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The Asymmetric Effect of the Business Cycle on Poverty in Argentina

Summary: After the crisis of 2002, Argentina started a process of strong recovery of the social indicators, which slowed from 2007 and has stagnated since 2012. The present situation is slightly better in relation to the 1990s, but worse if the comparison is made with the 1980s and the 1970s. Despite the high growth rates experienced until 2011, income distribution was the main cause of improvement in poverty and extreme poverty measures. This article examines the risk of reversing in the coming years part of the recovery achieved. This risk is based on the possible asymmetric effect of the business cycle on social indicators, analyzed through the income and income distribution elasticities of poverty and extreme poverty estimated for the 2003-2017 period.

Key words: Poverty, Income growth, Income distribution, Business cycle, Argentina.

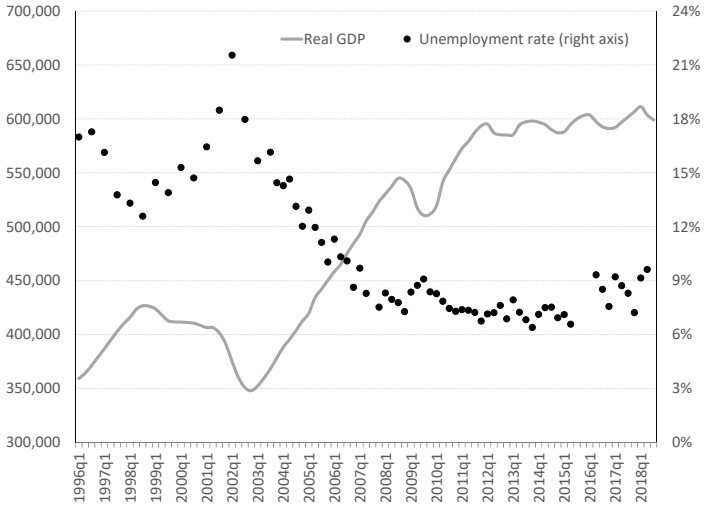
JEL: C22, D31, E32, I32.

After the end of the Convertibility Law in December of 2001, the Argentine economy was devastated. Between mid-1998 and mid-2002, the gross domestic product (GDP) declined almost 20%, of which more than a half happened during the last 12 months. In this sense, Figure 1 shows the evolution of GDP (left axis) and unemployment (right axis) in Argentina. The unemployment rate increased from 13% to 20% of the labor force and the wage share in GDP fell from over 40% to less than 34%. Therefore, the recession generated an unprecedented deterioration on the social indicators. In the second half of 2003, poverty and extreme poverty reached 58% and almost 22% of total population, respectively[1].

Since 2003 the combination of a favorable international context with expansive domestic policies generated a strong and fast recovery, which later translated into economic growth. Until 2008 the average annual growth rate reached 8% and, after the subprime crisis, it started growing again at a rate of 10% and 6% in 2010 and 2011, respectively. In addition, it was a pro-poor growth: the unemployment rate went down to around 7% of the labor force and the ratio between wages and GDP exceeded 50%.

[1] The poverty and extreme poverty indicators, as well as the Gini index, used in this paper are own estimations based on the microdata of the Permanent Household Survey (EPH by its acronym in Spanish).

This behavior was reflected on social indicators: by 2011 poverty was below 30% of the population, while extreme poverty was reduced to 7%.



Source: Authors' estimates based on INDEC (2018)[2].

Figure 1 Argentine Real GDP (Constant Prices of 2004-ARS Million: Left Axis) and Unemployment Rate (% of the Labor Force: Right Axis)

However, since 2012 the economic activity stagnated, alternating even years of falling GDP with odd years of low growth. The result was a GDP of 2018 similar to that of 2011, so GDP *per capita* fell by almost 8% during those years. The unemployment rate rose to near 10% of the labor force and the wage share in GDP returned to around 45%. In this context, social improvements slowed down, until they stopped.

This article examines the main reasons behind Argentine social recovery and analyzes the risks of a reversion of the improvement achieved. These risks are based not only in the difficulties the country is facing to continue growing, but also in the possible asymmetric effect of the business cycle on social indicators. Based on the income and income distribution elasticities of poverty and extreme poverty, this article analyzes whether 1 percentage point (p.p.) of income growth improved social indicators in the same proportion as the deterioration due to 1 p.p. of income fall during the 2003-2017 period.

The article is structured as follows. After this introduction, there is a review of the literature on the effect of the business cycle on poverty. In the second section, the improvement of the Argentine social indicators between 2003 and 2017 is analyzed, differentiating which part was due to the income growth and which to the income distribution. The third part comprises an econometric exercise in which income and income distribution elasticities of poverty and extreme poverty are estimated and, in

[2] **Instituto Nacional de Estadística y Censos de la República Argentina (INDEC).** 2018. Permanent Household Survey. https://www.indec.gob.ar/bases-de-datos.asp (accessed May 13, 2018).

particular, it is tested if these elasticities showed a similar magnitude depending on whether they were observations of increase or decline in income. The last section concludes.

1. The Asymmetric Effect of Business Cycle on Social Indicators

A household is poor (extremely poor) if the income per adult equivalent of all of its members does not exceed the corresponding value of the poverty (extreme poverty) line. The extreme poverty line measures the cost of a representative basic food basket an adult equivalent needs to satisfy certain nutritional requirements (2750 kcal per day). Meanwhile, the poverty line measures the cost of a representative basic goods and services basket which is calculated as the product between the basic food basket and the inverse of the Engel's coefficient (the representative relation between the food and non-food expenditures). Thus, the number of poor people can be reduced by improving the average income and/or the income distribution of the economy.

Nevertheless, in the middle of the last century, the "inverted U" theory sparked the debate about the effect of economic growth on poverty. It claimed that income distribution tended to deteriorate during the first stages of economic development to a certain point in which expansion began to be more evenly distributed (Simon Kuznets 1955). If income growth could worsen the income distribution, its total effect on poverty remains unknown.

Although Kuznets himself was cautious about his conclusions, many authors defended his hypothesis (Irving B. Kravis 1960; Harry T. Oshima 1970; Irma Adelman and Cynthia T. Morris 1973; Felix Paukert 1973; William R. Cline 1975; Montek S. Ahluwalia 1976; Sherman Robinson 1976, among others). However, these articles used cross-sectional data, when it would be necessary to use time series data to test this hypothesis correctly (Gary S. Fields 1989). In fact, later articles which use time series data (Ahluwalia 1974; Fields 1980; Rati Ram 1991) or panels (Mark D. Partridge, Dan S. Rickman, and William Levernier 1996; Michael Bruno, Martin Ravallion, and Lyn Squire 1998) found no evidence of an inverse relationship between growth and distribution.

Moreover, other authors concluded that growth and equality are related in a direct, but asymmetrical way (Alain de Janvry and Elisabeth Sadoulet 2000; Nora Lustig 2000; Pierre-Richard Agénor 2004, among others). This implies that during periods of growth income distribution tends to improve; while during recessions it tends to get worse. But these variations are not symmetrical: the improvement during growth periods is weaker than the deterioration during recessions. Thus, volatility in real terms would negatively affect income distribution (Ricardo Hausmann and Michael Gavin 1996; Thomas Laursen and Sandeep Mahajan 2004; Richard Breen and Cecilia García-Peñalosa 2005; Cesar Calderón and Eduardo Levy Yeyati 2009; Wen Shwo Fang, Stephen M. Miller, and Chih-Chuan Yeh 2015).

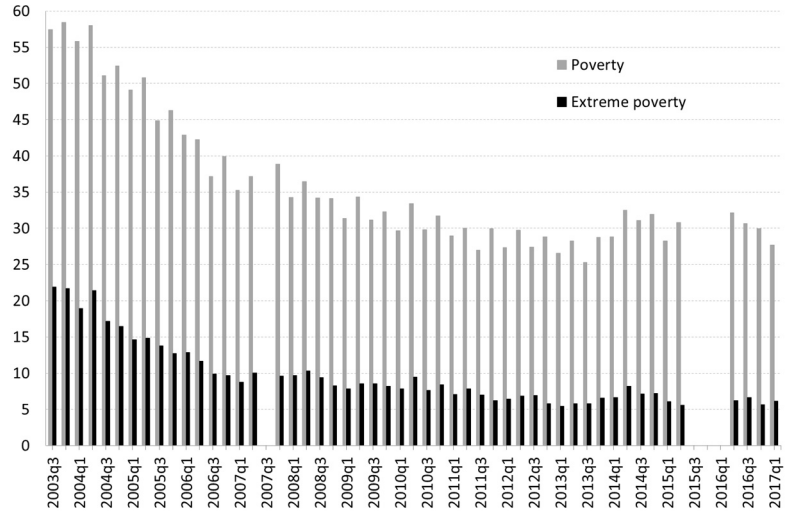
In short, if the economic cycle has an asymmetric effect on income distribution, this effect has to be necessarily reflected in the variations of poverty and extreme poverty. In this regard, the Inter-American Development Bank (IDB 1995, pp. 203-207) pointed out that if Latin America had had the level of macroeconomic volatility of developed countries, in 1995 its poverty would have been 25% lower. In the following

sections, the asymmetric effect of the business cycle on social indicators in Argentina for the 2003-2017 period is analyzed. But first, the evolution of social indicators between these years is examined, and then the asymmetry is tested through the estimation of the income and income distribution elasticities of poverty and extreme poverty.

2. The Social Recovery of Argentina after the End of the Convertibility Law

2.1 Poverty and Extreme Poverty Rates, Gap and Squared Gap

In mid-2003, Argentina was recovering from the worst economic crisis in its history. Poverty and extreme poverty reached almost 60% and more than 20% of the total population, respectively. In the following years, the strong economic growth and the improvement in the income distribution allowed a fast recovery on social indicators. Indeed, in the third quarter of 2006, poverty was around 37% and extreme poverty had drilled the floor of 10%. Even though improvements continued until 2013, the pace slowed down as a consequence of the increase in inflation and the greater structural precariousness of the poor. The first significant deterioration occurred in 2014, due to the fall in real income and the worsening in distribution given the sharp devaluation of the Argentine *peso* in January (Figure 2).



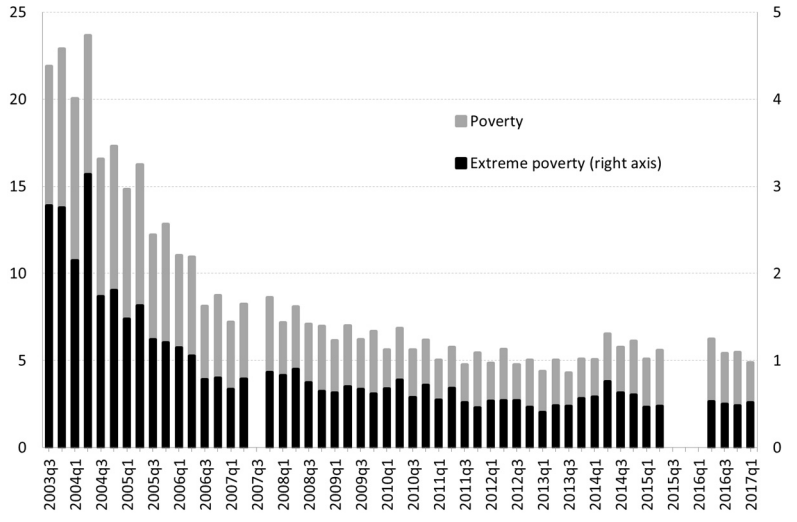
Source: Authors' estimates based on INDEC (2018).

Figure 2 Argentine Poverty and Extreme Poverty Rates (% of Total Population)

But poverty and extreme poverty rates are not the only relevant data to analyze social indicators. In fact, these indicators capture the incidence (poor people as a percentage of total population), but not depth (how far are poor people from leaving poverty). Depth can be measured by the poverty or extreme poverty gap. This is the difference between the poverty and extreme poverty line (total and basic food baskets)

and the family income per adult equivalent of poor and extremely poor families. A depth indicator can be calculated by adding the poverty and extreme poverty gaps of all members of the poor and extremely poor families, and dividing this sum by total income. The result is the percentage of total income needed to eliminate poverty or extreme poverty: result shown in Figure 3.

Between 2003 and 2017, Argentine poverty and extreme poverty gaps followed a similar path to the corresponding rates. They fell sharply until the third quarter of 2006. They continued to decline though at a slower pace until 2013. Since then, their values have been more or less constant. As mentioned previously, these indicators also show the magnitude of poverty and extreme poverty in terms of total income. By 2003, an income transfer equivalent to about 22% and 3% of total income was needed to eliminate poverty and extreme poverty, respectively. At present, these percentages fell to 5% and 0.5%.

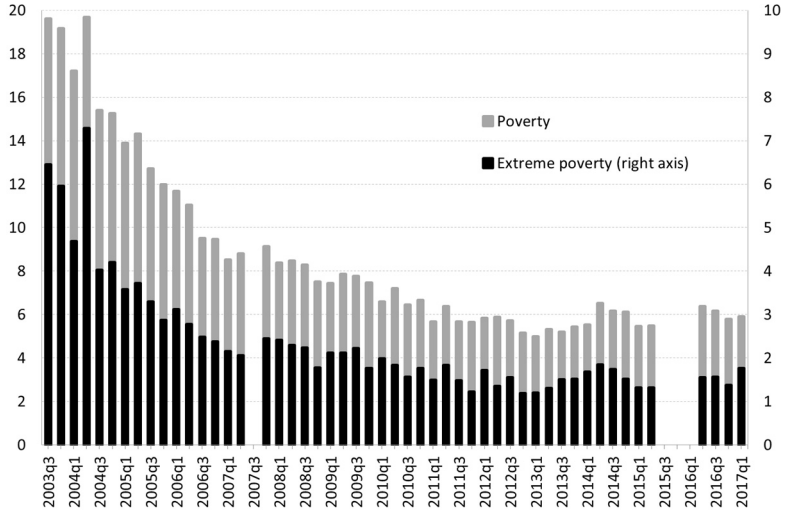


Source: Authors' estimates based on INDEC (2018).

Figure 3 Argentine Poverty (Left Axis) and Extreme Poverty Gaps (Right Axis) (% of Total Income)

However, neither the gap nor the rate take into account the income distribution within the poor population. To do so, the squared poverty gap can be used, an indicator for which the lower the family income the greater the weight. Between 2003 and 2017, the Argentine squared poverty and extreme poverty gaps showed in Figure 4 have a similar evolution to the corresponding rates and gaps. The only difference is that the decline began a year earlier (in 2012 instead of 2013). This means that the income distribution within the poor and extremely poor people started declining in 2012.

Summing up, between 2003 and 2017 Argentine social indicators showed a strong recovery. However, the present situation still does not represent a substantial improvement when compared to previous decades. Although the EPH methodology



Source: Authors' estimates based on INDEC (2018).

Figure 4 Argentine Squared Poverty (Left Axis) and Extreme Poverty (Right Axis) Gaps (Squared Total and Basic Food Baskets *per capita*)

was modified in 2003 and comparability was affected, the poverty rates in the second half of 1998 and today have a similar value. Extreme poverty showed a slightly better improvement, since the rate of around 6% for the last five years was never reached during the 1990s. In any case, all indicators of poverty and extreme poverty are nowadays higher than during the 1970s and the 1980s.

2.2 Income Growth and Income Distribution Effects

As mentioned previously, poverty indicators are modified basically by two distinguishable effects: income and income distribution[3] variations. Making this decomposition allows the analysis of which one of these effects was more important to explain the Argentine social recovery between 2003 and 2017. Moreover, disaggregated data series are going to be used as a robustness check in income and income distribution elasticities of poverty and extreme poverty estimations.

Even though several methods can be used to perform this decomposition (Fernando Medina and Marco Galván 2014), the one developed by Vahid Mahmoudi (2001) is chosen here. By averaging the results that arise from fixing as reference the initial and final years of the period, it improves Gaurav Datt and Martin Ravallion's method (1992) because it has no residual (Medina and Galván 2014, pp. 24-26). What is more, this method was previously used to study Argentina and other Latin American countries, but for different time periods (Matías Busso, Federico Cerimedo, and Martín Cicowiez 2005; Leonardo Gasparini, Federico Gutiérrez, and Leopoldo Tornarolli 2007; Gasparini, Cicowiez, and Walter S. Escudero 2013 pp. 554-561, among others).

[3] In this article the distribution of income refers to disposable income, i.e. after taxes and transfers.

In what follows, the contribution of these two effects to the Argentine social recovery between 2003 and 2017 are analyzed. As can be seen in Tables 1 and 2, at the beginning of the period, the income growth effect was the most important one to explain the improvement, but since mid-2006 it has been losing relevance. In the end-to-end comparison, income growth and income distribution effects explain 16.2 p.p. (54.4%) and 13.6 p.p. (45.6%), respectively, of the total 29.7 p.p. drop in the poverty rate, 7.2 p.p. (42.2%) and 9.8 p.p. (57.8%) of the total 17 p.p. fall in the poverty gap, and 5 p.p. (36.4%) and 8.7 p.p. (63.6%) of the total 13.7 p.p. decline in the squared poverty gap (Table 1).

Table 1 Poverty Rate, Poverty Gap and Squared Poverty Gap Variation - Total, Income Growth Effect and Income Distribution Effect (Percentage Points)

	Poverty rate variation			Poverty gap variation			Squared poverty gap variation		
	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect
2003Q3-2004Q3	-6,4	-3,1	-3,3	-5,3	-2,4	-3,0	-4,2	-1,6	-2,6
2003Q3-2005Q3	-12,6	-8,6	-4,0	-9,7	-6,0	-3,7	-6,9	-3,8	-3,1
2003Q3-2006Q3	-20,3	-14,0	-6,3	-13,8	-8,6	-5,2	-10,1	-5,9	-4,3
2003Q3-2007Q2	-20,3	-12,5	-7,8	-13,7	-7,0	-6,7	-10,8	-5,0	-5,9
2003Q3-2008Q2	-21,0	-11,9	-9,1	-13,8	-6,5	-7,3	-11,1	-4,7	-6,5
2003Q3-2009Q2	-23,2	-14,7	-8,4	-14,9	-8,0	-6,9	-11,8	-5,7	-6,1
2003Q3-2010Q2	-24,1	-13,8	-10,3	-15,1	-7,1	-7,9	-12,4	-5,2	-7,2
2003Q3-2011Q2	-27,5	-16,0	-11,4	-16,1	-7,9	-8,2	-13,2	-5,9	-7,4
2003Q3-2012Q2	-27,7	-15,8	-12,0	-16,3	-7,7	-8,6	-13,7	-5,7	-8,0
2003Q3-2013Q2	-29,2	-16,5	-12,7	-16,9	-7,9	-9,0	-14,3	-5,9	-8,4
2003Q3-2014Q2	-25,0	-13,0	-12,0	-15,4	-6,3	-9,1	-13,1	-4,7	-8,4
2003Q3-2015Q2	-26,7	-14,5	-12,2	-16,3	-6,9	-9,4	-14,1	-5,1	-9,0
2003Q3-2016Q2	-25,3	-13,8	-11,5	-15,7	-6,6	-9,1	-13,2	-4,8	-8,4
2003Q3-2017Q1	-29,7	-16,2	-13,6	-17,0	-7,2	-9,8	-13,7	-5,0	-8,7

Source: Authors' estimates based on INDEC (2018).

Income distribution is the most important explanatory factor for all extreme poverty indicators. Thus, income growth and income distribution effects explain 5.2 p.p. (33.2%) and 10.6 p.p. (66.8%), respectively, of the total 15.8 p.p. fall in the extreme poverty rate, 0.6 p.p. (28.6%) and 1.6 p.p. (71.4%) of the total 2.3 p.p. fall in the extreme poverty gap, and 1.2 p.p. (24.7%) and 3.5 p.p. (75.3%) of the total 4.7 p.p. fall in the squared extreme poverty gap (Table 2). Likewise, as it occurs with poverty indicators, the relevance of income distribution increases as we move from rate to gap and to squared gap (Table 2).

Thus, between 2003 and 2017, notwithstanding very high income growth, income distribution was the most important effect in the progress of most social indicators (at least until 2011)[4]. In this regard, the Gini index showed a notable improvement until 2012, when it stabilized although with high short-term volatility. This behavior is seen not only when the incomes of the entire population are considered, but also

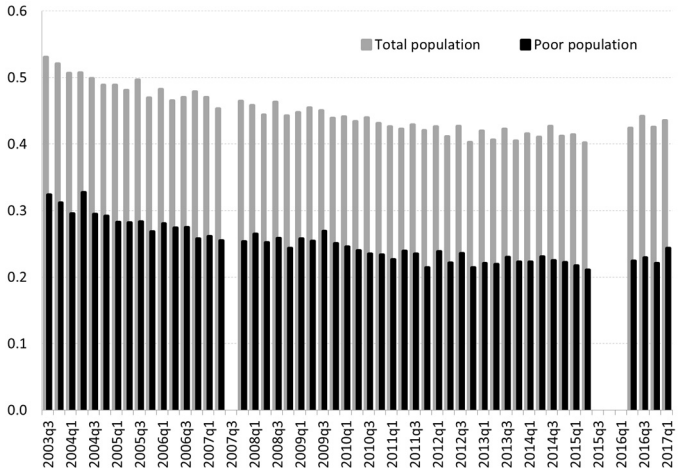
[4] Gasparini, Gutiérrez, and Tornarolli (2007) and Medina and Galván (2014, pp. 71-72) found similar results for Argentina and other Latin American countries, although for different periods.

when only the incomes of poor people are taken into consideration (Figure 5). It is precisely the improvement of equality within the poor population that causes the income distribution effect to be a more relevant factor in explaining the fall in squared gaps relative to gaps and rates.

Table 2 Extreme Poverty Rate, Extreme Poverty Gap and Squared Extreme Poverty Gap Variation - Total, Income Growth Effect and Income Distribution Effect (Percentage Points)

	Extreme poverty rate variation			Extreme poverty gap variation			Squared extreme poverty gap variation		
	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect
2003Q3-2004Q3	-4,8	-1,9	-2,9	-1,0	-0,3	-0,8	-2,4	-0,5	-1,9
2003Q3-2005Q3	-8,2	-4,7	-3,5	-1,5	-0,7	-0,8	-3,2	-1,2	-2,0
2003Q3-2006Q3	-12,0	-7,0	-5,0	-2,0	-1,0	-1,0	-4,0	-1,8	-2,2
2003Q3-2007Q2	-11,9	-5,5	-6,4	-2,0	-0,7	-1,2	-4,4	-1,4	-3,0
2003Q3-2008Q2	-11,6	-4,8	-6,8	-1,9	-0,7	-1,2	-4,2	-1,2	-2,9
2003Q3-2009Q2	-13,3	-6,1	-7,2	-2,1	-0,9	-1,2	-4,3	-1,6	-2,8
2003Q3-2010Q2	-12,5	-5,2	-7,3	-2,0	-0,7	-1,3	-4,6	-1,3	-3,3
2003Q3-2011Q2	-14,1	-6,0	-8,1	-2,1	-0,8	-1,3	-4,6	-1,5	-3,1
2003Q3-2012Q2	-15,1	-6,2	-8,9	-2,2	-0,8	-1,5	-5,1	-1,4	-3,7
2003Q3-2013Q2	-16,1	-6,4	-9,7	-2,3	-0,8	-1,5	-5,2	-1,5	-3,7
2003Q3-2014Q2	-13,7	-4,7	-9,1	-2,0	-0,6	-1,4	-4,6	-1,2	-3,4
2003Q3-2015Q2	-16,3	-5,4	-10,9	-2,3	-0,7	-1,6	-5,1	-1,3	-3,9
2003Q3-2016Q2	-15,7	-5,2	-10,5	-2,2	-0,6	-1,6	-4,9	-1,2	-3,7
2003Q3-2017Q1	-15,8	-5,2	-10,6	-2,3	-0,6	-1,6	-4,7	-1,2	-3,5

Source: Authors' estimates based on INDEC (2018).



Source: Authors' estimates based on INDEC (2018).

Figure 5 Gini Index

In short, Argentina experienced a significant recovery on social indicators from 2003 to the present, although the current levels of poverty and extreme poverty are still historically high. The period analyzed can be divided into three sub-periods. Between 2003 and 2006 the recovery was very intense and was led by income growth. Between 2007 and 2011 poverty and extreme poverty continued to decline but at a slower pace and led by income distribution. From 2012 to date income growth and income distribution improvement stagnated joined by significant volatility. This halted (and even reversed slightly) the decline in poverty and extreme poverty.

3. The Asymmetric Income Elasticity of Poverty and Extreme Poverty

So far this paper has shown that Argentina experienced an important recovery on social indicators until 2012. Restarting this trend again depends, among other things, on achieving economic growth, which is being hampered by a less favorable international context and a highly unstable exchange rate. Thus, it is not clear that Argentina will be able to maintain the current social situation, particularly if the business cycle has an asymmetric effect on poverty and extreme poverty.

Our next point relates to the asymmetric cycle through the short- and long-term income elasticities to observe if there are any significant differences depending on the variable analyzed. To examine this, the income and income distribution's effect of poverty and extreme poverty are estimated for the 2003-2017 period. This exercise is also carried out for the gap and squared gap. Additionally, it is tested whether the magnitude of the income variation effect on social indicators is similar when income increases or decreases[5]. In what follows, the methodology used is briefly explained, and then the results obtained are shown.

3.1 Methodology

The methodology consists on an error correction model. This model is very common to relate integrated variables of order 1, which usually have equilibrium relationships. It consists on a two-stage procedure. First, a regression is made between the variables in levels or logarithms, in order to detect long-term relationships. From this equation the residue is extracted and its order of integration is analyzed. In case the residual is stationary, that is, integrated of order 0, the existence of cointegration relations between the variables can be concluded. This is because a linear combination of integrated variables of order 1 results in a variable with a lower order of integration. In that case, the second step is to make a new regression, but this time with the variables transformed in differences, so they would already be stationary, and including the series of residuals of the long-term equation lagged one period as an explanatory variable. This variable, called the error correction term, measures what percentage of the deviation from the long-term relationship is corrected in each period. The result of the second step is the short-term relationships of the variables.

[5] Some articles, such as Martin Ravallion and Shaohua Chen (1997), De Janvry and Sadoulet (2000), François Bourguignon (2003), Richard H. Adams (2004) and Gasparini, Gutiérrez, and Tornarolli (2007), among others, already estimated these elasticities, but without testing the asymmetry.

In this specific case, an error correction model is developed for each of the dependent variables, that is, the poor and extremely poor population, as well as the gap and the squared gap. The long-term Equation (1) relates the natural logarithm of each of these variables to the logarithm of the family income per adult equivalent and the Gini index. A dummy variable that takes the value 1 for all quarters whose year-on-year change in income was negative is added. This dummy variable is also multiplied by the two independent variables, in order to identify if the elasticities presented a different magnitude depending on whether it is a period of growth or decline in income. If the product of the income and the dummy variable is significant, then an asymmetric effect of the business cycle existed on poverty and extreme poverty. The short-term Equation (2) relates the same variables, but in this case transformed through the difference of the logarithm. In this equation the one-lagged residual of the long-term equation is included, i.e. the error correction term.

$$lnP_t = \alpha_0 + \alpha_1 lnY_t + \alpha_2 lnG_t + \alpha_3 D + \alpha_4 D lnY_t + \alpha_5 D lnG_t + \alpha_6 T + \varepsilon_t, \quad (1)$$

$$\Delta lnP_t = \beta_0 + \beta_1 \Delta lnY_t + \beta_2 \Delta lnG_t + \beta_3 D + \beta_4 D \Delta lnY_t + \beta_5 D \Delta lnG_t + \gamma \varepsilon_{t-1} + \epsilon_t, \quad (2)$$

where P_t is the poverty or extreme poverty indicator, Y_t is the family income per adult equivalent, G_t is the Gini index, T is the trend, D is the dummy variable, α_i are the long-term elasticities, β_i are the short-term elasticities, γ is the error correction term, ln is the natural logarithm and Δ is the first difference operator.

As seen in the previous section, the variation of the three poverty and extreme poverty indicators can be disaggregated concerning the income growth and the income distribution effects. Therefore, the exercise proposed here is carried out not only for the total variation of the indicators, but also for the variation resulting only from the income growth effect, on the one hand, and from the income distribution effect, on the other. Income is the only explanatory variable in the first case and the Gini index in the second.

3.2 Results

The first step is to analyze the integration order of the variables. To do so, unit root tests are carried out using the Dickey-Fuller (David A. Dickey and Wayne A. Fuller 1981) test. In no case is the unit root null hypothesis rejected for the logarithms of the variables (Table A.1 of the Appendix). In contrast, the unit root tests of the long-term equations residuals rejected the null hypothesis of unit root, so they can be considered stationary (Table A.2 of the Appendix). Thus, the cointegration relationship between the variables can be assumed. Lastly, the Ljung-Box (Greta M. Ljung and Georde E. P. Box 1978) statistic shows that the residuals in all short-term equations are white noise, which confirms the suitability of the models (Table A.3 of the Appendix).

Table 3 depicts the elasticities estimated for the poor population, the poverty gap and the squared poverty gap for the 2003-2017 period. In general terms, the variables were significant and the signs were the expected ones. For both the long- and short-term, the income elasticities of poverty, poverty gap and squared poverty gap were negative and their absolute values were just above 1. This means that 1 p.p. of income growth generated a reduction of slightly more than 1% in the three poverty indicators. On the income distribution elasticity side, the magnitude showed a greater dispersion and increased as we moved from rate to gap and to squared gap. This suggests that income distribution improvement impacted on poverty only if family income

per adult equivalent exceeded the total basket, while the gap and, even more, the squared gap improved even if income was below the poverty line.

Furthermore, the coefficient of the product between the income and the dummy variable was significant in many cases and its sign was negative. This implies that the absolute value of the income elasticity of poverty is greater in periods of falling income than in times of growth. In other words, there is evidence of an asymmetric effect of the business cycle on poverty in Argentina between 2003 and 2017. On the other hand, there was no such change in the values of the income distribution elasticity of poverty.

Table 3 Poverty Estimations Results

	Poor population			Poverty gap			Squared poverty gap		
	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect
Long-term									
Income	-1.054***	-0.934***		-1.111***	-1.039***		-1.127***	-1.058***	
	(0.0590)	(0.0163)		(0.0734)	(0.0111)		(0.101)	(0.0141)	
Gini index	1.610***		1.312***	2.474***		1.641***	3.286***		2.027***
	(0.242)		(0.0773)	(0.302)		(0.114)	(0.414)		(0.211)
Dummy variable	0.391	0.134**	0.0354	0.308	0.0185	0.0540	0.291	-0,043	0.0441
	(0.245)	(0.0607)	(0.0693)	(0.304)	(0.0411)	(0.0883)	(0.418)	(0.05253)	(0.163)
Dummy *x* income	-0.402*	-0.141**		-0.537*	-0.0237		-0.697*	-0.00756**	
	(0.219)	(0.0646)		(0.272)	(0.0437)		(0.374)	(0.00360)	
Dummy *x* gini	-0.0133		0.0352	-0.260		0.0704	-0.459		0.0646
	(0.284)		(0.0835)	(0.354)		(0.107)	(0.486)		(0.197)
Trend	-0.000213	-0.00209***	0.00297***	-0.00256*	-0.000113	0.00110*	-0.00235	0.00110***	0.000872
	(0.00119)	(0.000193)	(0.000402)	(0.00148)	(0.000130)	(0.000584)	(0.00204)	(0.000166)	(0.00108)
Constant	17.86***	16.75***	17.03***	17.73***	16.09***	16.50***	17.81***	15.65***	16.27***
	(0.154)	(0.0113)	(0.0522)	(0.192)	(0.00765)	(0.0779)	(0.264)	(0.00971)	(0.144)
R^2	0.989	0.997	0.965	0.990	0.998	0.986	0.986	0.997	0.972
Short-term									
Income	-0.841***	-0.907***		-1.026***	-1.079***		-1.054***	-1.115***	
	(0.102)	(0.0402)		(0.130)	(0.0221)		(0.185)	(0.0243)	
Gini index	1.448***		1.196***	2.006***		1.660***	2.794***		2.156***
	(0.243)		(0.0910)	(0.334)		(0.122)	(0.473)		(0.207)
Dummy variable	0.0156	0.00428	0.0145***	0,044	0.00135	-0.00306	0,049	-0.000582	-0.0107
	(0.0168)	(0.00627)	(0.00488)	(0.03888)	(0.00388)	(0.00658)	(0.05544)	(0.00410)	(0.0111)
Dummy *x* income	-0.876***	0.0267		-0.898***	-0.212***		-0.894*	-0.319***	
	(0.275)	(0.0958)		(0.318)	(0.0554)		(0.450)	(0.0613)	
Dummy *x* gini	0,441		0.429**	0.404		0.177	0.780		0.0864
	(0.70869)		(0.182)	(0.564)		(0.247)	(0.822)		(0.421)
Error correction term	-0.663***	-1.082***	-0.818***	-0.731***	-0.592***	-1.136***	-0.929***	-0.443**	-1.164***
	(0.194)	(0.190)	(0.171)	(0.175)	(0.196)	(0.175)	(0.173)	(0.171)	(0.158)
Constant	-0.0201**	-0.00922***	0.00846***	-0.0268**	0.00235	0.00547	-0.0256	0.00849***	0.00749
	(0.00898)	(0.00331)	(0.00269)	(0.0114)	(0.00191)	(0.00364)	(0.0163)	(0.00207)	(0.00612)
R^2	0.939	0.974	0.896	0.922	0.993	0.891	0.884	0.991	0.849

Notes: Standard deviations are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' estimations.

Similar conclusions are reached from the equations of the extremely poor population, gap and squared gap (Table 4). The short- and long-term income elasticities

were again around 1, while the income distribution elasticities were much higher than that of poverty. This is consistent with the data observed in the previous section, in which the income distribution effect was more relevant for the reduction of extreme poverty than for the fall of poverty. On the other hand, as in the case of poverty, income distribution elasticity showed more dispersion than income elasticity, and it increased as it moves from extreme poverty to the gap and to the squared gap. The explanation is the same and it is related to the transfers from the non-indigent to the indigent, which, although in some cases did not be enough to avoid indigence, did allow them to improve their situation and reduce the gap.

Table 4 Extreme Poverty Estimations Results

	Extremely poor population			Extreme poverty gap			Squared extreme poverty gap		
	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect	Total	Income growth effect	Income distribution effect
Long-term									
Income	-1.098***	-1.147***		-1.160***	-1.063***		-1.216***	-0.898***	
	(0.131)	(0.0289)		(0.171)	(0.0246)		(0.211)	(0.0275)	
Gini index	3.326***		1.628***	5.023***		2.792***	6.075***		4.131***
	(0.537)		(0.261)	(0.702)		(0.426)	(0.864)		(0.626)
Dummy variable	0.966	-0.0715	0.0274	1.262	-0,214	0.00280	1.571	-0.299*	-0.0466
	(0.770)	(0.183)	(0.202)	(1.006)	(0.15742)	(0.330)	(1.239)	(0.17341)	(0.485)
Dummy *x* income	-0.915*	0.0365		-1.083*	-0.00700**		-1.112	-0.00750*	
	(0.465)	(0.107)		(0.607)	(0.00343)		(0.748)	(0.00382)	
Dummy *x* gini	-0.743		0.0551	-0.733		0.0239	-0.402		-0.0347
	(0.628)		(0.244)	(0.821)		(0.398)	(1.011)		(0.585)
Trend	-0.00680**	0.00164***	-0.00248*	0.00110	0.00268***	0.00135	0.00858*	0.00264***	0.00654**
	(0.00267)	(0.000333)	(0.00133)	(0.00348)	(0.000287)	(0.00218)	(0.00429)	(0.000320)	(0.00321)
Constant	19.03***	16.94***	16.33***	19.38***	16.03***	16.25***	19.66***	15.35***	16.66***
	(0.347)	(0.0415)	(0.178)	(0.454)	(0.0360)	(0.291)	(0.559)	(0.0401)	(0.428)
R^2	0.982	0.992	0.968	0.972	0.989	0.940	0.956	0.979	0.902
Short-term									
Income	-0.986***	-1.188***		-0.989***	-1.154***		-0.939***	-1.029***	
	(0.249)	(0.0517)		(0.243)	(0.0396)		(0.296)	(0.0397)	
Gini index	3.049***		2.036***	5.259***		3.173***	5.822***		4.325***
	(0.598)		(0.272)	(0.609)		(0.394)	(0.734)		(0.553)
Dummy variable	-0.0419	-0.0154*	-0.0285*	0,043	-0.00276	-0.0218	0.023	-0.00366	-0.0159
	(0.0388)	(0.00801)	(0.0147)	(0.09215)	(0.00642)	(0.0213)	(0.11051)	(0.00637)	(0.0298)
Dummy *x* income	-1.526**	0.0317		-0.907*	-0.496***		-1.046	-0.568***	
	(0.613)	(0.125)		(0.528)	(0.0997)		(0.643)	(0.0975)	
Dummy *x* gini	2,374		-0.218	2,819		-0.0183	2,676		0.239
	(1.94355)		(0.554)	(2.59888)		(0.808)	(3.0982)		(1.139)
Error correction term	-0.942***	-0.856***	-0.990***	-1.147***	-0.400***	-1.185***	-1.181***	-0.450***	-1.197***
	(0.172)	(0.166)	(0.172)	(0.161)	(0.141)	(0.149)	(0.157)	(0.121)	(0.143)
Constant	-0.0374*	0.0122***	0.00292	-0,012	0.0171***	0.0158	0,031	0.0187***	0.0303*
	(0.0221)	(0.00424)	(0.00806)	(0.02907)	(0.00328)	(0.0117)	(0.03556)	(0.00328)	(0.0163)
R^2	0.834	0.965	0.748	0.873	0.976	0.804	0.851	0.967	0.809

Notes: Standard deviations are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Authors' estimations.

Finally, there is also evidence of the asymmetric effect of the business cycle on extreme poverty in Argentina between 2003 and 2017, although in this case some additional clarification is needed. First, the break in the income elasticity of extreme poverty was identified in eight of the twelve estimated equations. However, in two of them (long-term income growth effect of the gap and the squared gap) the value of the coefficient was very close to zero. In contrast, in the long- and short-term case of the total effect of the squared gap, the *p*-values were just above 10% (14.5% and 11.2%). In short, there is evidence of the asymmetric effect, although somewhat weaker than in the case of poverty. On the income distribution elasticity side, in line with the results achieved for poverty, in neither case the magnitude depended on the economic cycle phase.

4. Conclusion

After the Convertibility Law, the Argentine social situation was very precarious. From 2002, the country began to recover until 2011. This growth was pro-poor because it improved not just the poverty index but also the income distribution. In fact, the income distribution effect was the main cause of the improvement on social indicators. However, since 2012, growth and income distribution stagnated and, therefore, social improvement was halted and even showed a slight deterioration.

This analyzes the asymmetric effect of the business cycle on social indicators between 2003 and 2017. An error correction model is used that tests the magnitudes of the income elasticities of poverty and extreme poverty during periods of growth and recession.

Results suggest that the business cycle had an asymmetric effect on social indicators, which means that the improvement on poverty and extreme poverty due to 1% growth in income was lower than the deterioration as a consequence of a reduction in income of 1%. Therefore, the most favorable macroeconomic policy that will improve social indicators sustainably implies fostering a stable rate of economic growth and especially avoiding recessions, rather than enhancing short-term growth.

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Appendix

Table A.1 Unit Root Tests (Dickey-Fuller Critical Values, 1981)

	Levels						First differences			
	No intercept, no trend		With intercept, no trend		With intercept and trend		No intercept, no trend		With intercept, no trend	
	t-statistic	*p*-value	*t*-statistic	*p*-value	*t*-statistic	*p*-value	*t*-statistic	*p*-value	*t*-statistic	*p*-value
Poor population (total)	-0,9161	0,3130	-1,5111	0,5134	-1,7067	0,7137	-2,9000	0,0048	-3,3074	0,0210
Poor population (growth effect)	0,4775	0,8120	0,7828	0,9919	-1,9502	0,6029	-6,1297	0,0000	-5,9476	0,0000
Poor population (distribution effect)	-1,4465	0,1360	-2,2189	0,2031	-1,2286	0,8903	-4,3395	0,0001	-4,6259	0,0006
Poverty gap (total)	0,3211	0,7716	-2,2030	0,2098	-0,0288	0,9935	-3,1631	0,0023	-3,7835	0,0062
Poverty gap (growth effect)	-0,6712	0,4161	0,0885	0,9582	-2,2724	0,4337	-2,7103	0,0089	-2,7714	0,0768
Poverty gap (distribution effect)	-1,2067	0,2021	-1,6452	0,4466	-0,3088	0,9851	-4,3783	0,0088	-4,5497	0,0012
Squared poverty gap (total)	-1,2129	0,2012	-1,7154	0,4132	-0,4000	0,9814	-3,4148	0,0189	-3,4835	0,0608
Squared poverty gap (growth effect)	0,9310	0,8969	0,7444	0,9887	0,7433	0,9989	-2,6075	0,0130	-3,7218	0,0179
Squared poverty gap (distribution effect)	-1,6903	0,2717	-1,2394	0,6433	-2,2422	0,4502	-7,2655	0,0000	-7,8957	0,0001
Extremely poor population (total)	-1,6131	0,2219	-2,3930	0,1496	-2,2697	0,4412	-8,6473	0,0000	-9,9163	0,0000
Extremely poor population (growth effect)	-0,2847	0,5746	0,5597	0,9859	-1,0060	0,9276	-5,9201	0,0000	-6,1494	0,0000
Extremely poor population (distribution effect)	-1,3952	0,2564	-1,5752	0,4855	-2,8895	0,1768	-5,8296	0,0000	-7,4209	0,0000
Extreme poverty gap (total)	-1,9389	0,1347	-2,4381	0,1377	-1,3304	0,8667	-6,1365	0,0000	-7,3143	0,0000
Extreme poverty gap (growth effect)	-1,2713	0,1839	-1,3394	0,6009	-2,6003	0,2824	-5,4427	0,0000	-5,5994	0,0001
Extreme poverty gap (distribution effect)	-1,2661	0,2896	-1,9813	0,2937	-2,7227	0,2333	-6,7082	0,0000	-7,6301	0,0000
Squared extreme poverty gap (total)	-1,5783	0,2212	-2,4603	0,1321	-1,5539	0,7945	-5,4166	0,0000	-6,3461	0,0000
Squared extreme poverty gap (growth effect)	-0,8547	0,3370	-0,3441	0,9062	-2,7294	0,2314	-5,6527	0,0000	-5,8329	0,0000
Squared extreme poverty gap (distribution effect)	-1,0222	0,3064	-2,2789	0,1832	-2,4699	0,3402	-5,9892	0,0000	-6,6590	0,0000
Family income per adult equivalent (poor population)	-0,1827	0,6117	0,5301	0,9849	-1,6544	0,7454	-5,4502	0,0000	-5,5002	0,0001
Family income per adult equivalent (extreme poor population)	0,0365	0,6864	0,8092	0,9925	-1,5173	0,8000	-5,8424	0,0000	-5,8757	0,0000
Gini index	1,4708	0,9621	-1,6523	0,4454	-1,8575	0,6570	-2,0280	0,0423	-2,5567	0,1120

Source: Authors' estimations.

Table A.2 Unit Root Tests of the Residuals of Long-Term Equations - MacKinnon Critical Values (James G. MacKinnon 1991)

	t-statistic
Poor population (total)	-3,4725
Poor population (growth effect)	-4,5379
Poor population (distribution effect)	-4,1003
Poverty gap (total)	-4,4722
Poverty gap (growth effect)	-4,1262
Poverty gap (distribution effect)	-6,2384
Squared poverty gap (total)	-5,5059
Squared poverty gap (growth effect)	-3,4052
Squared poverty gap (distribution effect)	-7,0417
Extremely poor population (total)	-5,2939
Extremely poor population (growth effect)	-6,1040
Extremely poor population (distribution effect)	-4,4129
Extreme poverty gap (total)	-6,2639
Extreme poverty gap (growth effect)	-3,7053
Extreme poverty gap (distribution effect)	-4,4129
Squared extreme poverty gap (total)	-6,2054
Squared extreme poverty gap (growth effect)	-6,6952
Squared extreme poverty gap (distribution effect)	-7,5354

Notes: MacKinnon critical values: -4,1378 (α = 1%), -3,4687 (α = 5%), -3,1354 (α = 10%).

Source: Authors' estimations.

Table A.3 Autocorrelations of the First Two Lags and *p*-values Associated to the Ljung-Box Statistics (1978) for the Residuals of the Long- and Short-Term Equations

Equation	Lag	Short-term		Equation	Lag	Short-term	
		Auto correlations	*p*-value			Auto correlations	*p*-value
Poor population (total)	1	-0,215	0,137	Extremely poor population (total)	1	-0,107	0,457
	2	0,056	0,306		2	0,074	0,664
Poor population (growth effect)	1	0,048	0,739	Extremely poor population (growth effect)	1	-0,061	0,675
	2	0,054	0,879		2	-0,247	0,205
Poor population (distribution effect)	1	-0,173	0,232	Extremely poor population (distribution effect)	1	0,065	0,653
	2	0,184	0,212		2	0,024	0,892
Poverty gap (total)	1	-0,148	0,304	Extreme poverty gap (total)	1	-0,094	0,513
	2	0,079	0,505		2	0,075	0,704
Poverty gap (growth effect)	1	0,040	0,780	Extreme poverty gap (growth effect)	1	-0,128	0,377
	2	0,079	0,824		2	0,323	0,052
Poverty gap (distribution effect)	1	-0,040	0,781	Extreme poverty gap (distribution effect)	1	0,036	0,804
	2	0,101	0,750		2	0,159	0,521
Squared poverty gap (total)	1	-0,133	0,356	Squared extreme poverty gap (total)	1	-0,015	0,920
	2	-0,001	0,653		2	0,098	0,787
Squared poverty gap (growth effect)	1	0,004	0,980	Squared extreme poverty gap (growth effect)	1	-0,079	0,585
	2	0,255	0,203		2	0,138	0,540
Squared poverty gap (distribution effect)	1	0,007	0,962	Squared extreme poverty gap (distribution effect)	1	0,038	0,790
	2	0,136	0,635		2	0,158	0,524

Source: Authors' estimations.