is shown in Figure 1.**

---

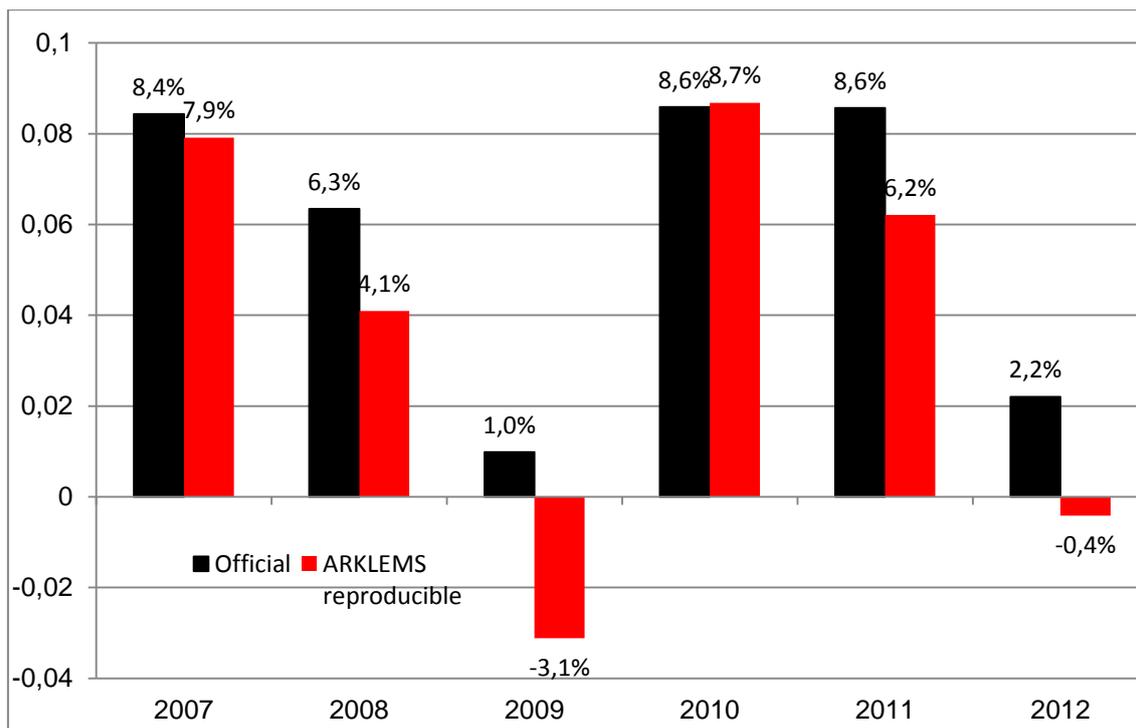
<sup>5</sup> The same reasoning could be applied to the case of the CPI. The distortions in the CPI are not because previous to the intervention the CPI had a low quality because it was based on old weights derived from an old Household Expenses and Income Survey or because there are plutocratic effects on the index. The fact is that the most basic price collection and last publication of aggregates is manipulated. Also the publication of price levels for particular classes of goods has been abandoned since 2007.

Official GDP shows a positive gap of 12.3% at 2012 respect to reproducible ARKLEMS GDP. This lower level of GDP at constant prices has several implications for macroeconomic analyses. Argentina, in fact, has a more moderate growth profile, as it will analyze in next section, but also a lower level of non-price competitiveness due to lower capitalization and labor and total factor productivity.



**Figure 1:** Argentina GDP 1993-2012, Volume index 1993=100.

Our estimation of GDP growth, following the traditional methodology and the usual data sources, grew less than the official figures since 2007. Moreover, official figures change the sign of GDP cycle, a positive rate during the 2009 and 2012 recessions.



**Figure 2:** Argentina GDP growth 2007-2012, annual rates

**As we will see in the following section, during the period of intervention of official statistics, Argentina GDP grew 15.9% between 2007 and 2012 (3% at annual rate), an outstanding GDP des- acceleration respect with the period 2002-2007 47% (8.1% annual rate), before intervention. But official figures show a double times higher GDP growth: 30% (5.3% annual rate) for the same period.**

Several discrepancies by industry explain this macroeconomic difference between both estimations. It is worth to point out that not all the differences at the industry level are positively biased in the official indicator: in some years, some of our series grew more, as occurs in the case of freights services in 2010 and 2011, construction in 2011 and 2012, and public administration during the whole period under analysis. This fact shows that our indicator does not create a systematic bias in the level of the GDP, as opposed to the bias generated by the discretionary intervention on the official series. Hence, the gap between the two series is mainly due to the withdrawal of the traditional methodology followed by National Accounts in Argentina since the last quarter of 2007.

We compile the same series and apply the traditional methodology as historical national accounts (table A4) by industry at 4-5 ISIC level classification. This procedure reveals the existence of a “Pandora Box Effect” of accumulation of positive gaps between official GDP series by industry with respect to our indicator. This occurs in most individual series (with very few exceptions), as it will become evident when in the next paragraphs we review each sector separately.

**Agricultural and Livestock:** We reproduce the usual methodology at a highly detailed level by good. That methodology applies a fix schedule by crop type. We apply a “fact” schedule by crop in quarterly series, but this does not affect the annual series significantly. We detect that some regional crops and minor livestock activities are not

included now in the official series, but this does not provoke any important difference with our ARKLEMS estimation (except for a higher variance related to “weather effects” and changes in supply decisions).

**Mining:** This industry in Argentina is mostly based on oil and gas extraction (which represents nearly 98% of the Argentine mining sector). Of course we also included metallic production and other mining activities, but taking into account the crisis in oil and gas production that is going on in Argentina since 2000 up to the present, we capture a negative trend in the series, which is not reflected by its official counterpart. There is also some evidence that official series include metallic mineral extraction activities at 2004 prices instead of 1993 base year. This is a wrong and discretionary criterion probably driven by the intention of showing a positive trend that avoids reflecting the crisis in the oil and gas production.

**Electricity, Gas and Water Supply:** The official series since the end of 2007 does not reflect the trends that appear on the basic series of the main utility supply indicators.

**Manufacturing Sector:** This sector is the core of the GDP National Accounts, together with the agricultural and livestock sector. This is due not only to its direct impacts on the aggregate GDP (more than 20% of the total at constant prices) but also to the indirect impacts on the estimations of other sectors’ GDP. This is, for example, the case of Trade and Transport, whose GDP estimation is directly linked to the manufacturing sector (and represents another 10% of total GDP).

We compile original indicators for more than 100 different industries at 4-5 ISIC digits (representative branch), detecting important gaps since the last quarter of 2007. **Our guess is that the official series now takes into account the original INDEC Manufacturing Quarterly Survey, which collects value-of-production data at current prices, and deflates it using the wholesale index prices. As is described above, the wholesale price index is distorted since 2008. This survey has never been taken globally into account in the estimation of value added and gross output of the manufacturing sector in national accounts (CEPAL 1991, SNAAR 1999). Using a methodology that takes into account the basic volume series, and not a manufacturing survey which deflates values at current prices, we find very different figures in our manufacturing sector estimations.**

**Construction:** The traditional methodology measures value added and output as a weighted compounded indicator that takes into account a volume index of construction materials<sup>6</sup> and employment. Since several years ago (before the intervention), the materials’ indicators methodology was modified: weights changed from 1993 to 1997, and the basic series have several methodological problems (e.g., cement changed from an output volume indicator to an indicator that captures sales to the domestic market). Since 2008, the materials’ indicator was intervened. Besides, the indicator for the employment in the construction sector was included in national accounts without a clear and systematic methodology. We think that the INDEC now captures total employment from a household survey, but this survey is only available with a lag of several months, so there is no reported evidence about what kind of employment indicator is in fact used in the measurement of national accounts. The GDP series

---

<sup>6</sup> It is called ISAC, and it is a Laspeyres index of cement, iron rods, paintwork, bricks and asphalt.

elaborated by us takes into account registered employment and an indicator of materials from the main materials producers (which correlates well with the original INDEC indicator up to 2007). Important differences on the performance of the sector have been detected in 2008 and 2009.

**Wholesale and Retail Trade:** There is a systematic gap since 2007-2008, due to the impact of the application of a commodity flow on adjusted series from agricultural and livestock sector, and also from manufacturing.

**Hotels and Restaurants:** There is also a systematic gap since 2007-2008. The case of hotels and restaurants is impressive, especially during 2009: the official INDEC GDP series does not take into account the impact of the H1N1 flu and the negative shock of international crisis on the activity of tourism, reflected in the basic series elaborated by the Argentine Department of Tourism. For example, room nights dropped more than 30% at a national level (50% in Buenos Aires city), and most restaurants and cafeterias had to close several months due to H1N1 restrictions during that year. Nevertheless, the official GDP indicator for tourism grew 1% (in comparison to a reduction of 4% in our alternative indicator).

**Transport and Communications:** In this sector, there is also a systematic gap due to the impact of the application of commodity flows on adjusted series from agricultural and livestock sector and manufacturing. Our series grew more during 2010 and 2011, but since 2012 they grew less than the official GDP sector indicator, because this indicator does not take into account the important negative impact of labor union riots on bus and metro transport, and the accident that occurred on the main railroad passenger service on February 2012, which provoked a huge drop on passenger transport activity.

**Financial Intermediation:** There is a systematic gap since 2007. This is the only case where the gap has to do with the deflation of nominal figures by a biased CPI: fisim<sup>7</sup>, bank fees and other activities related with financial intermediation as insurance, credit cards, private pension funds, etc. Besides, the official GDP measurement did not take into account the drop in 2008 of the activity of Private Pension Funds due to nationalization.

**Business and Real Estate Activities:** Once again, here there is a systematic gap since 2007-2008. Some evidence of non-systematic approaches on real estate activities with own or leased property previous of intervention also exists, but this does not impact considerably on the sector's output at 1 ISIC digit. The gap is generated because of inconsistent official measurement through commodity flows of minor sectors as renting equipment, and inconsistencies of labor input series of professional services.

**Public Administration:** This is the only case where our GDP indicator shows a small positive gap in levels and a moderate growth against official series, especially since 2007. The official estimation includes a non-public non-reported series of public administration employment, which supposedly includes labor in public offices at national, provincial and local levels, together with military employment. In the case of

---

<sup>7</sup> Financial Intermediation Services Indirectly Measured

our estimation, we take into account registered employment in public administration from fiscal records. This series has the disadvantage of excluding some provinces, but reflects a higher trend of public employment which is not reflected in the national accounts official non-public series. There is a strong evidence of a boom of public employment since 2007, and mainly during national election years (2009 and 2011) that is not totally reflected in the official national accounts.

**Other services:** This sector includes education, health and other services whose original methodology of annual official series is based on school enrollment and hospital and other health centers utilization indicators. But because these indicators are not disposal at required frequency; quarterly official series follows in fact employment series<sup>8</sup> till 2007. We detected that original traditional employment basic series included in our GDP estimations didn't match official series since 2008, which shows a systematic positive bias.

The following section quantify the contribution of the gaps by industry to GDP gap at macroeconomic level and how the economic growth stylized facts were misled by official figures, contrary to several myths that it is spread in the analysis of Argentina .

## **STYLIZED FACTS: “DEMYTHIFYING” THE MYTHS**

Now it is time to review the consequences of opening Pandora box statistics intervention by reviewing the myths of Argentina's growth, based on our GDP estimations.

### **1.1 MYTH 1: THE METHODOLOGICAL MYTH**

**The Argentine GDP has a positive bias because official INDEC estimation deflates value added at current prices with a manipulated consumer price index.**

As it is shown previously, official GDP Reproducible GDP show a positive bias of 12,2% for 2012 year. More than 94% of the usual GDP before intervention takes into account volume indicators by industry, so positive biases in the present official GDP are not due to a consistent application of a new methodology but to withdrawing the traditional methodology of National Accounts and apply discretionary non-reported criteria. The revision reports that through traditional methodology and data sources, only financial intermediation (5% of GDP) are affected by deflation<sup>9</sup>.

Moreover, if it analyses the contribution of every industry value added gap, it finds that financial intermediation explains only 27% of the total GDP gap, as it is shown in the following figure:

---

<sup>8</sup> It is worth mention that National Accounts Bureau didn't publish any annual revision since 1999.

<sup>9</sup> In the case of restaurants and non-regular passenger transportation, the traditional methodology uses a demand function approach (because there are no direct surveys on those industries), so index prices do not enter directly in the estimation unless through the relative prices of those categories in the CPI. But this methodology was abandoned in 2003, before the beginning of the intervention, based on uniquely unitary income elasticity.

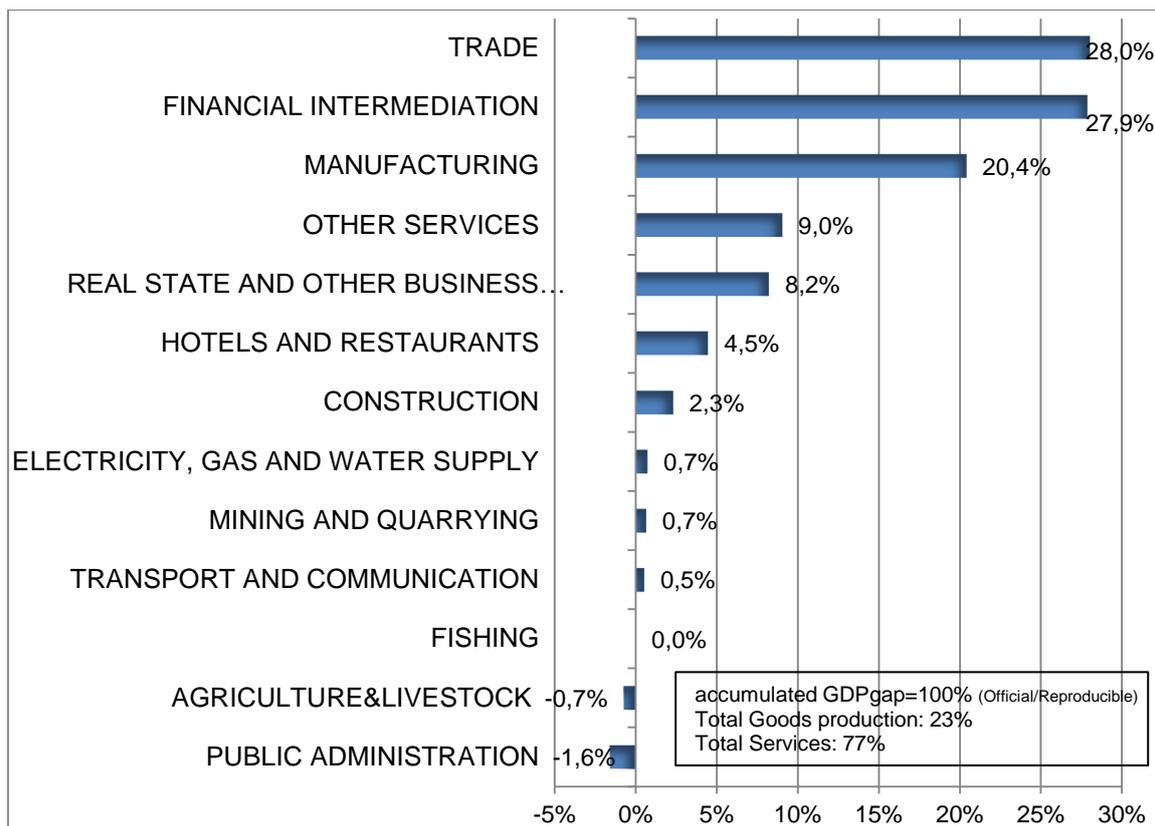


Figure 3: Industry Contribution to Argentina GDP gap (ratio between Official GDP and ARKLEMS reproducible GDP 2012 level -total GDP 2007-2012 Gap level=100% (12.2%).

Mostly of the bias in official figures are explained by services: 77%, and goods production 23%. The main sectors that explain the gap, besides financial intermediation are trade (28%) and manufacturing (22%) which explains 50% of the total gap. Other important service explains the rest of the gap: other services (10.5%), real estate and other services (8.8%), hotels and restaurants (4.8%). The rest of services and goods production explains minor share, compensated by minor negative gaps of public administration and agriculture.

Of course, sectoral composition of the gap expresses the accumulation of differences between sectoral series along 2007-2012 period. But some sectors shows important differences during some specific years. It is worth mention that official GDP doesn't recognize recessions of 2009 and 2012 crisis. Especially case is the crisis of 2009 that have an important negative effect on GDP, which is not recognize at all by official series, taking into account the impact of severe drought of the last decade, the flu H1N1 and the international crisis on the level of activity of several sectors as agriculture and livestock activities and transport and hotels.

**To summarize, the procedure of our GDP estimations show that the resulting gap does not depend on official CPI index manipulation but mainly, 70% of the total gap is due to discretionary intervention on individual industries that implied changing the original national accounts methodology.**

## 1.2 MYTH 2: ARGENTINA'S RESURRECTION MYTH

**The recent Argentina growth episode was the highest growth acceleration of the last decades.**

The analysis of the GDP cycle is relevant to study whether an economy is recovering from a recession or a previous crisis, and whether it starts again a process of growth acceleration. It is also good to see if the economy is growing in the long run, beyond a recovery along the cycle (Rostow 1965 and Hausmann et.al. 2005). This is an old and basic approach, sometimes known as “NBER approach”. Its origins date back to a paper by Burns and Mitchell (1945), written more than sixty years ago.

According to Hausman, Prichett and Rodrik (2005), output recovery after a crisis (“the recovery effect”) could be unsustainable in the long run if the post-growth output does not exceed its pre-episode peak. Generally, GDP peaks coincide with an output level near the potential output, where all production factors are fully utilized. In general, the GDP between cyclical peaks grows at a lower rate than during a recovery phase, because it is more difficult to grow when there is full capacity utilization. Furthermore, GDP growth rates in the long run (between peaks) are usually lower than GDP growth rates during recoveries, because the former ones are based on productivity and not on changes in the production factors’ utilization rates, as it is explained by Coremberg (2012a) and Jorgenson (2011).

One of the stylized facts of the commodity price boom that took place between 2002 and 2011 is that the economic growth of Latin America and Argentina occurred after a deep economic depression during the 1998-2001 period. How much of the economic growth is really due to the boom and how much is due to a “recovery effect”? By how much did GDP accelerate, in comparison to the previous positive phase that occurred during the so-called “Washington Consensus period” in the 1990’s? We conclude that the answers to those questions depend on the consistency of the GDP series used.

The periods of analysis have been chosen in order to compare the actual boom to that which took place during the reforms of 1990-1998. The latter period corresponds to the initial positive phase of the reforms put into force after the lost decade of the 1980’s. It lasts until the negative shock of 1998, when the depression period started (1998-2002). Moreover, comparing that crisis phase (1998-2002) to 2002-2012 allows analyzing the impact of the present boom of basic products’ prices on the recovery after the crisis. It also allows for comparing between extreme GDP levels. We also report data for the periods 2002-2007 and 2007-2012, taking into account that 2007 is not technically a cyclical peak, but rather is the year when the political intervention of official statistics began (especially on the last quarter of that year).

Table 1 shows the GDP performance in the periods previously defined according to the official INDEC statistics and to our alternative GDP ARKLEMS reproducible estimations.

<b>Table 1: Argentina GDP growth</b>			
-1993 prices-			
		<b>ARKLEMS</b>	<b>OFFICIAL</b>
<b>1990-1998</b>	Accumulated Growth	56,3%	56,3%
	Annual Growth	5,7%	5,7%
<b>2002-2012</b>	Accumulated Growth	71,1%	91,9%
	Annual Growth	5,6%	6,7%
<b>2002-2007</b>	Accumulated Growth	47,6%	48,3%
	Annual Growth	8,1%	8,2%
<b>2007-2012</b>	Accumulated Growth	15,9%	29,4%
	Annual Growth	3,0%	5,3%
<b>1998-2012</b>	Accumulated Growth	42,2%	59,4%
	Annual Growth	2,5%	3,4%

Source: ARKLEMS. GDP growth at producer prices.

At annual rates, recent growth episode from 2002 to 2012 measured by reproducible GDP is similar to the previous positive phase in Argentine history (1990-1998). However, official figures shows that recent growth episode is stronger than the previous one.

**The figures on Table 1 show that there was no GDP acceleration for the period 2002-2012 in comparison with the previous positive cycle 1990-1998.**

GDP estimations show “Chinese rates”, approximately 8% annual growth, only during the period 2002-2007 (47.6% compound rate). But after 2007, Argentina suffered an important GDP slowdown: 15.9% of accumulated growth (3.0% annual rate). The official GDP performance, however, shows almost doubles 29.4% than the reproducible GDP (5.3% annual rate).

Another, more formal, approach to qualify an episode as a growth sustainable acceleration is the one proposed by Hausman, Prichett and Rodrik (2005). This approach qualifies growth acceleration episodes and growth in the long run taking into account GDP per capita instead of GDP, using the following method:

- 1)  $g_{t+n} > 3.5 \text{ ppa}$  → *Growth is rapid*
- 2)  $\Delta g_{t+n} > 2.0 \text{ ppa}$  → *Growth accelerates*
- 3)  $y_{t+n} > \max(y_j), i \leq t$  → *Post growth output exceeds pre episode peak*
- 4) *Relevant time horizon is eight years (i.e.,  $n = 7$ )*

Table 2 shows the corresponding values for  $g$  and  $\Delta g$  according to the official and alternative GDP estimations.

<b>Table 2: Argentina GDP per capita growth</b>					
-1993 prices-					
		<b>G</b>		<b><math>\Delta g</math></b>	
		<b>ARKLEMS</b>	<b>OFFICIAL</b>	<b>ARKLEMS</b>	<b>OFFICIAL</b>
<b>1990-1998</b>	Accumulated Growth	43,7%	43,7%		

	Annual Growth	4,2%	4,2%		
<b>2002-2012</b>	Accumulated Growth	48,3%	38,3%		
	Annual Growth	4,0%	5,2%	-0,2%	1,0%
<b>2002-2007</b>	Accumulated Growth	37,7%	38,3%		
	Annual Growth	6,6%	6,7%	2,4%	2,5%
<b>2007-2012</b>	Accumulated Growth	7,7%	20,4%		
	Annual Growth	1,5%	3,8%	-2,7%	-0,5%
<b>1998-2012</b>	Accumulated Growth	15,6%	29,9%		
	Annual Growth	1,0%	1,8%		

Source: ARKLEMS. GDP growth at producer prices.

**By comparing the figures that appear on Table 2, we can see that there is no GDP per capita acceleration for the period 2002-2012 in comparison with the previous positive cycle of 1990-1998. The acceleration occurs only during a period of five years (2002-2007), but it does not fulfill all Hausmann et al. (2005)'s rules for qualifying as a sustainable growth episode.**

**Moreover, after 2007, the so-called “Chinese rates” could not be sustained, since both GDP and GDP per capita growth showed a strong slowdown. There is no structural change on the GDP trend, either, especially when we compare the trend of the GDP per capita between 2002 and 2012 and the one that corresponds to the period 1990-1998.**

However, this technical classification of macroeconomic data that does not aim to hide the important “quality” differences of present decade in comparison with 1990-1998: more labor creation, real wages recovery and the scope of the “social safety nets” of the Argentine economy.

The sustainability of these changes in the long run, however, has been put into question.

As it is demonstrated in Coremberg (2011,2012a), Argentina growth profile showed an unsustainable growth from the point of view of source of growth: growth profile was extensive based on factor utilization and accumulation and Total Factor Productivity slowdown during the recent growth episode.

**As we showed previously, the reason is not only based on unsustainable and inefficiency of productive factors, but mainly of lower growth performance that it is not recognize in official statistics.**

Argentine GDP grew between peaks only 2.5%, according to ARKLEMS estimation (instead of the official 3.4%). If we remember one of the main lemmas of the canonical economic growth theory as pointed out by Barro and Sala I Martin, (1997); Aghion and Howitt (1998) and Acemoglu (2002), “small numbers matter”: one point of difference of GDP growth can explain a great part of the accumulated differences in GDP per capita level between poor and rich countries in the long run. Argentina can be taken as an example of this lemma: the PPP GDP per capita of 1998 was 8.273 dollars<sup>10</sup>, so if the country could grow at a rate of 3.4% for the next 100 years its GDP per capita would reach 53559 dollars (6.5 times its initial GDP per capita level). However, if the growth

<sup>10</sup> Measured in 2000 constant price dollars .

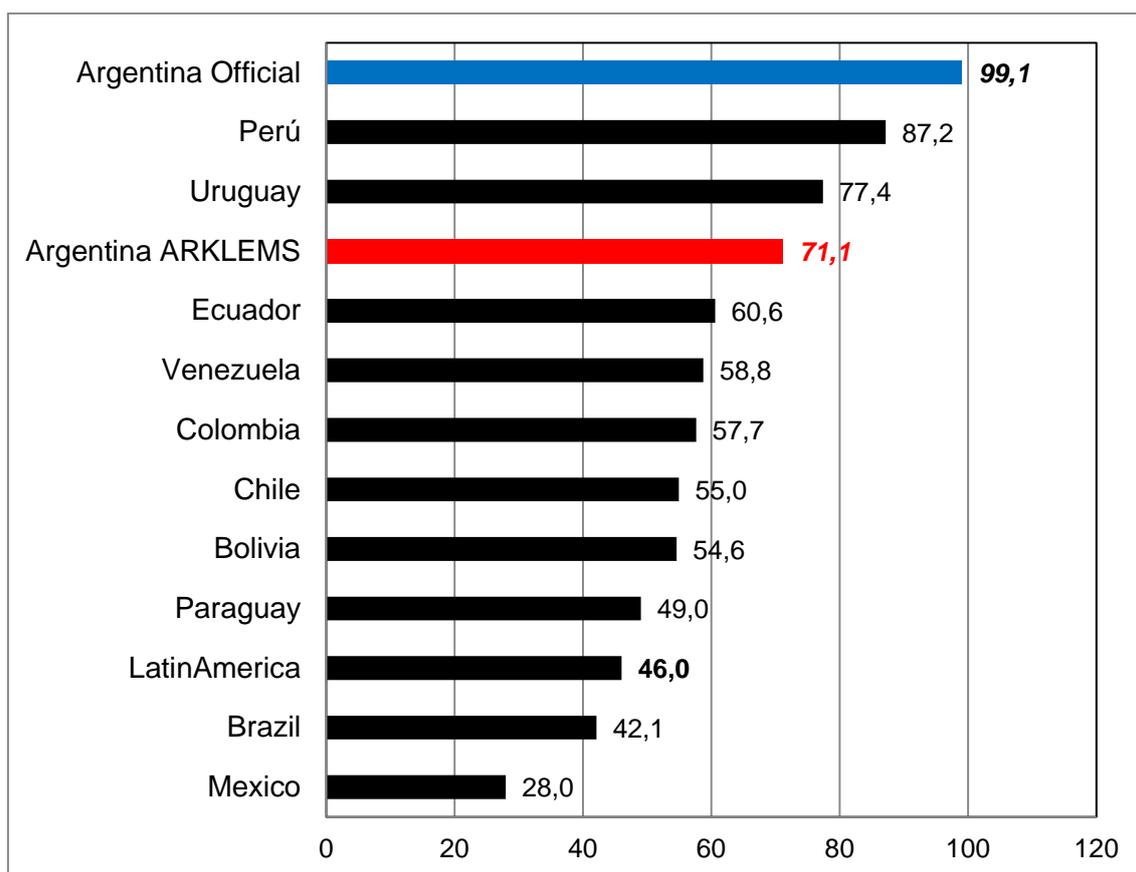
rate were equal to 2.5%, as our ARKLEMS estimation suggests, the GDP per capita will only reach 23115 dollars only 2.8 times the initial level. Of course, the exercise of measuring future GDP per capita according to official GDP growth compute “freaky numbers”: GDP per capita level could be by 53 times higher (official figures of 2002-2012) or 600 times just in case strict Chinese unsustainable rates (official figures of 2002-2007).

It is worth to point out that 2.5% GDP growth and 1.0% GDP per capita growth is nearly what the Argentine growth profile during the period 1900-2012, according to our estimations.<sup>11</sup>

### 1.3 MYTH 3: ARGENTINA’S GROWTH CHAMPIONSHIP

**There is another myth: Argentina is the country of Latin America which has had the highest growth acceleration of the region during the last decade.**

We have already seen that the reproducible Argentine GDP growth during the present boom (2002 -2012) was 71% of accumulated growth (5.6%) annual rate. This performance can be compared with the one registered by other Latin American countries, as shown in the following figure.



<sup>11</sup> ARKLEMS Tornquist estimations, measuring output including composition effects according to growth accounting and productivity approach shows a slightly lower trend of 2.3% between peaks (1998-2012), so GDP per capita would grow in a century to US\$ 18.206 per capita, which is 2.2 times the initial GDP per capita level (see Coremberg, 2012, for ARKLEMS Source of Growth methodology). Coremberg, Goldzier, Heymann and Ramos (2007), conversely, show a GDP growth annual rate of 2.5% between 1950 and 2006. This figure updates would reach nearly 3% if we consider the whole 1900-2012 period.

Figure 4: Latin America GDP Growth, 2002-2012 (compound rate, %). Source: ARKLEMS and ECLAC.

Argentina, Peru and Uruguay are the countries that lead the ranking of growth, far beyond regional average. The largest countries in the continent (Brazil and Mexico) grew below the region's trend.

According to official figures, Argentina is the "growth champion" in the whole region: its growth accumulated an impressive 99%, which more than doubles the region's average. However, if we use our ARKLEMS GDP estimation, instead, the growth performance of Argentina is substantially lower (71%, nearly 30 points less than the official figures) and lies behind those of Peru and Uruguay.

Although Latin America seems to have experienced a significant economic growth process since 2002, it is important to don't forget that the region was recovering from a previous economic recession. If one compares the Latin American growth during 2002-2012 (3.8% annual average) to the previous growth cycle of 1990-1998 (3.4%), the region does not seem to show a differentiated performance between both periods. Even more, if one takes into account the period in which the regime of imports substitution was in force (1950-1980), Latin America grew at an annual rate of 5.5%, and this figure is close to the present growth rates of most Southeast Asian countries (Ocampo 2011).

The beginning of the commodity price boom in 2002 coincided with the end of the great economic depression which had affected Latin America and began in 1998 with large devaluations in Brazil and Russia. The crisis was later magnified by so-called "*flight to quality*" effect during the do.com crises in US, when there was an important capital flight outside Latin America.

During this period of economic depression (1998-2002), Latin America only grew at an annual rate of 1.3%. But it is worth to point out that while the rest of the region showed average positive but slower growth rates during that period, Argentina and Uruguay showed an impressive net drop of their GDP's followed by Venezuela and Paraguay.

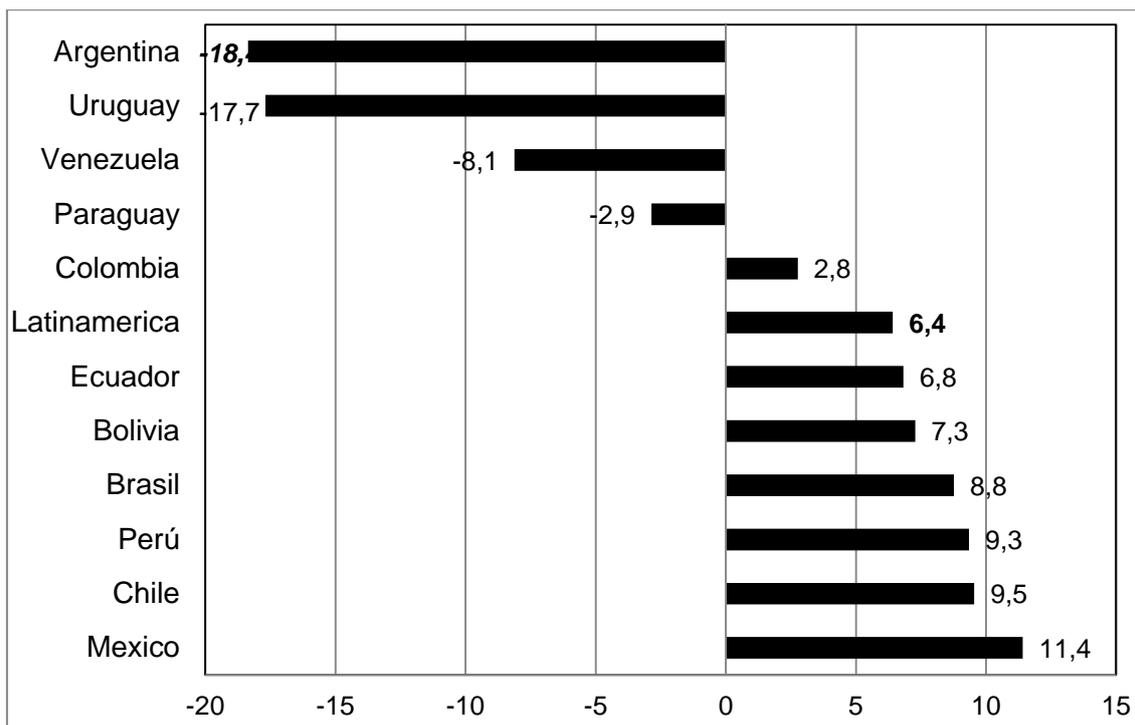


Figure 5: Latin America GDP Growth, 1998-2002 (compound rate, %). Source: ARKLEMS and ECLAC.

One of the reasons for the depth of the Argentine crisis was the lack of flexibility and resistance of its economy to face external shocks due to the strong commitment that the “convertibility law” implied (the 1 to 1 parity between the Argentine peso and the US dollar). Likewise, the negative consequences on Uruguay of the crisis at the end of the Convertibility law period in Argentina were immediate, because of the high dependence of that country with respect to the Argentine economy in those days.

However, as it was shown above, Argentina showed an important resurrection. The exit from the crisis and the recovery of the Argentine economy were due not only to the bailout and the strong devaluation of the domestic currency at the beginning of 2002, but also to the impact of agricultural product prices increase (especially soybean and corn), which generated a significant increase in exports, allowing a recovery of fiscal policy’s margins. In addition, there were also significant wealth effects based on urban real estate and farming land revaluation, which additionally to bailout helps the reduction of financial vulnerability of private corporate sector (Coremberg 2012b).

However, as derives from ARKLEMS measurement, the Argentine GDP recovery was important but its rate was similar to the one registered in the previous recovery from hyperinflation during the 1980 decade.

According to economic growth theory, we should be able to identify the sustainability of present growth if we can analyze how much of this growth is due to a recovery effect and how much was based on sustainable growth above maximum GDP level attained by the region before the crisis of 1998.

When we look at that, we see that the countries’ growth ranking substantially changes. Latin America as a whole grew 55% between 1998 and 2012 (which implies a 3.2%

annual rate). Peru, Ecuador, Chile, Bolivia, Colombia and Brazil experienced a growth rate which was above the regional average.

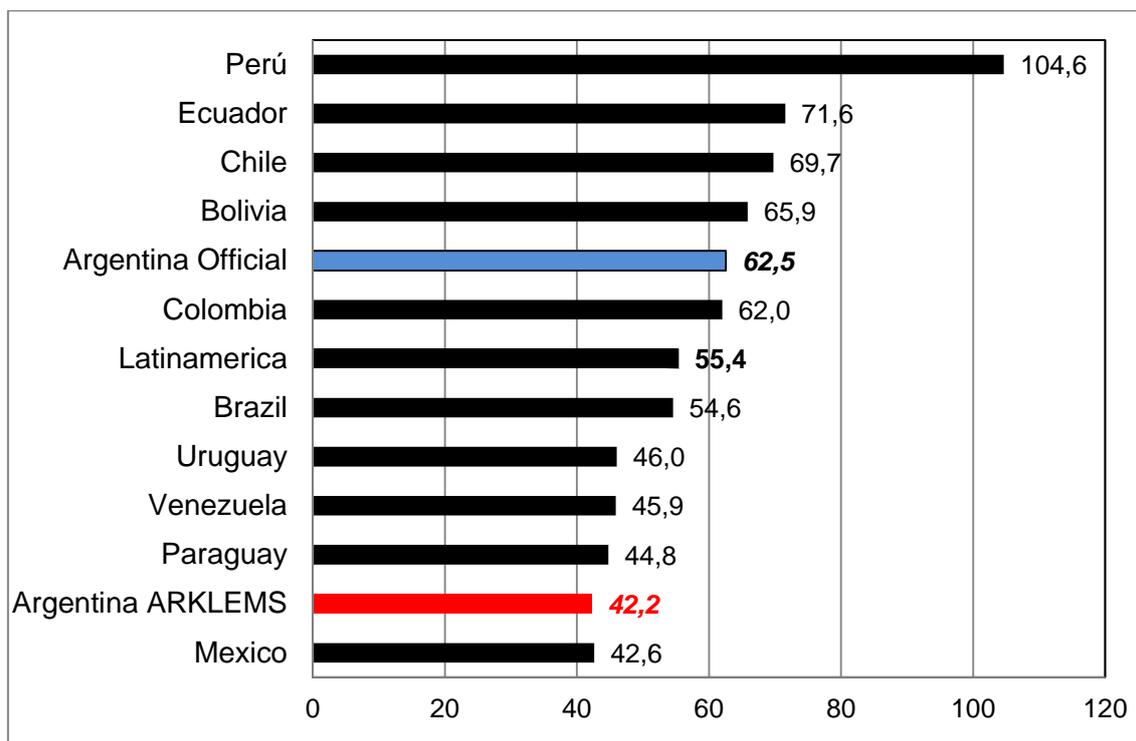


Figure 6: Latin America GDP Growth, 1998-2012 (compound rate, %). Source: ARKLEMS and ECLAC.

Argentina's official GDP also shows a performance above the average of the region, but if we take into account the ARKLEMS reproducible GDP measurement, then Argentina belongs to the group of countries whose growth performance is below the region's average.

**According to our figures, Argentina grew 42% between 1998 and 2012 (20% less than the official figures), and this figure is smaller than the ones that correspond to Brazil, Uruguay, Paraguay and Venezuela, and is only superior to the growth performance experienced by Mexico.**

These comparative performances allow looking at another concept which is generally forgotten about the theory of economic growth: continuous growth. Not only recovery and growth acceleration is important, but also that rates of growth must be continuous and sustained. This consideration reinforces the need to analyze continuous long-run growth periods without cyclical effects.

**Commodity price boom impact on Argentina allowed a recovery of the aggregate demand with respect to the crisis period, but this has not translated into a change of trend in the long run. Argentina's recent growth episode, therefore, is a case of normal recovery in terms of the Argentine economic history of volatility and irregular growth behavior, which does not seem to have generated a structural change in its long-run growth pattern.**

## CONCLUSIONS

The main purpose of this paper is to make an exhaustive revision of the Argentina National Accounts' methodology in order to reproduce GDP series since 1993 and check economic growth after political intervention of official statistics.

This work depicts the results of estimating the GDP taking into account the same traditional series and methodology that had been used for 25 years up to the intervention of the official statistics in 2007.

This research shows that our serie reproduces Argentina's GDP growth from 1993 up to 2006. Since then, the difference between the official series and ARKLEMS reproducible series accumulates an important positive bias.

The divergence between our results and official figures is due to the withdrawal of the traditional GDP measurement methodology in almost every sector of GDP. The paper shows that these distortions are not based on deflating value added by industry at current prices levels with manipulated price indices but mainly on discretional intervention in every industry component of the GDP, not only financial sector but also trade and manufacturing and the rest of services and goods production sectors, with the objective to be to show a higher GDP growth.

Official series present a GDP that grows at higher rates during the recent recovery period (2003-2012) than in the previous one (1990-1998), and make Argentina to lead the GDP performance of the region. But, this research demonstrated that ARKLEMS reproducible GDP for recent growth episode has a similar performance to previous positive cycle, 1990-1998. Tehcnical analyses based on typical NBER cycle decomposition updated by Hausman et.al. (2005), shows that Argentina does not have a sustainable growth acceleration.

The paper showed that Argentina growth was important during recent growth episode, but contrary to official figures, was not the growth championship of Latin America region. Argentina has also one of the largest GDP volatilities in the whole region, showing a very slow performance, lower (next to Mexico) than the region and Brazil, when the comparison is realized between peaks of economic cycle (1998-2012).

After checking the results using the same traditional series and methods that were customary in Argentina before 2007, Argentine official GDP could not evade the so-called "Pandora Box" effects, caused by the political intervention of official statistics.

## ANNEX

Date of publication	Title	Institution	Base Year	Period
1946	National Income of Argentina	NAB-Central Bank	1935	1935-1945
1955	GDP and Income of Argentina	Secretariat of Economic Issues	1950	1935-1954
1958	The Economic Development of Argentina	ECLAC	1950	1900-1955
1964	GDP of Argentina	NAB-Central Bank	1960	1950-1962
1964- 1968	Income distribution and National Accounts of Argentina	CONADE-CEPAL (ECLAC)	1960	1950-1963
1966	GDP origin and National Expenditure Composition	NAB-Central Bank	1960	1950-1966
1971	GDP origin and National Expenditure Composition	NAB-Central Bank	1960	1950-1969
1975	System of National Accounts and Income of Argentina	NAB-Central Bank	1960	1950-1973
1979- 1980	Quarterly estimations of supply and Demand	NAB-Central Bank	1970	1970-1980
1996	Revision of Quarterly estimations of supply and Demand	NAB-Ministry of Economy	1986	1980-1996
1999	System of National Accounts, Base year 1993	NAB-Ministry of Economy	1993	1993-1997
2000	Updated of supply and demand	NAB-Ministry of Economy	1993	1998-1999
2001	Input Output Matrix 1997	NAB-Ministry of Economy-INDEC	1993	1997

Notes: NAB (National Accounts Bureau), all titles has been translated from Spanish.

<b>TABLE A2: Author's Estimation of Argentina ARKLEMS reproducible GDP by sector, 2006-2012</b>							
<b>-GDP in million pesos at 1993 prices-</b>							
	2006	2007	2008	2009	2010	2011	2012
AGRICULTURE&LIVESTOCK	17.265	18.515	18.823	14.819	19.392	20.031	17.618
FISHING	497	465	484	427	472	511	502
MINING AND QUARRYING	5.219	5.162	5.090	4.911	4.932	4.737	4.636
MANUFACTURING	54.975	59.153	60.997	58.081	63.983	66.888	65.522
ELECTRICITY, GAS AND WATER SUPPLY	9.023	9.468	9.796	9.698	10.100	10.604	11.067
CONSTRUCTION	20.751	23.118	23.402	21.355	22.596	24.828	24.372
TRADE	41.587	46.222	48.457	45.037	50.677	54.603	52.462
HOTELS AND RESTAURANTS	8.079	8.650	8.802	8.404	8.973	9.364	9.216
TRANSPORT AND COMMUNICATION	33.049	37.561	40.991	42.858	49.233	55.388	56.571
FINANCIAL INTERMEDIATION	14.573	16.794	16.855	15.302	16.184	17.994	18.745
REAL STATE AND OTHER BUSINESS SERVICES	43.959	45.992	48.336	48.062	49.608	51.436	52.190
PUBLIC ADMINISTRATION	15.561	15.957	16.758	17.917	18.762	19.781	20.799
OTHER SERVICES	44.603	46.541	48.459	49.556	50.727	52.173	53.025
<b>TOTAL</b>	<b>309.140</b>	<b>333.599</b>	<b>347.251</b>	<b>336.426</b>	<b>365.639</b>	<b>388.337</b>	<b>386.725</b>

Source: Author's estimation of ARKLEMS reproducible GDP by sector based on data source cited in SNAArgentina(1999)

<b>TABLE A3: Official Estimation of Argentina GDP by sector, 2006-2012</b>							
<b>-GDP in million pesos at 1993 prices-</b>							
	2006	2007	2008	2009	2010	2011	2012
AGRICULTURE&LIVESTOCK	17.265	19.037	18.523	15.601	20.046	19.557	17.342
FISHING	497	465	484	427	472	511	502
MINING AND QUARRYING	5.219	5.195	5.250	5.193	5.113	4.933	4.980
MANUFACTURING	54.975	59.153	61.842	61.503	67.547	74.962	74.660
ELECTRICITY, GAS AND WATER SUPPLY	9.023	9.541	9.863	9.954	10.567	11.049	11.583
CONSTRUCTION	20.751	22.806	23.641	22.744	23.915	26.085	25.396
TRADE	41.587	46.219	49.870	49.751	56.245	64.486	65.739
HOTELS AND RESTAURANTS	8.079	8.745	9.417	9.486	10.180	10.964	11.137
TRANSPORT AND COMMUNICATION	33.049	37.568	42.129	44.860	49.605	54.231	56.918
FINANCIAL INTERMEDIATION	14.573	17.280	20.279	20.436	22.225	26.944	32.211
REAL STATE AND OTHER BUSINESS SERVICES	43.959	46.018	48.902	50.878	52.982	55.661	55.860
PUBLIC ADMINISTRATION	15.561	16.134	16.758	17.609	18.486	19.220	20.008
OTHER SERVICES	44.603	47.050	49.519	51.540	53.513	55.776	57.404
<b>TOTAL</b>	<b>309.140</b>	<b>335.211</b>	<b>356.478</b>	<b>359.983</b>	<b>390.896</b>	<b>424.380</b>	<b>433.740</b>

Source: National Statistics and Census Institute (INDEC)

## BIBLIOGRAPHIC REFERENCES

- Aghion & Howitt (1998): Endogenous Growth Theory. MIT Press
- Acemoglu, D. (2008): Introduction to Modern Growth, Princeton University Press
- Barro, Robert and Sala I Martin, Xavier (1997): Economic Growth, McGraw Hill Ed.
- Cavallo, Alberto (2012). Online vs Official Price Indexes: Measuring Argentina's Inflation - Journal of Monetary Economics. December 2012
- Chen, V.; Gupta, A., Therrien, A.; Levanon, G. and van Ark, B. (2010): Recent Productivity Developments in the World Economy: An Overview from The Conference Board Total Economy Database. International Productivity Monitor N.19, spring 2010
- Diewert, W. and Fox, K. (1999): Can Measurement Error Explain the Productivity Paradox? The Canadian Journal of Economics Vol. 32, No. 2, Special Issue on Service Sector Productivity and the Productivity Paradox (Apr., 1999), pp. 251-280
- Coremberg, A. (2009): "Measuring Source of Growth of an Unstable Economy: Argentina: Productivity and Productive Factors by Asset type and Industry. Methods and Series (in Spanish). ECLAC Buenos Aires Office. Estudios y Perspectivas 41
- Coremberg, A. (2011): "The Argentine Productivity Slowdown. The challenges after global financial collapse", World Economics 2011. Vol.12, nº4. <http://www.world-economics-journal.com/Contents/ArticleOverview.aspx?ID=481>
- Coremberg, A. (2012a): Measuring Productivity in Land Rich Economies. The ARKLEMS+LAND Project, WorldKLEMS 2<sup>nd</sup> Conference, Harvard University
- Coremberg (2012b): Where is the Wealth of Argentina?. The National Balance Sheet of Unstable and Natual Resource Dependent Economy. International Association of Research in Income and Wealth Conference, Boston.
- Coremberg, A. Heymann D., Goldzier, P., y Ramos, A. (2007): "Patterns of Saving and Growth of Argentina Argentina 1950-2006". Cepal Santiago
- Cortázar, René, y Jorge Marshall (1980), "Índice de Precios al Consumidor en Chile: 1970-78", Colección Estudios 4, Cieplan.
- Cortázar, René, y Patricio Meller (1987), "Los dos Chile y las estadísticas oficiales: una versión didáctica", Apuntes 67, Cieplan.
- ECLAC (1991): Revision of National Accounts and Income Distribution of Argentina. Proyecto Revisión de las Cuentas Nacionales y de la Distribución del Ingreso. Final report. ECLAC Buenos Aires. Diciembre 1991
- EUKLEMS (2007): "Eu Klems Growth And Productivity Accounts", prepared by Timmer, Marcel, Ton van Moergastel, Edwin Stuivenwold, Gerard Ypma, Mary O'Mahony and Mari Kangasniemi <http://www.euklems.net>
- García, Jorge, y Hugo Freyhoffer (1970), "La tasa efectiva de inflación en Chile entre 1961 y 1968 y el comportamiento de los agentes económicos", Publicación 118, Instituto de Economía y Planificación, Universidad de Chile.
- Hausman R., Prichett L. and Rodrik D. (2005): Growth Accelerations, Journal of Economic Growth, December 2005, Volume 10, Issue 4, pp 303-329
- Jorgenson, Dale and Vu, Mun (2001): Productivity Growth in China, 1981-95, Kennedy School of Government, Cambridge, MA, September 2001
- Jorgenson, Dale W (2011): "Innovation and Productivity Growth," American Journal of Agricultural Economics, Vol.93, Issue 2, April 2011, pp. 276-296

- IO97Argentina (2001): Input Output Matrix 1997Argentina. Matriz Insumo Producto Argentina 1997. Ministerio de Economía-Secretaría de Programación Económica. Instituto Nacional de Estadísticas y Censos. Ministry of Economy-INDEC
- ISWGNA (2008): "System of National Accounts", The Inter-Secretariat Working Group on National Accounts- Commission of the European Communities-EUROSTAT, International Monetary Fund, OECD, World Bank, United Nations, Brussels/Luxembourg, New York, París, Washington, D.C. 2008.
- Maddison, Angus and Wu Harry (2008): Measuring China's Economic Performance. World Economics, Vol. 9, No. 2, April-June 2008
- Ocampo, Jose Antonio (2012): Let's Be Clear: This Will Not Be Latin America's Decade, VoxLACEA, <http://vox.lacea.org/?q=JoseAntonioOcampo1>
- OECD (2001): OECD Productivity Manual: a Guide to the Measurement of Industry-Level and Aggregate Productivity Growth, Paris.
- OECD (2008): Measuring Capital. 2nd draft version. OECD, París
- Ren, Rouen (1997) China's Economic Performance in an International Perspective, OECD Development Centre Studies.
- PNUD-BIRF (1992): Studies for Design of Public Policies, National Accounts Methodological report. "Estudio para el Diseño de Políticas Públicas". Tomo 11. Cuentas Nacionales. Informe Metodológico. United Nations Development Program- International Bank for Reconstruction and Development. Buenos Aires 1992
- SNA Argentina (1999): National Accounts System of Argentina. Base year 1993. Quaterly and Annual Series. Ministry of Economy.
- Streb, Jorge (2010): ¿ Why citizens tolerate the distortion of the CPI?, Colectivo Economico, blog in Spanish Argentina.<http://colectivoeconomico.org/2011/03/15/por-que-la-ciudadania-tolera-la-distorsion-del-ipc/#more-515>
- Sturgess, Brian (2010): Greek Economic Statistics: A Decade of Deceit. So how come the rating agencies missed it again? World Economics, Vol. 11 No. 2 April-June 2010
- Young, Alwyn (2000) "Gold into Base Metals: Productivity Growth in the People's Republic of China during the Reform Period", mimeo, University of Chicago.