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CONTENTS

Editorial introduction

Ida Musiałkowska

ARTICLES

Inequality and politics in Brazil: Bolsa Familia and beyond

Ladislau Dowbor

Income gaps: Education and inequality

Julián Leone, Jorge Lo Cascio

Financial cooperation initiatives in Latin America: Conditions of origins, subsistence and eventual vanishing

Elia Elisa Cia Alves, André Martins Biancarelli

Searching for similarities in EU corporate income taxes for their harmonization

Edyta Małecka-Ziembińska, Anna Siwiec

What determines the scale of state ownership in enterprises? Some evidence from post-socialist countries

Piotr Matuszak

Efficiency of services in CEE countries—case study of Poland and Belarus

Elżbieta Skąpska, Ewa Rollnik-Sadowska

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Income gaps: Education and inequality¹

Julián Leone², Jorge Lo Cascio³

Abstract: The aim of this paper is to analyze the employment-related real income gaps according to the education level reached by the working population during the 1997–2017 period. Using a panel methodology (pseudo-cohorts) it sums up that throughout recession, employment-related real income gaps by education level are wider, amplifying income inequality. During the economic boom the narrowing of the gap was due to the weak growth in skilled employment that did not manage to recover the pre-crisis values. This phenomenon is typical of a labour market structure with less skilled employment demand than its increasing supply. The employment-related difference in reduction of the real income gaps is exclusively reflected by a decline in employees from the highest education segment. The whole of tertiary education although with less intensity, replicates its trend. Not only educational credentials increase future employment-related income but also starting then not completing a university degree provides a significant disparity. Gender control shows a sharp drop in its determination.

Keywords: education, inequality, human capital.

JEL codes: J24, J31.

Introduction

For Argentina this paper aims to identify the facts from the evolution of employment-related income gaps by education levels in the period 1997–2017 which was characterized by marked economic cycles. Employment-related income gaps are understood as the retribution distances between individuals with a different level of education. Not only the employees' wage but also self-employment remuneration is considered but non-employment-related income

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such as social pensions and public transfers are not included. Multiple papers use the gap's concept to analyze the income inequality challenges (Colacce, Mojica, & Zurbrigg, 2020; Salvia, Fachal, & Robles, 2019; Arcidiácono, 2015; Altimir & Beccaria, 1999).

The central hypothesis states that inequality widens during the onset of economic crisis periods but is reduced during times of economic growth no matter what is the educational endowments of the population. In addition, during the economic boom, when employment-related income gaps are reduced, lower educational levels have larger benefits than higher education. Even though the latter increase their share in the population, the returns on education seem to interact with macroeconomic conditions. This article focuses on the supply attributes; the importance of the gender control in income determination and the life cycle interaction (pseudo cohorts) with an individual's education. However, it also allows for demand for technological and other qualification requirements from the demand for labor. This overview helps to explain the devaluation of high credentials with an employment-related income gap (tertiary education vs high school workers) a drop of 40% from the post-crisis period. Furthermore, that gap measured against not completing high school showed a widening due to a heterogeneous plunge; 25% decrease in its hourly employment-related real income gap while the skilled return dropped 35%. The generalized income decline stands out, but is much less for lowest educational level. As will be analyzed this trend is consistent with a labour structure with a lesser skilled labor demand than its growing supply. At the same time the successive income recoveries were evidence by a larger intensity for the lowest skilled workers (41% vs 22% of the skilled employees in 2002–2007 period).

On the other hand, it is observed that not only educational credentials increase future labour income but also starting then not completing a university degree provides approximately 20% of extra reward, expressing a networking effect. Finally, gender control shows a sharp drop in the employment-related income determination. While for the first five years a wide gender gap was observed at the end of the period the gender control expressed a minor explanatory value.⁴

The article is organized in four sections where the first one delineates the theoretical framework from the theory of human capital by collecting their contributions and criticisms. The second section describes the methodological decisions adopted for the estimates. In the third the results are presented and analyzed, both for the income gaps and for the pseudo-panels. In the last section concluding remarks and future lines of research are expressed.

⁴ Not at all it means that in Argentina there are not important gender challenges (labour informality, youth insertion, vertical equity, etc.).

1. The theory of human capital: Contributions and criticisms

The human capital theory has strongly entered in to the “common sense” of the demands on education, so the expectation regarding schooling is often reduced to obtain future benefits in monetary terms, in trying to measure the capital formed during the educational process. In this way it is expected that gaining skills and knowledge as capital, because of the student’s educational investment, will improve the productivity of the future workers, allowing them to obtain higher income. In this way the differential in labour productivity translates into differential income. Schultz (1983) states that although labour productivity grew in tandem with investment in physical capital, formal educational credentials were presented as the main determinant of this process. Empirical evidence illustrates a different trend during the last twenty years. For example, an OECD report (2013) affirms that labour productivity shows a strong deceleration in line with a decrease in the capital—labour ratio. Being particularly pronounced after 2008 the factors’ productivity plunge appears as the structural phenomenon that explains the trend.

To acquire a rate of return on educational investment the human capital theory has considered schooling years as a measure of investment in education. However, this measure seems incomplete since it does not capture the total cost of the investment. Not only educational expenditures are worth including, but also the opportunity cost of income not received during the time devoted to education (Schultz, 1983). In a more recent view Hanushek and Woessmann (2015) propose to use the scores of the standardized learning tests as an indicator of education. In this sense, standardized tests of academic performance such as PISA can be used to compare learning in international terms since it seeks to capture the cognitive skills of students who represent their “knowledge capital”, leaving social skills in the background. Consequently, the use of these tests recorded throughout the time of education will quantify the value added by education.

Despite the objections the human capital theory maintains its hard core that formats the causalities with which education is usually associated. This can be expressed as the fact that higher education improves wages, the distribution of income and equal possibilities for the population, enabling economic development. Morduchowicz (2004), among others, affirms that these causal relationships go in a reverse direction. On the other hand an OECD (2018) report indicates that in many of its member countries (with high levels of education) real wage growth was associated with lower labor productivity growth, entailing a reduction in labour share of national income. Moreover, median wages grew at an even lower rate than the average wage, displaying an increasing wage inequality. However, the theory of human capital also allows the justification of the state investment in education from a perspective that associates the educational issue with income improvements (via productivity) or insertion in the labour market (avoid unemployment).

1.1. Educational credentials and labor opportunities

Academic degrees are credentials that, in terms of human capital theory, could be thought of as selection mechanism in the labour market (Araki, 2020). There is no consensus if the years of “educational investment” in the formal system provides a subsequent labour development. Morduchowicz (2004) analyses this issue considering that credentials associated with educational attainment generate a real impact in the future revenues. Considering this second state, high paid jobs are reserved for those who manage to pass the “educational obstacles” sending a “signal” to the job seekers. Moreover, the workers’ wages correspond with the expected productivity according to the academic degree (Psacharopoulos & Woodhall, 1987). Thus academic credentials could be understood as an instrument which allows a reduction in the transaction costs for staff selection (Blaug, 1985).

A rising, highly educated labour supply does not assure its absorption by firms. A demand shortage enables a disarrangement with underqualified jobs mismatched with high academic credentials. This could imply a larger labour flexibility, helping a job replacement environment instead of a demand boost (Emmerij, 1981). It allows a “row effect” in which individuals try to achieve many credentials in order to be placed in as many rows as possible, increasing its chance of being hired (Thurow, 1972). An over-qualification in jobs could be triggered as a result of underutilization of human capital and consequent collapse in the education returns (Gómez, 2000).

Macroeconomic slump and the obsolescence in the economic structure encourage an incapacity to absorb highly skilled individuals (Carnoy, 1999). In that case the causality proposed by human capital theory is verified, but in the other way around; economic status promotes more and better education, so it only performs as a “springboard” during economic booms close to full employment. González Rozada and Menendez (2002) even dispute the Argentine higher education system claiming that 90% of its students come from top half families and almost 50% come from private high school.

To sum up, it could be expected that during economic upgrade, labour would be paid according to its educational endowment, promoting an improvement not only in the aggregate income but also in its distribution. Nonetheless during economic recessions in which an economy is far from its production possibility limit, education acts as a “parachute”, softening the wage plunge. Therefore there are more highly skilled workers than jobs available using those high skills. That surplus moves toward less skilled jobs, generating a qualification depreciation and displacing those with less human capital.⁵

⁵ Similarly raised is that of Beaudry, Green and Sand (2013).

1.2. Employability as an educational problem

According to Gallart (1997) during the 1990s a productive restructuring process was deepened, based on three pillars. In the first instance an adjustment of the public sector and its functions, including reconfigurations in the provision of services, including education (Salvia et al., 2019). The second aspect is the liberalization and deregulation of markets, including the labour market. Finally the production was affected by technological innovations and changes in firms' organizational structures (Ray & Mookherjee, 2020). In this way the labor market began to require polyvalent qualifications, management skills, cross-cutting capacities to use information in changing situations and cooperation among workers. The traditional educational requirements of qualifications are abandoned to give way to educational training in competencies that are defined in an open and flexible way, not being the heritage of the jobs but the attributes of the workers who are in permanent training (relearning). The definition of competences is "a joint task between companies, workers and educators" given that they "are not abstract but come from a reflection on the reality of the world of work" (Gallart, 1997).

Thus the question posed by Gallart (1997) of how young people are inserted in this world of work becomes relevant (Salvia et al., 2019) and makes it possible to think about the reforms of educational systems as "changes in the ways of articulating the training process with the company and training in work, a challenge faced by university institutions" (Gómez, 2000, p. 24). In this direction Apella and Zunino (2017) indicate that the entry into the labour market by young people is mainly in to less intensive occupations in the development of non-routine manual tasks exhibiting a larger capacity to adapt and a disposition for cognitive tasks. For all these reasons a potential distributive risk emerges, polarizing both supply and labour demand (Frey, 2019). The influx of a highly qualified group (associated with non-routine cognitive tasks) together with a low one (non-routine manual tasks) can pose complex challenges for middle-income jobs (routine manuals) (Acemoglu, Autor, Dorn, Hanson, & Price, 2019). Autor and Dorn (2013) show that for the North American labour market (in line with the results for the European Union), the variation of participation in total employment by educational level takes a form of U showing a clear polarization. On the other hand the variation in salaries accompanies the increase in the queues, although not in a homogeneous manner. The highest increases occur in the upper part, being modest in the lowest and substantially lower in the mean.

1.3. Gaps in income and education: Working hypothesis

Understanding the contributions and limitations of the human capital theory this work is based on this conceptual framework. The hourly income gaps of the employed will be analyzed by strata of educational level, ruling out the

valuation of years of formal education. Despite this it is recognized that credentials (nominated in titles) achieve, or at least potentially allow, an income differential. The breakdown of occupations by branch of economic activity, the occupation sector (public-private) and the impact on the hiring regime are left for future work. Instead the option of the analysis of age cohorts to visualize the valorizations of the educational credentials both along the work life cycle and intergenerational is selected.

The main and founding hypothesis is that education could deepen income inequality during economic crisis. As for growth cycles, wages improve homogeneously, which implies a reduction in income differentials by educational levels reached. To a certain extent it is postulated that educational credentials act as a selection mechanism prior to arriving on the labor market. They lose their momentum in times of low unemployment and act forcefully in the face of a shortage of job opportunities (“row effect”). On the other hand there are difficulties associated with “credentialism” or the depreciation of school titles: “educational credit inflation” devalues the degrees and reduces the expected return on human capital investment. By increasing the supply of skilled workers a permanent obsolescence of qualifications is triggered, forcing them to get even more degrees and resulting in over-schooling. Consequently the overcrowding of an educational level lowers its differentiating power on the labor market.

2. Methodology

Data from the Argentine statistical households’ living conditions (EPH in Spanish) is used for the reference years 1997–2019. The survey covers private households in the principal urban conglomerates with the basic socio-economic and demographic data for the household members observed. Considering four different educational attainments, labour real income is distinguished for each of any geographic regions. With a pseudo panel (cohorts) analysis this paper follows the revenue path for the different age groups. During the period considered both segments of economic recessions (including the deep crisis of December 2001) and sustained recovery are included, allowing a corroboration of the hypotheses.

Annual splices were made based on the biannual or quarterly frequency waves as appropriate. Then the population segments with lower level were selected in the eighteen-year-old group given that employment-related income gaps will be considered, this being the age at which an individual can jump from the educational stratum, enter the labour market, or both. The upper limit is 65 years, when a person accesses retirement benefit for two main reasons two main reasons. On the one hand the cases of workers above this age range are not enough. On the other given that for most of the cases and years selected a distribution scheme is involved (in a “pay as you go” system), it tends to equal-

ize income regardless of what has been done in their working life by distorting the results around the award for having been educated or not.

To estimate the average reward of those individuals with different educational levels, there are two main methods of calculation. A first approach lies in the known “static” calculation that assumes the subsequent income of a person for his whole life, taking as reference another individual of identical characteristics. Through a cross-sectional study individuals’ salaries with dissimilar ages are observed, although of the same educational level and they are assumed to be a single individual. As can be anticipated this hides strong assumptions and consequent difficulties. In the case of increasing or decreasing an income profile over time linked to economic growth or technological change, it would not be considered given that it calculates an entire horizon based on a static data (in this case a reference year). In an alternative way this work takes the dynamic criterion, but not in a precise way since it requires following individuals during their lives and it is not captured by the EPH. Thus this monitoring will be carried out through groups of individuals with equivalent characteristics, performing a pseudo-cohort analysis for people born in the same years. Thereby dissimilar statistics are obtained for the population groups enunciated, making an analysis of panel data for the different cohorts instead of inferring variables from other groups as in a cross-sectional study.

On the other hand a control will be carried out by sex, considering two important considerations. First, the decision to enter the labour market may differ according to gender. The second and best-known lies in a clear problem of horizontal equality in which for same task and characteristic a woman is less well remunerated on average. It will seek to contrast the returns to education, with and without control by sex, to avoid biases in the results and make a comparison over time.

Regarding the characteristics of the groups of individuals that make up pseudo-cohorts the maximum educational level reached is taken to form four segments: a) full tertiary/university level; b) incomplete tertiary/university superior; c) full high school; d) until incomplete high school that includes all those who did not complete their studies, including incomplete high school, complete elementary school and incomplete elementary school. The latter category is used as a reference.

The main variable will be the employment-related real⁶ income per hours of work for the four segments or educational level mentioned, making it worthwhile to make some comments about the selection. For obvious reasons the total family income that prevents the observation in isolation of the individual’s return, is not considered. Thus the remuneration paid for the main occupation, is considered, including exclusively the labour reward. Again non-employment-

⁶ Employment-related income is controlled by the inflation effect using the consumer price index. See Table 5a.

-related income is set aside. Finally, it should be noted that a maximum of 98 working hours per week was considered.

The data series are then condensed obtaining the average income according to the specified characteristics. Gender, the year in which the survey is carried out, educational level, region and cohort are considered. Due to the need to count numerous samples, bands of five years are taken within the same cohort, bearing in mind that, for some regions or specific educational levels, the data found is scarce. In the search for reliable results, only those cases where the sample exceeds 100 cases for the set of combined characteristics, are analyzed.

3. Results

3.1. Evolution of income gaps by regions and educational level

The temporal evolution presents nuances depending on the educational level. In this section the gaps analyses by scales are made, focusing on the differential between the tertiary/university degree compared to the simple completion of high school education. The general conclusions, largely due to the important share, accompany the results of Gran Buenos Aires (GBA), as shown by Tables 1a & 2a in the annex. In the latter, as in the Noroeste (NEA), Cuyo and Patagonia, the distance between both educational levels in the 1997–2017 period were severely shortened. Special attention is required to the GBA, where besides being the most populated, it presented a brutal fall in inequality. This tendency was confirmed even despite its widening post-crisis 2001 (see Graph 1). Starting from a gap of almost 90% for the year 1997, it stretched to 125% in the year 2002, to culminate 2017 with 71%, having even dropped to 62% in 2012 (see Table 1), characterized by some macroeconomic upward growth. However, after two years of economic collapse, for 2019, the education returns became wider. In a way the return to higher education becomes much broader in times of crisis while it decreases during boom periods. In recessive intervals this phenomenon is observed almost identically in the Patagonian region, while in Northwest Argentina (NOA) and NEA despite expanding after the crisis continues to do so until 2007 and then reversed the trend markedly (see Tables A1, A2).⁷

On the other hand the hourly employment-related income gaps for the educational stratum with Full high school also observed a fall for all regions. However the most significant drop was evident in the GBA area, as exhibited by Table A2. Obtaining a high school degree resulted in 35% higher earnings in

⁷ It is interesting to note that Marcelo Gordillo and Ariza Ramírez (2005) show for the period 1997–2003 in Colombia, similar conclusions. After a deep crisis in 1999, the distance between the educational extremes not only increased, but also was the one that most widened.

1997, which fell to only 17% in 2017, becoming the shortest gap in the country. Despite different variations in absolute terms this downward trend is observed in almost all regions (see Tables A4, A5). Furthermore that sharp drop is witnessed for the aggregate, with a decline to a 20% “premium” to the medium education in 2017 (see Table 1). Thereby there is more substitutability or lower price elasticity between those who completed their high school degree and those who did not.⁸ These results are in line with Card (2009), who analyses the impact of migration and inequality, concluding that those workers at the incomplete high school level are perfect substitutes for those with a medium level of education (“high school equivalents”). Thereby the consequences of a policy applied to the lowest level of the educational distribution have a much more extensive scope, considering not only those with completed high school, but also the level below.

Finally agents who went through an institution of higher education, despite not completing their studies, are also included in the analysis (see Table 1). Regarding the educational credentials approach anomalies should not be observed given that the extra reward is assumed for the completion of the stage. However the distance between “Tertiary and University incomplete” and “High School Complete” is not only wide, but in no case (except Patagonia) presents a decrease. As confirmed by Table A2, on average, having passed through

Table 1. Real* hourly employment-related income gaps by educational levels contrasted with lower ones 1997–2019. Argentina (urban agglomerations)

Education level / years	Real hourly employment-related income gaps by educational levels contrasted with lower ones			
	full high school (%)	incomplete tertiary/ university (%)	full tertiary/ university (%)	university vs. full high school (%)
1997	34	20	55	86
2002	29	23	69	109
2007	31	23	57	93
2012	28	18	35	60
2017	20	22	40	71
2019	27	28	38	78

* Real income valued in national currency (Argentine Peso) constant prices of 2019. Table A1 shows the series of estimated data. Additionally, see Table A4 for the exchange rate with the US dollar and Euro. See Table A5 for the series of Consumer Price Index in Argentina.

Source: Authors calculations based on Table A1.

⁸ The high school credential only adds between 20% and 30% during the entire period as shown by Table 2.

a higher education institution adds a 20% higher reward than those who only completed high school education, a gap that widens during recessions (2002 or 2019). In this way jumps are generated in income levels even for those who have not obtained the qualification. Different effects could justify this phenomenon. A first explanation refers to the set of contacts and ties established with other study partners, commonly known as the “networking” effect. On the other hand, in certain cases, belonging to an educational institution enables the achievement of a job position as a student. In this way it is possible to “make a career” within a company or organization without yet completing their studies until later. However the surplus remuneration for attaining university rather than not, is inferior to the university “premium” with respect to full high school.

After the comparison segmented by the income gaps in the educational levels, the same analysis is carried out applying a control by gender (see the absolute real hourly income in Graph 2). As shown by Table A1, between completed university and completed bachelor’s degree a strong and early widening in the gap is observed that is then diluted to the previous values not controlled by sex.

Women are more likely to enter and graduate than men, as states in the Gender Gap Report (World Economic Forum, 2020). This report shows Argentina in 30th place in terms of gender equality well above the average in a ranking that considers inequalities in political, health (top of the world), educational and economic terms.⁹ However regarding the latter, it places our country in the 103rd position and in summing up, economic opportunities are the most inequitable component. Therefore, the larger relative share of women in the upper end of the educational distribution makes the income gap, without control, narrower. Again it is displayed as a horizontal equity problem where a lower income is perceived at the same grade. Indeed, by isolating the gender component and comparing only the educational credentials it can be seen that for 1997, 2002 and 2007 there is a much wider distance for the aggregated values at the country level as well as in regional terms (see Graph 2). For the year 2002, mainly in GBA, where the effect is strengthened further reinforcing the hypothesis that education works as a “parachute” in crisis periods.

However, both at a regional and aggregate level a strong reversal in this phenomenon is shown. Table 2a states that the gap convergence is confirmed in values close to Table 1 (without control), and even less as in the case of Cuyo, Pampeana and Patagonia for the year 2017. A first hypothesis could be linked to the explosion of technology promoting more wide-ranging work of cognitive nature and less related to physical strength (Frey & Osborne, 2017). However, in its artificial intelligence section, the Gender Gap Report (World Economic Forum, 2020) casts some doubts on this approach. In fact only 22% of pro-

⁹ Argentina shows an interesting tendency falling in the disparity ranking from the 36th place in 2018 to 30th in 2020.

professionals in this area are women, representing a gap of 72%, which remained constant in recent years without presenting a positive trend for the future. This occurs even though the qualifications in the field are almost identical for men and women. A second hypothesis could derive from the formalization process during the 2000s and the more extensive larger unionization. In terms of this Card, Lemieux and Craig Riddell (2020) state that union impacts in North America, once disaggregated by sector, do not differ its effects by gender, contributing to reducing economy-wide wage dispersion. Nevertheless, Argentina is characterized by a limited social protection coverage and large turnover rates so the incidence of unionization could be lower (Maurizio & Beccaria, 2020). In this way another explanation to understand this trend could be linked with the importance of cultural change in the role of women in labour market.

3.2. Income gaps evolution by cohort

This section analyzes the hourly employment-related income, its evolution and the gaps between the cohorts selected for the 1997–2019 period. Table 2 shows the ages of the selected cohorts for monitoring the remunerations in each period. The width of the cuts for five years is explained by the non-overlap of the cohort members analyzed. Likewise the chosen cohort evolution covers the whole period, discarding those which only present data for limited years.

Table 2. Age in selected cohorts

	1997	2002	2007	2012	2017	2019
Cohort 3	19–23	24–28	29–33	34–38	39–43	44–48
Cohort 4	24–28	29–33	34–38	39–43	44–48	49–53
Cohort 5	29–33	34–38	39–43	44–48	49–53	54–58
Cohort 6	34–38	39–43	44–48	49–53	54–58	59–63
Cohort 7	39–43	44–48	49–53	54–58	59–63	64–69

Source: Authors' elaboration.

Table 3 demonstrates that, for 1997–2002 period, all Cohorts' incomes collapsed for the entire distribution. Ranges vary between 33% for full-time university students and 38% for incomplete high school and full high school levels. This drop in real hourly reward is due to the economic crisis which occurred during 2001–2002 in which the unemployment rate reached 25% in urban areas. In the same sense the income differentials for the higher educational levels were slightly expanded, especially for Cohorts 5 and 7. However, the gaps with respect to Cohort 3 are reduced for all educational levels, i.e., the youngest group experienced a less pronounced fall compared to the remaining cohorts. This phenomenon is observed more clearly in the lower educational levels. Likewise

Table 3. Real* hourly employment-related income. Selected cohorts by educational levels 1997–2019. Urban agglomerations (values expressed in national currency (Argentine Peso) constant prices of 2019)

Cohort	Year 1997				Year 2002				Year 2007				Year 2012				Year 2017				Year 2019			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
3	106	124	179	229	84	90	127	163	122	155	198	271	153	195	243	309	157	195	247	315	112	140	197	265
4	133	147	198	245	92	110	146	204	123	175	236	339	154	199	249	345	155	186	230	332	116	153	201	276
5	136	196	242	334	90	124	153	253	130	180	226	331	154	203	268	332	166	202	238	338	111	157	205	276
6	146	201	244	319	94	132	183	236	138	197	249	336	161	215	258	347	161	206	266	354	127	149	205	301
7	153	238	294	399	98	135	166	273	138	188	261	339	166	225	294	347	169	208	263	383	114	178	205	280
Total	146	196	235	364	92	119	146	248	125	164	202	317	154	197	232	314	156	187	228	319	115	145	187	259

* Real income valued in national currency (Argentine Peso) constant prices of 2019. Table A1 shows the series of estimated data. Additionally, see Table A4 for exchange rate with the US dollar and Euro. See Table A5 for series of Consumer Price Index in Argentina.

Notes: A. Incomplete high school, B. Full high school, C. Incomplete tertiary/university, D. Full tertiary/university.

Source: Authors' calculations based on EPH.

Cohort 7, that for 1997 showed the highest salary among all educational levels, loses that place only in the incomplete tertiary/university stratum. Finally, for the full tertiary/university level in Cohort 3, the first group of higher-level graduates are inserted in the labour market with a higher income level than the previous level of education: it may indicate that previous work experience has less importance in explaining revenue levels than educational credentials.

During the following five years' incomes improve for all the cohorts and educational levels. The economic recovery along with the increasing rates of employment, allowed a (re) hiring of workers. Despite the recovery the rewards fail to reach pre-crisis levels for all the cohorts and educational stages,¹⁰ with special emphasis on the full high school level of education. In contrast Cohort 7 remains below the 1997 values for all educational levels, especially in full high school (-21%) and full university (-16%). The same behavior confirms Cohort 5, but with less intensity. Cohort 4 shows an increase compared to 1997, except for the educational level up to incomplete high school education. It is worth noting the 37% increase in the full university group compared to 1997. Cohort 6 illustrates a positive performance for the high educational levels but negative for the lowest. The income differentials for Cohort 3, the younger ones, are extended to the full university level, while in Cohort 7 they reduce strongly. This phenomenon implies less dispersion in the returns to full university students which could be explained by the ages of the members of the Cohorts: while Cohort 3 is the first third of the working life and Cohort 7 is in the final section.

The five-year period 2007–2012 includes a high volatility business cycle producing fluctuations of short duration: economic growth until 2008, downfall in 2009, a recovery until 2011 and a recession of 2012. There has also been a fall in the productivity growth rate with persistent inflation, the price distortion and a worsening of public accounts, which has a negative impact on private labour demand (Damill & Frenkel, 2013). In this regard private sector full-time employment at the end of 2012, achieved a close ratio to 2007, in contrast with the accelerated momentum of the previous five-year period. Thus the income recovery is verified for all educational levels, despite its heterogeneity. This refers to the year 1997 except for the full university level in most of the cohorts. Particularly, Cohort 7 is the most impacted due to its decline in the income cycle ("age effect") overcoming the experience effect. In this sense it will be necessary to explore the "revolving door effect" that implies the replacement of occupations experienced by "young people" to receive a lower income. At the same time the most obvious improvements are observed in Cohort 3 compared to 1997 when they were between 19 and 23 years old where the full high school level verifies an increase of 55%, followed by "until high school incomplete" (42%), something expected owing to their initial labour phase.

¹⁰ Except for Cohort 3 and 4 which exceeds the 1997 real hourly income.

Period 2012–2017 is characterized by a high annual volatility with growth in the odd years and recession in the even ones, stagnation in labour demand and rising inflation. In this sense it is necessary to be cautious with the analysis of real hourly employment-related income since they are strongly affected by inflation rates (Table A3). In the case of 2017, CPI increase was above 25%, but in sharp decline compared to the previous year where it exceeded 40%, enabling a real income recovery. Thus, in general terms, it is shown as a stagnation, with slight improvements in the highest educational strata. Both the occupied with incomplete high school and complete university maintain their income and the complete high school level and incomplete high school level lose slightly. At the complete university stage the most evident increase is in Cohort 7 (Table A3). At the same time the real hourly employment-related income gaps about the previous educational level are maintained with a slight growth in the complete university level.

The evolution in the selected period shows that the real hourly employment-related income differences between cohorts are reduced according to the ages. By 1997 Cohort 3 represented the labour market's youngest generation, exhibiting the lowest return for all educational levels, despite its relatively low weighing.¹¹ Anyway as seen in Table 3 ten years later, this cohort achieves almost the same income of Cohort 7 except the upper level graduates. Likewise, Cohort 7 achieves the best revenues in 1997, despite being in the boom of the income cycle. It cannot be left aside that the Cohort 7 for 2017 is close to retirement and Cohort 3 in the middle of its working life, resulting in a comparison that is not entirely homogeneous.

One of the most striking points lies in the educational stratum until incomplete high school is the only one in Cohort 7 which presents an improvement in 2017 compared to 1997. A labour demand approach shows that countries of the Latin American region present a low percentage of skilled employment compared to their GDP per capita (Schteingart, 2018). Despite a positive correlation between both the region, as well as the Middle East, have lower shares than those that would normally derive from its economic volume. A common denominator is an intensive profile in natural resources rather than in knowledge-intensive tasks. In this sense the World Bank Report on Digital Dividends (World Bank, 2016) focused on the labor factor share fall as a fraction of national income. Its correlation with the increase in inequality occurs through an increasing labour market polarization. The technology diffusion brings an increase in both high and low qualification tasks, relegating medium training occupations (Autor & Dorn, 2013). However, this correlation is interrupted (at least in part) in countries rich in natural resources and as commodities' exporters. Likewise national labour law also varies as shown by Arcidiácono

¹¹ Young employment rates are the lowest in the region, as a result the high school and university education facilities (Schteingart, 2018).

(2015) regarding that minimum wage policies in Argentina that reduced the wage gap for both formal and salaried workers.

Finally, as seen in Table 3, Cohorts 5 and 6 are the most stable, with the lowest loss in the crisis period (1997–2002), although they are not the most rapidly recovering. The youngest are the ones with the highest growth rate after the crisis, surpassing in 2007 the salaries of the previous decade. In this sense it is possible to explain it as a typical phenomenon of the income cycle where there is an increase up to half of an employee's working life and then a gradual decline.

Performance of the lowest educational stage is generalized both for each of the cohorts and in general terms for the total population. In 2012 all age segments had exceeded pre-crisis levels even for the most adult Cohort. The reduction of real hourly employment-related income is exclusively reflected by a decline in the highest education segment that is far from achieving the past values. Furthermore, the complete high school level, although with less intensity, replicates the trend of the higher part of the distribution. As an example Cohort 3 in 2017 with a complete high school level earned an average real hourly employment-related income of \$217 while its counterpart in 1997 (Cohort 7) showed a value of \$251. Again there is a sharp drop in the distance between those who finish high school and those who do not, presenting more substitutability between one and the other.

Conclusions

Macroeconomic structure played a key role in the human capital analysis presented. Skilled labour generated a wider employment-related real income differential during recessions than in times of economic recovery. This is explained by a larger reduction in the basic educational levels than the fall in the upper part. Therefore, in recessive times educational credentials amplify the hourly income inequality, confirming the central hypothesis of this work.

Likewise, it is observed that not only educational credentials increase future employment-related income but also starting then not completing a university degree provides a significant differential. This phenomenon is verified at country level and for each region. Therefore, even without the credential, the ordinary arrival and studying in a high-level institution generates multiple positive externalities that lead to higher-paying jobs.

During economic growth inequality was reduced with relative independence from the educational levels of the population. In times of economic recovery (2002–2012) the employment-related real income gaps experience a significant shrinkage, not only when compared with their peaks observed in times of crisis (2002), but even when contrasted with prior levels. Economic growth generates important improvements throughout the educational distribution, although with a heterogeneous influence. Unlike developed countries the re-

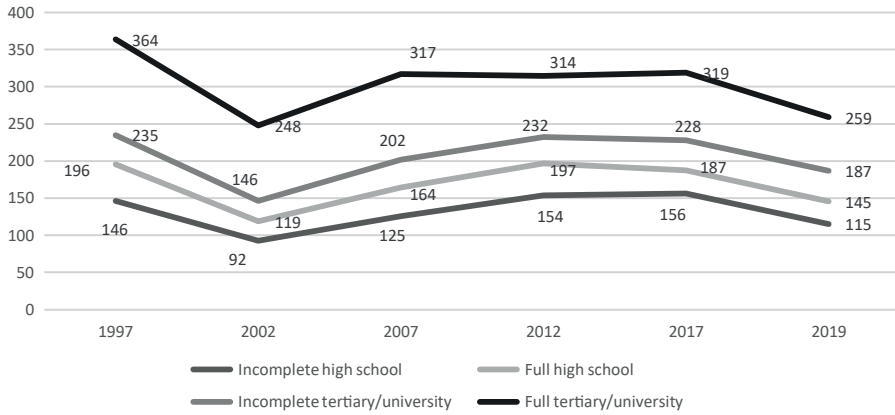
turns on education decline in relative terms. With an upward supply of skilled employment for both cases, the labour price difference seems to be a labour demand phenomenon. In effect the developed countries exhibit a rising return to education, even with an increasingly skilled labour supply. Linking a booming demand of high qualification to the leading role of new technologies, a weak knowledge intensive industry constitutes a job not in accordance with an upward skilled labour supply.

During the considered period educational segments underwent a readjustment in their composition, with an increasing participation of the highest levels. However, the lowest group was the only one that showed enough evidence of a complete income recovery from crisis values. Therefore, it is inferred that lower valuation of higher education is a result of a devaluation in high credentials. Despite being the most evident, the high school cohort also displayed a reduction in its return, becoming almost a substitute for those who does not possess it.

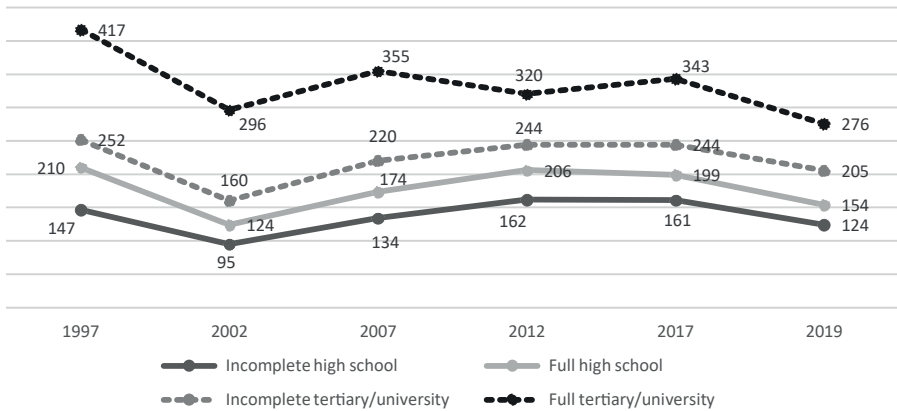
On the other hand, gender control shows a sharp drop in the income determination. While for the first five years a wide gender gap was observed, for the last five its addition produced weaker results. Indeed, horizontal equity challenges, far from being obsolete, tend to decrease in the observed period. This analysis has to be deepened in later studies.

Finally, the cohorts approach allows the comparison of age groups with the same credentials at different periods, isolating the income cycle of individuals. The generalized income fall stands out, but much less for the lowest educational level. Thereby with a stable income in the lowest part the educational gap narrowed. Income differentials tightened as the highest levels did not recover their profiles prior to the 2001 crisis, especially for the oldest groups. Controlling by human capital endowment on the returns on education presents a collapse, showing a loss in credential valuation.

Appendix



Graph 1. Real hourly employment-related income gaps by educational levels contrasted with lower one 1997–2019. Argentina (urban agglomerations). Values expressed in national currency (Argentine Peso) constant prices of 2019
 Source: Authors' calculations based on Table A1.



Graph 2. Real hourly employment-related income gaps (male) by educational levels contrasted with lower one 1997–2019. Argentina (urban agglomerations). Values expressed in national currency (Argentine Peso) constant prices of 2019
 Source: Authors' calculations based on Table A1.

Table A1. Real hourly employment-related income by educational level between 1997 and 2019. Argentina (urban agglomerations). Values expressed in national currency (Argentine Peso) constant prices of 2019

Región	Education level / year	Incomplete high school		Full high school		Incomplete tertiary/ university		Full tertiary/ university		Total	
		total	male	total	male	total	male	total	male	total	male
Argentina (urban agglomerations)	1997	146.3	146.7	195.8	210.1	235.1	251.8	363.7	417.4	200.9	201.0
	2002	92.4	94.8	118.7	123.9	146.3	160.5	247.9	296.3	133.3	136.5
	2007	125.5	134.2	164.2	173.6	201.7	219.8	317.2	354.6	182.8	187.9
	2012	153.5	161.6	196.7	206.1	232.2	244.4	314.2	320.3	212.8	211.8
	2017	155.9	161.0	187.1	199.3	228.1	244.4	319.1	343.2	213.2	215.8
	2019	114.8	124.3	145.5	154.1	186.9	205.3	258.8	275.7	171.0	174.1
GBA	1997	160.5	160.5	216.3	235.3	259.0	279.2	412.1	466.5	223.1	223.8
	2002	101.6	103.9	126.7	133.0	161.8	181.0	288.0	348.9	150.5	155.3
	2007	131.6	141.0	168.9	178.2	218.4	241.0	347.6	398.6	193.9	201.0
	2012	162.8	171.3	206.7	217.0	257.0	273.5	334.7	346.6	225.5	226.1
	2017	168.4	169.6	197.5	214.1	243.6	260.9	342.1	375.1	228.6	233.0
	2019	120.3	131.2	152.3	160.9	206.8	229.0	275.7	302.0	182.8	188.9
NOA	1997	110.4	116.5	154.2	153.6	188.4	208.4	282.3	318.0	153.1	153.6
	2002	69.4	73.7	99.5	101.1	117.9	123.9	190.6	217.0	101.2	101.1
	2007	85.3	93.1	119.4	127.3	145.6	158.7	256.6	274.1	134.1	134.2
	2012	113.7	120.5	146.4	153.0	172.2	179.9	278.2	276.4	166.1	161.0
	2017	119.2	127.9	150.2	154.2	183.4	185.6	282.1	288.4	173.6	168.4
	2019	92.8	99.2	118.7	124.4	141.8	148.7	223.6	230.0	137.4	135.9
NEA	1997	105.3	109.1	159.4	167.3	174.7	191.9	284.0	336.9	148.5	150.2
	2002	69.4	73.1	101.6	105.1	102.0	102.8	183.9	213.0	97.0	97.6
	2007	80.6	89.6	115.0	123.3	160.1	172.4	232.4	243.2	125.2	126.8
	2012	106.5	114.8	138.3	141.0	165.9	177.6	235.4	232.4	150.6	146.7
	2017	111.2	119.9	151.6	157.0	168.5	179.3	239.7	249.0	160.8	159.9
	2019	91.1	99.8	124.4	134.2	141.3	163.3	204.6	205.8	137.1	139.7
Cuyo	1997	118.9	121.6	162.8	165.0	200.9	222.1	339.8	382.6	167.9	166.2
	2002	80.7	84.5	108.7	115.3	134.2	145.6	210.3	216.4	116.2	113.6
	2007	106.9	112.5	139.5	149.0	171.1	179.3	270.6	296.3	156.1	157.6
	2012	123.6	132.5	155.9	160.5	184.4	198.1	268.0	261.5	172.4	170.2
	2017	128.0	137.0	155.1	164.4	191.6	197.0	267.9	270.7	178.5	177.0
	2019	99.6	104.5	126.9	132.9	161.8	180.6	250.6	244.6	153.0	149.1

Pampe- ana	1997	134.9	135.9	171.9	184.4	197.5	207.3	289.7	340.9	176.4	178.2
	2002	84.4	86.2	109.1	114.8	117.9	124.5	179.7	204.4	111.2	112.5
	2007	129.9	138.8	170.1	180.4	191.7	206.7	288.5	314.0	182.6	187.3
	2012	156.2	163.3	200.3	210.7	220.9	224.4	296.0	298.6	213.4	211.8
	2017	152.3	162.2	184.1	196.4	228.4	253.5	303.6	322.0	208.2	213.0
	2019	114.1	121.7	144.4	154.6	176.7	188.5	241.0	248.0	165.7	165.8
Patagonia	1997	183.8	190.7	257.8	266.1	308.5	312.9	461.6	560.2	247.0	249.5
	2002	118.3	124.5	157.6	163.9	191.0	213.0	307.7	339.2	167.2	169.0
	2007	193.6	210.7	249.5	266.1	257.8	273.5	395.1	407.1	250.5	256.4
	2012	212.6	231.3	289.6	306.6	307.5	345.5	408.0	410.5	287.7	295.2
	2017	210.0	228.4	278.8	296.9	309.2	332.9	403.1	406.6	281.5	289.5
	2019	160.2	176.8	205.5	220.6	237.8	254.4	308.4	333.7	217.8	227.0

Source: Authors' calculations based on EPH.

Table A2. Real hourly employment-related income gaps by educational levels contrasted with lower one 1997–2019. Argentina (urban agglomerations). Values expressed in national currency (Argentine Peso) constant prices of 2019

Región	Edu- cation level / year	Real hourly employment-related income gaps by educational levels contrasted with lower one							
		full high school (%)		incomplete tertiary/ university (%)		full tertiary/ university (%)		university and full high school (%)	
		total	male	total	male	total	male	total	male
Argentina (urban agglome- rations)	1997	34	43	20	20	55	66	86	99
	2002	29	31	23	29	69	85	109	139
	2007	31	29	23	27	57	61	93	104
	2012	28	28	18	19	35	31	60	55
	2017	20	24	22	23	40	40	71	72
	2019	27	24	28	33	38	34	78	79
GBA	1997	35	47	20	19	59	67	91	98
	2002	25	28	28	36	78	93	127	162
	2007	28	26	29	35	59	65	106	124
	2012	27	27	24	26	30	27	62	60
	2017	17	26	23	22	40	44	73	75
	2019	27	23	36	42	33	32	81	88

NOA	1997	40	32	22	36	50	53	83	107
	2002	43	37	18	23	62	75	92	115
	2007	40	37	22	25	76	73	115	115
	2012	29	27	18	18	62	54	90	81
	2017	26	21	22	20	54	55	88	87
	2019	28	25	19	19	58	55	88	85
NEA	1997	51	53	10	15	63	76	78	101
	2002	46	44	0	-2	80	107	81	103
	2007	43	38	39	40	45	41	102	97
	2012	30	23	20	26	42	31	70	65
	2017	36	31	11	14	42	39	58	59
	2019	37	34	14	22	45	26	64	53
Cuyo	1997	37	36	23	35	69	72	109	132
	2002	35	36	23	26	57	49	93	88
	2007	31	32	23	20	58	65	94	99
	2012	26	21	18	23	45	32	72	63
	2017	21	20	24	20	40	37	73	65
	2019	27	27	27	36	55	35	97	84
Pampeana	1997	27	36	15	12	47	64	69	85
	2002	29	33	8	8	52	64	65	78
	2007	31	30	13	15	51	52	70	74
	2012	28	29	10	7	34	33	48	42
	2017	21	21	24	29	33	27	65	64
	2019	27	27	22	22	36	32	67	60
Patagonia	1997	40	40	20	18	50	79	79	111
	2002	33	32	21	30	61	59	95	107
	2007	29	26	3	3	53	49	58	53
	2012	36	33	6	13	33	19	41	34
	2017	33	30	11	12	30	22	45	37
	2019	28	25	16	15	30	31	50	51

Source: Authors' calculations based on Table A1.

Table A3. Real hourly employment-related income. Selected cohorts (male) by educational levels 1997–2019. Agglomerations urban. Values expressed in national currency (Argentine Peso) constant prices of 2019

Cohort	Year 1997				Year 2002				Year 2007				Year 2012				Year 2017				Year 2019			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
3	103	131	188	325	86	86	143	200	131	166	211	308	160	200	263	314	160	217	246	343	122	147	221	295
4	131	148	206	274	97	120	154	211	131	183	257	394	166	206	263	343	166	194	234	365	125	161	220	301
5	137	200	246	377	91	131	154	303	143	194	251	377	166	223	280	337	171	223	251	365	121	176	233	287
6	148	211	257	337	97	143	177	257	148	211	257	360	171	228	274	371	177	223	297	388	141	157	225	309
7	154	251	308	445	108	154	194	314	148	200	297	365	183	217	240	343	166	228	285	417	127	192	220	313
Total	148	211	251	417	97	126	160	297	137	171	217	354	160	206	246	320	160	200	246	343	124	154	205	276

Notes: A. Incomplete high school, B. Full high school, C. Incomplete tertiary/university, D. Full tertiary/university.

Source: Authors' calculations based on EPH.

Table A4. Exchange rates. Argentine Peso/US Dollar & Argentine Peso/Euro

	Argentine Peso/US Dollar	Argentine Peso/Euro
29/12/1997	1	s/d
31/12/2002	3.37	3.53
31/12/2007	3.14	4.58
31/12/2012	4.91	6.49
29/12/2017	18.64	22.41
31/12/2019	59.89	67.23

Source: Authors' calculations based on Argentine Central Bank statistics.

Table A5. Consumer Price Index of the Greater Buenos Aires area (1996 = 100) & Annual variation (expressed in %) 1996–2019

Year	Consumer Price Index of the Greater Buenos Aires area (1996 = 100)	Annual variation
1996	100.0	0.1
1997	100.3	0.3
1998	101.0	0.7
1999	99.2	-1.8
2000	98.4	-0.7
2001	96.9	-1.5
2002	136.6	41.0
2003	141.6	3.7
2004	150.2	6.1
2005	168.7	12.3
2006	185.4	9.8
2007	233.0	25.7
2008	286.5	23.0
2009	329.0	14.8
2010	411.9	25.2
2011	501.4	21.7
2012	637.1	27.1
2013	811.0	27.3
2014	1124.6	38.7
2015	1427.3	26.9
2016	2013.3	41.0
2017	2539.2	26.1
2018	3735.3	47.1
2019	5710.0	52.9

Note: This series spliced was due to reliability issues of the national statistical agency between 2007 and 2016.

Source: Authors' calculations based on (Consumer Price Index from The National Institute of Statistics and Censuses (INDEC) for the period 1997–2006; Zack, Schteingart, & Favata, 2017 for the period 2007–2016 and again Consumer Price Index from The National Institute of Statistics and Censuses (INDEC) for the period 2017–2019).

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Aims and Scope

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