Argentine Education: A Tax Analysis from a Social Returns Perspective

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Abstract

"Educational investment" is frequently used as a reference for educational expenditures, due to its positive returns in future terms. This article verifies that its benefit can overcome the individual agent, triggering social (economic) returns as a future higher tax collection. It is conducted a simulation based on a dissimilar income tax treatment to determine whether the education productive approach justifies its public intertemporal incentive in Argentina. Under this treatment, the internal rate of return is maintained in a positive field (around 12% per capita, even with diverse sensitivity scenarios), even after considering those students who do not finish their degrees or those who drop out. On the one hand, financing public education is a profitable decision insofar as its present investment triggers a maximization of future aggregate income. In this sense, a special tax treatment (income tax deduction), could be a useful policy, allowing a maximization of social returns and potential growth in public funds.

Keywords: Tax deduction; Externalities; Education; Social returns; Argentina

JEL codes: H23, H52

Introduction

Many studies find that an additional year of schooling or higher education degrees significantly increases individual salaries [1]. Some of them assume that private returns have a more powerful impact on welfare than the aggregate educational level as schooling is not only linked to an increase in productivity but is also a signalling value. Economic concerns may differ from private returns, however [2,3]. The effects that education drives on the agent's income function is not only limited to personal well-being, but also to higher national welfare and income overall [4,5]. Despite its potential significance, much less is known about the social returns of education than private ones. This paper seeks to verify its economic scope in the case of Argentina, a country in which public education means state-run but also free access, with no tuition fees, using a cost-benefit analysis considering tax collection and cost of public education provision. From this assumption, a program operating through a tax code is proposed with the aim of encouraging people to acquire additional education by reducing the price of schooling and relaxing liquidity constraints. Again, this is justified on a return-on-investment argument for a policy that pays for itself [6]. If more people receive better and more education than they otherwise would, their higher salaries will benefit society as they pay sufficiently more taxes to finance the programs, in addition to becoming better citizens in various ways [7,8]. Through a simulation based on a dissimilar income tax treatment, we corroborate a social return approach. The article then proceeds as follows: The information is presented in a first section outlining our research conceptual framework and exploring the externalities that are accounted for to date. Accordingly, it includes an analysis of higher education returns, both at private (individual) and public levels (through increased fiscal revenue.) The next section contains our policy proposal with an impact analysis, summarized in a tax deduction for tuition. Finally, we present our conclusions.

Education externalities

The first theoretical frameworks are laid on the foundations of human capital theory. Thanks to the contributions of Schultz, Mincer, and Becker, education started to be thought of in an

income-maximizing framework. In this way, agents choose their highest educational level seeking to optimize the discounted present value of expected income flows, considering its cost function, introducing the well-known Mincerian income. Consequently, any additional year of schooling would increase the "academic reward." For this reason, educational investment could be considered as a microeconomic function, in a similar way to physical investment; time and money initially invested crystallizes in future returns. At macroeconomic level, several authors have highlighted a positive correlation between aggregate educational level, individual productivity, and per capita income growth [9]. Some of the most recent ones focused on knowledge spillovers both for peers and at company level, using endogenous arguments for growth. The pioneer was who pointed out, for large markets, the improvements that allow exploiting and improving returns to scale, in which technical progress would depend not only on investment in physical but also human capital producing knowledge spills. On the other hand, educational investment extends beyond individual limits. Highly skilled workers can also benefit their lower-skilled colleagues. Likewise, the "networking" effect increases the productivity of the latter, engendering spillovers in the knowledge accumulation process [10,11]. Within this framework, performs a dynamic analysis concluding in the well-known "Learning by doing"; employees are trained and learn in their jobs, and in this way increase the productivity of the company and the industry [12]. Nonetheless, education also contributes a qualitative differential that exceeds the person in training. Furthermore, externalities go beyond the strictly economic dimension. Schooling has an indirect impact on the improvement of health indicators both through a reduction in mortality in all age and race segments, including infant mortality and a drastic decline in adolescent motherhood [13-15]. In this direction, using cross-sectional data and multiple regressions, controlling by schooling, measures the effect of income inequality on mortality ratios [16]. Indeed, an increased percentage of the population without a high school diploma is found to be associated with an increase of 2.1 deaths per 1000 population. Using multiple logistic regression models, show that there are significant mortality gradients by education for all age groups and for both genders [17]. Finally, in 1980, at age 25, people with some kind of degree had a life expectancy of another 54.4 years, while for people with only a high school degree (or less) it was only 51.6 years [18]. The expansion of educational attainment is one of the main determinants of the reduction in inequality and a greater respect for civil rights, generating greater job opportunities that prevent criminal activities, with drastic reductions in property crimes and homicides. On the other hand, use the Dutch Crime and Law Enforcement Survey as input, finding that the probability of committing crimes such as shoplifting, vandalism, assault and bodily injury decreases with

years of education [19]. For example, for the year 1995, the frequency of crimes such as assault and vandalism were zero for individuals with higher education, while it is more strongly concentrated in the lower tail of the educational distribution (primary and lower secondary education.) They also highlight a certain peculiarity in that education seems to increase the chances of committing some kind of tax fraud [20]. According to, 75% of state prison inmates and 59% of federal prisoners in 1997 did not have a high school diploma. Similarly, find that a one-year increase in average years of schooling reduces both property and violent crime by approximately 11% [21]. Take the educational reforms that took place in Sweden between the 1950s and 1960s, in which compulsory schooling was extended from 7 to 9 years, to assess their impact on societal behaviours. However, these reforms did not take place simultaneously throughout the country. The authors compare individuals who were exposed to two different school systems, but who belonged to the same birth cohort and worked in the same labour market. The results indicate that an additional year of education reduces the probability of criminal conviction by 7% and the probability of imprisonment by 16% for men. In line with this, suggest that the Swedish school reform also affected the criminal activity of subsequent generations [22]. Thus, their estimates show that the education reform led to a small but positive reduction in criminal conviction rates among children of parents exposed to the school reform. Finally, it is observed that, as the educational level increases, so too does familiarization with social, political and economic issues; civic responsibility increases simultaneously with a greater commitment to caring for the environment [23,24]. Education externalities also include an economic dimension, confirming a true impact for the tax administration. Numerous studies show a strong association between learned skills and income in the labour market. Consistent with a higher income, the fiscal revenues would be larger due to higher tax revenue. This effect is verified not only through taxation on earnings and wealth, and social security. A higher income implies a higher growth in consumption and, therefore, higher revenues through value-added-tax. In addition, as the proportion of qualified workers grows, the time spent in unemployment would be lower, reducing treasury pressure for unemployment subsidies [25,26]. Therefore, accounting for the individual "prize" would result in a clear underestimation, where private returns differ from the social returns to education. In conclusion, increasing educational expenditures may affect both individuals and social income functions, since the fiscal position is included through the future increase in tax revenues and a partial decrease in contingency expense. In this sense, education could be understood with a usual investment scheme, where the associated expenses represent the financial costs. Considering educational expenditures as a production input makes a differential tax treatment in a traditional

cost-benefit approach plausible, as some examples from international experience indicate.

Social returns in a dynamic framework

This section starts with an individual future earning simulation in a dynamic framework, which makes it possible to approximate both private and public returns. Thus, the cost-benefit analysis will no longer be limited to the future monetary agents' "reward," but also to the treasury overall. For this kind of research, there are different methodologies to be applied depending on data availability. Ordinary least squares estimation is the most common, used for the Argentinean case for the period 1992-2002, with the disadvantage that in order to interpret the Mincer coefficient as the internal educational rate of return, stiffer assumptions must be made [27]. In a similar study for Canada, concludes that OLS estimates tend to underestimate real returns in comparison with other methods, highlighting the advantages of randomised controlled trials (RCT), but stating their difficulty in randomising control and treatment groups [28]. Unlike the OLS regression method that estimates the average marginal effects, the application of a conditional and an unconditional quantile regression model makes it possible to capture the specific effect of the vector of relevant attributes on different segments of the conditional and unconditional income distribution. In the case of Argentina, as in most of the countries of the region, micro-data do not make it possible to observe individuals in longer panels capturing the individual's whole life. In order to solve this central challenge (this study will not focus on a crucial moment during workers' employment histories (e.g., after experiencing job loss or after childbirth) since we would also need a permanent biography follow-up. While such rich data are less available for middle- and low-income countries, a repeated cross-section through pseudo panels based on household surveys (EPH in Argentina) is proposed for this document. According to Heckman et al (2006), a cross-section regression would be unwise if the labour market is not stationary (as is clearly the case for Argentina and the rest of the region), proposing a cohort analysis as an alternative way of constructing a panel, a methodology also suggested. There are two main approaches to estimate the average reward of those individuals with different educational levels. A first method lies in a "static" calculation that infers the subsequent personal income for their whole life, taking as reference another individual with identical personal attributes. Through a cross-sectional study, individual's salaries with dissimilar ages are observed but the same educational level is assumed as a single individual. Naturally, this hides strong assumptions and consequent difficulties. In the case of an income profile increasing or decreasing over time, by case linked to economic growth or technological change, this would not be considered given that it estimates an entire horizon based on static data (in

this case a reference year.) Alternatively, this work takes a dynamic criterion, but not in a precise way since it requires following individuals during their lifetime, which 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. Therefore, dissimilar statistics are obtained for the population groups, making a panel data analysis for different cohorts, instead of inferring variables from other groups as in a cross-sectional study. The analysis begins with the income gap between individuals with a certain educational level and agents with a lower level of education. Thus, the return from higher education is estimated based on the differential with secondary education. The gap observed between university graduates and undergraduates is also included. Considering the wide scope of education enrolment and its universalization (especially primary school), measuring the primary school monetary prime is a complex task without enough individuals with no education. For this reason, returns from the lowest ratings are excluded from the analysis. In this framework, an educational credential approach with individual attributes control is used, but since income is not constant over time and varies according to age (experience), the calculation is controlled by life cycle [29]. Returns are adjusted by cohort, revealing the evolution of the cash flows in their working lives. From a fiscal approach, the exercise is presented with an initial investment that lasts for the first 5 years: the public budget for national universities (in per capita terms) added to the funds that the treasury does not collect while schooling lasts and job placement is delayed. For a retirement age of 65 (a work horizon of 40 years), individual income is evaluated, thus estimating the government revenues share. In this way, the expected cash flows are updated by the average variation of the wage index of the last 15 years by a discounted real rate of 2%. Under these parameters, the internal rate of return (IRR) turns out to be 12.4% (per capita) for public sector with a payback on the investment calculated in 13 years. That is, since it is counted from the public outlay, this is equivalent to 8 years after graduation, so the remaining 32 years of working life would form a net profit for the government. If the future fiscal revenue for an individual who completes their university studies is calculated at present value, our estimations arrive at a net public earning of 219,400 dollars per person. The same methodology is used for private returns. The IRR for a public university student is located at 10.1%, estimating an opportunity cost during the first 5 years of study, associated to inactivity. At the same time, considering also the monthly fee, the IRR for a student from a private university is 7.3% (considering the average cost of 10 monthly fees plus a tuition of equal value per year). Note that the public gain for a 24-year-old student who graduates amounts to 10 million Argentine pesos, which, taken at the average exchange rate for the year

under evaluation, is equivalent to 219,400 US dollars. This amount might seem rather low and is a result of the last two currency crises of 2018 and 2019. Even considering a higher (or lower) enrolment rate, the net present value of government profit remains positive (and voluminous.) More people studying increases the skilled labour force supply, which might be associated with a lower educational premium (and vice versa.) So, we conduct a sensitivity analysis in order to illustrate how a supply shock may affect public returns. In the event of enrolment increasing (and its consequent graduation rate), there would be a higher share of skilled workers in the labour market, triggering a second-round effect known as a reduction in the educational premium, which would have some effects in other variables such as tax collection, for our case study (Table 1) (Figure 1).
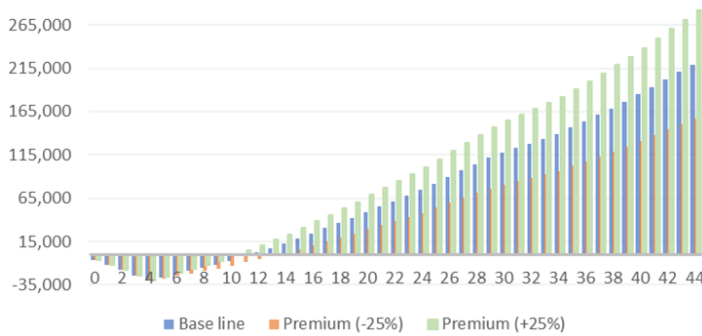

Figure 1: Public higher education investment accumulated NPV profiles.

However, not all students enrolled in a higher educational institution complete their studies. High dropout rates imply a cost that may not be recovered given that taxpayer's failure to graduate. However, there is a noteworthy monetary differential for those who do not finish their higher education (although much less than for graduates), so the public sector partially recovers the expenditure made. Considering the latest data available from the University Policy Department (SPU in Spanish), the number of students who drop out is obtained by a residual, weighing the dropout share by its effectively present income differential. Thus, the overall IRR decreases to 5.3% for the treasury (accounting for an NPV of USD 27.45 billion), taking the government 22 years to recover the whole university investment, with a remaining 23 years of working life as net earnings. Unlike "per capita" social returns, an integrated scenario is seen when aggregate educational expenditure is included and the income function combines the differential for graduates, for students who do not finish their degree, and the null differential for individuals who drop out, weighted by their share in the university population. To sum up, public spending on higher education generates a positive social return, making its financing profitable, despite the high dropout rate. This is one of the main challenges that the system will have to face in the public policies design.

Table 1: Sensitivity analysis.

Deviation from base	NPV of tax collection due to education premium	IRR
+25%	$281,797	14.4%
+20%	$269,317	14,0%
+17.5%	$263,078	13.8%
+15%	$256,838	13.6%
+12.5%	$250,598	13.4%
+10%	$244,359	13.1%
+7.5%	$238,119	12.9%
+5%	$231,879	12.7%
+2.5%	$225,639	12.5%
+1%	$221,896	12.4%
+0%	$219,400	12.3%
-1%	$216,904	12.2%
-2.5%	$213,160	12.1%
-5%	$206,920	11.8%
-7.5%	$200,681	11.6%
-10%	$194,441	11.4%
-12.5%	$188,201	11.2%
-15%	$181,962	10.9%
-17.5%	$175,122	10.7%
-20%	$169,482	10.4%
-25%	$157,003	9.9%

Income Tax Deduction as an Educational Public Policy

Policy impact Literature review

Considering education as a promotor of higher treasury revenue, it is plausible to think of an incentives scheme. A higher present investment accounts for a higher future social income, depending on effective academic achievement, understood as enrolment and graduation from higher education. Many authors have ventured into this subject, as most of the studies are conducted for developed economies with different income distributions from developing ones. Point out that many arguments rest on the fundamental assumption that society benefits in general from higher education graduates, with a broad discussion on whether this type of measure has a positive and significant impact on enrolment rates in higher education. Many documents state that the net result of a tax exemption will depend on whether such programmes actually change university attendance, or whether they only function as a subsidy on demand. Thereby, outlines the main tax-based student aid programs providing an economic perspective on tax-based student aid, and an assessment of their impact on student behaviour [30]. They conclude that tax credits and tuition tax deductions have no effect on aggregate human capital accumulation as in order to benefit middle-income families (with extensive administrative burdens on households, colleges and government) a reduction in overall tax rates would be desirable as a more transparent approach. Students may not fully benefit from the programs if they have insufficient tax liability or low levels of qualified spending, typical of middle-class students.

Table 2: University graduates' educational premium change scenarios.

Premium	Δ graduation	Global IRR
+25%	-25%	5.2%
+20%	-20%	5.2%
+15%	-15%	5.2%
+10%	-10%	5.2%
+5%	-5%	5.2%
0%	0%	5.2%
-5%	+5%	5.1%
-10%	+10%	5.0%
-15%	+15%	4.9%
-20%	+20%	4.7%
-25%	+25%	4.6%

Moreover, there is a chance that students from middle-class families would attend university regardless of the existence of tax-based aid programs. At the same time, finds no evidence that college enrolment increased faster among eligible groups, and hypothesizes that this could be due to lack of awareness among families on the margins of college enrolment [31]. Furthermore, use a regression discontinuity and regression kink analyses around eligibility cut-offs and phase-out regions, in addition to using a difference-in-difference to examine the effect of the introduction of the American Opportunity Tax Credit (AOTC) which increased tax-based aid differentially for taxpayers at various points in the income distribution, finding no effects on enrolment. Their analysis is based on the idea that the deduction might increase college-attendance if the latter were adjusted in simple ways that would not increase cost but would make it more likely to relax liquidity constraints and be perceived as a change in the price of university education (which it is) as opposed to an income change. If it is perceived as the latter, its effect would be negligible in line with the results. On the other hand, through an individual fixed effects approach, highlights that credits and tax deductions can be useful for older students and the middle class [32]. By reducing the net present value of college costs, the interest deduction can increase college enrolment, so that a deduction for student loans may be a well-targeted measure. It also finds that the decision to attend a higher education institution is not conditioned by the possibility of receiving a tax deduction. However, a sample share stands out, corresponding to men whose educational expectations as teenagers had not been met as of 1998, in which tax deductions have a strong positive effect on university enrolment. For this subgroup (which represents one-third of the total male sample), being eligible for a tax credit or deduction is associated with a 2.5% to 3.4% increase in the likelihood of attending a higher education course (this may be underestimated in the case of male household providers). Applies a difference-in-difference focusing on eligible versus ineligible groups around the introduction of tax breaks, but in changes in the

generosity of tax-based aid (including the tuition deduction) for eligible groups over time. Tax-based aid increases full-time enrolment in the first two years of college for 18–19-year-olds by 2.2 percentage points (6.7%), as the general enrolment increase comes at a steep price. Nonetheless, aid timing may affect households' response to the programs, provided tax-based benefits are likely realized when tax returns are received, generally after the payment of educational expenses, the delay of which cannot solve credit-constrained issues. Finally, the results reached in their comparison of US public policies suggest that direct investment in children with lower incomes in education and health have the highest rate of return on public funds, as they recover the investment made since there are fewer future transfers and higher revenues collected through taxes. The return on public funds decreases if policies are oriented towards adults, and may be somewhat higher if there is a large spill over effect onto children. The authors propose a method to compare the social benefit and cost of different policies by calculating the willingness to pay (WTP) and the sum of the initial cost of the programme and the estimated long-term effect on the budget (i.e., fiscal externalities.) The ratio of the former to the latter is the Marginal Value of Public Funds (MVPF), that is, the social utility per additional dollar spent on the policy. Therefore, a methodology for estimating the impact of the social return is proposed in line with an interaction with the public budget, in order to also account for the repayment capacity of the measures. They conclude that investment in the health and education of poor children is the type of policy that has the highest MVPFs (generally >5), yet they also find high returns for policies that seek to increase secondary and tertiary enrolment, in contrast to Heckman's thesis of rapidly diminishing returns by age. They also highlight examples of education policies that do not target children but do have high MVPFs generated on the supply side.

Methodology

Tax incidence analysis requires an outline of the universe of study. Focusing on the impact that income tax has on family income, this will be the welfare indicator used for the exercise. Although the tax burden affects consumption capacity, it is linked to the worker's salary, in such a way that using remuneration as a proxy allows a homogeneous comparison. As shown, individuals are organized based on two variables. On the one hand, they are stratified according to the level of ongoing studies achieved (whether public or private schooling), in order to measure the impact of the policy [34]. On the other, they are organized according to income decile (welfare indicator), considering two alternatives. A first option generates an ordinal structure in the income level and uses the per capita family income, making it possible to measure how close the family income is to a basic consumption basket. The second form considers the income

earned by the main breadwinner, a methodology used [35]. Given its greater stability, this method is the most suitable for our tax analysis and, therefore, is used here. The Permanent Household Survey (EPH) is the main data input, providing a representative sample for 32 urban agglomerations. Income distribution data is mixed with enrolment data under an income tax incidence model. Thus, taxpayer distribution could be estimated combined with the number of children attending school, along with the amount of spending (for further details, see methodological annex). As has been suggested, income tax levied on individuals (not businesses) is one of the most progressive tools available to the system, due to its concentration in high deciles, excluding those with lower incomes [36]. However, a deeper analysis is needed of what should be considered individual earnings. It is certainly not the purpose of this study to question its meaning and conception, but it is necessary to rethink what deductions are authorized by law and, therefore, those expenses included in income tax exemptions. In order to increase the relief available to taxpayers, a bill introduced in 2017 allowed individuals to deduct from income tax any interest paid on loans. Additionally, expenses for private medical insurance were included as a possible deduction on income tax. In other words, while the cost of a productive investment can be deducted, private spending for which there is a parallel public benefit is also exempt. Under these circumstances, and because they have both characteristics, a similar analysis is carried out for education. To conduct this exercise, a simulation is proposed with a fixed-sum tax deduction. Two main reasons justify this decision. First, granting such a benefit eliminates the "third-party payer" incentive if the public sector can afford total school enrolment. Thus, this discount would operate in the same way as the rest of the deductions, which in all cases have an annual cap (a fixed sum in the case of residential rental.) Since the tax is composed of a fixed sum and a variable rate (both dependent on the income level), the refund is calculated not only as a marginal rate, but also on the possible re-categorization (fixed sum) and, therefore, reduction of the lump sum paid. Finally, this exercise proposes a methodology in which the social benefits include both individuals' willingness to pay higher and also benefits accruing to the government budget due to behavioural responses to the policy in which government benefits from behavioural responses are located in the numerator (benefit), as opposed to measures linked with marginal value of public funds.

Table 3: Graduates and non-graduates educational premium change scenarios.

Premium	Δ graduation	Global IRR
+25%	-25%	4.8%
+20%	-20%	4.9%
+15%	-15%	5.6%
+10%	-10%	5.1%
+5%	-5%	5.1%
0%	0%	5.2%
-5%	+5%	5.1%
-10%	+10%	5.1%
-15%	+15%	5.0%
-20%	+20%	4.9%
-25%	+25%	4.8%

Educational spending in families

Although public provision is one of the main public policies to favour social mobility, in Argentina public and private education coexist, and extra expenditure must be made for the former. For 70 years, private tuition growth has become one of the main educational system stylized facts. However, this trend appears to have slowed in recent times, especially for primary school, a stage at which parents set out the type of education they want for their children. The Educational Expenditure Structure (HES) shows that educational expenditure from families decreased from almost 4% of disposable income in 1996/97 to 3.1% in 2017/18. Furthermore, excluding texts and other learning materials (considering only educational services), the share ratio decreased from 2.7% to 2.3%. This phenomenon takes place in a decreasing real wage scenario, due to several recessions. Accounting not only for income reduction, but also for the lower share of educational expenditure in the aggregate expenditure, during these twenty years the "educational investment" of families dropped 5.41%. It therefore emerges that boosting educational services related with study quality (in the sense of better tools for learning, such as private tutorials, might be useful for a society where only 15% of the people in study age actually attain a bachelor's degree. Several stylised facts about this phenomenon emerge, some of which go in the opposite direction to what is usually thought. Firstly, private enrolment is far from being exclusive to the richest deciles of the population, despite a positive correlation between private participation and income levels. In terms of purchasing power, in spite of being located at the top of the distributive pyramid the 9th decile receives an average remuneration equivalent to 3 total basic consumption baskets (where one is equivalent to the poverty line floor), which, among other things, contemplates only the minimum caloric requirements for living. Despite a positive correlation between private schooling and income level, it is useful to disentangle this association. Even more, accounting for those households with

school age members, the participation of private initial, primary, and secondary education, is highly significant from the fourth decile onwards. Indeed, only in the least wealthy third of households is the private education share less than a third. Note that the aggregate share is lower than the average of the deciles, in line with the greater demographic weight of households with fewer resources (Figure 2).
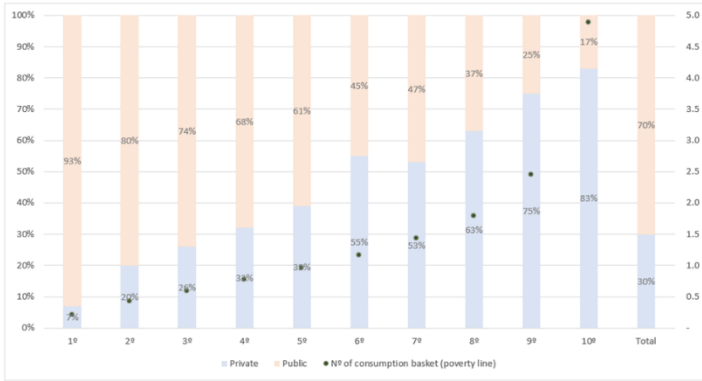

Figure 2: Weighting of initial, primary and secondary school by management type and decile of family per capita income and number of consumption baskets per income decile.

Secondly, the educational expenditure faced by families is more than the school fees. This indicator includes different school supplies (books, school equipment, etc.) and extracurricular activities which are not included in the formal syllabus. Although it is challenging to estimate a certain causality, households with children have considerable differences in educational expenses, which is clearly verified in the clothing and footwear category and, to a lesser extent, in recreation, culture and transportation. For this reason, the indirect expenditure that makes a comprehensive education comprises a heterogeneous structure. Far from being limited to private education, its weight in the family coffers may be larger than first assumed.

Policy impact estimates: a framework

The above discussion is set in a particular socioeconomic structure, where the middle class decreased from 47% of the population in 2017 to currently 32%, meaning that the number of people in poverty in Argentina is larger than the middle class. The new economic and social crisis generated by the COVID-19 pandemic represents a challenge in a number of dimensions, with a definite impact on education. In this respect, it is noteworthy that the evaluation of pedagogical continuity carried out by the Argentinean Ministry of Education in June 2020 showed that 1.1 million students dropped out of their schools (10%) and more than 200,000 children left private schools due to difficulty paying. The social framework in which this policy is implemented must be considered. Certain countries in the region face serious challenges to increase their growth rate and are gradually

compressing incomes for both lower and middle sectors. In Argentina, high inflation and consecutive economic crises have shrunk real wages, reducing the size of the middle class. In addition to this worsening of real wages, there is an outdated fiscal structure, with significant income tax in sectors that, despite being located at the top of the distributive pyramid, have clearly eroded purchasing power, with a consequent negative effect in educational investment. This approach is therefore suggested, as fiscal policy in developed countries often differs significantly from that in developing countries where income pyramids are much more compressed. Regarding tax treatment, since education is indirectly covered by income tax (as it cannot be deducted), a productive input would be taxed at first, and again in the following stages when the education yield is generated (future income), indicating that there is room to boost an individual incentive that amplifies social externalities. Under this scheme, a sort of double taxation exists today, with children who will pay higher income tax in the future, but whose investment in the present is also taxable. Further, it is expected that students respond to tax-based aid along both the extensive and intensive margins. Movement along the extensive margin is driven by a lower total cost of attendance (and again the perception of relative price change.) Along the intensive margin, the propensity to consume more education is driven by the marginal subsidy of the programmes, which is considered for the different income tax bands. Thus, according to the evidence of families' educational expenditure and changes in real wages, an income elasticity of 3.76 is accounted for, giving room for larger externalities at the minimum change in disposable income. The data from the third quarter of 2019 is taken into account, considering the current tax model. This exercise proposes a deduction from the income tax equivalent to a minimum wage for each person or dependent child who is studying, adjusted to the tax scale of each , only if their gross remuneration does not exceed the equivalent of 12 minimum wages. The adjusted gross income eligibility limits and the phase-out range for the tax credits prevent high-income families from benefitting from tax aid. Income tax stands out for its significance for public budgets. It also raises a series of exemptions through which it is possible to lighten its burden. The payment of rent, debt interest, private medicine and even domestic service are some of items that the treasury at least partially allows to be deducted from income tax. Interestingly, families' investment in human capital is not included in this list. With the proposed deduction, not only is a direct impact on household income expected, but also a clear incentive to reallocate those resources to a long-term investment, based on the discount both in tuition and school fees as well as diverse connected inputs (private language classes, essential materials for studies, etc.) Thus, introducing a fiscal stimulus measure would potentially raise expenditures, concentrate demand for

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educational services, while generating an impact on educational quality. Once again, school fees (including indirect educational expenses) could be thought of as productive loan interest, with a specific tax treatment. For this simulation, the parents' financial statement is analysed together with their children's educational level. Given that the universe of parents with school-age children that pay income tax is uneven, distribution is segmented according to the rate (category) at which they are taxed. For this reason, a special treatment is suggested for educational investment that favours its promotion. Considering it as a deductible dimension, it could generate a better targeting of resources towards learning activities [37-40].

Table 4: *Public returns to higher education.*

t	Counterfactual cash flow	Adjusted by average wage adjustment	Deflated by 2% real interest rate
0	-$288,120	-$288,120	-$288,120
1	-$288,120	-$371,674	-$285,903
2	-$288,120	-$479,460	-$283,704
3	-$288,120	-$618,503	-$281,522
4	-$288,120	-$797,869	-$279,356
5	$179,490	$641,194	$172,692
6	$179,490	$827,140	$171,364
7	$179,490	$1,067,011	$170,046
8	$179,490	$1,376,444	$168,738
9	$179,490	$1,775,613	$167,440
10	$251,225	$3,205,971	$232,555
11	$251,225	$4,135,702	$230,766
12	$251,225	$5,335,056	$228,991
13	$251,225	$6,882,222	$227,230
14	$251,225	$8,878,067	$225,482
15	$323,154	$14,731,757	$287,809
16	$323,154	$19,003,966	$285,595
17	$323,154	$24,515,116	$283,398
18	$323,154	$31,624,500	$281,218
19	$323,154	$40,795,605	$279,055
20	$354,422	$57,718,558	$303,703
21	$354,422	$74,456,940	$301,366
22	$354,422	$96,049,452	$299,048

t	Counterfactual cash flow	Adjusted by average wage adjustment	Deflated by 2% real interest rate
23	$354,422	$123,903,793	$296,748
24	$354,422	$159,835,893	$294,465
25	$435,196	$253,178,731	$358,793
26	$435,196	$326,600,563	$356,033
27	$435,196	$421,314,726	$353,294
28	$435,196	$543,495,996	$350,576
29	$435,196	$701,109,835	$347,880
30	$326,825	$679,213,954	$259,242
31	$326,825	$876,186,001	$257,248
32	$326,825	$1,130,279,941	$255,269
33	$326,825	$1,458,061,124	$253,306
34	$326,825	$1,880,898,850	$251,357
35	$463,650	$3,442,150,544	$353,845
36	$463,650	$4,440,374,202	$351,123
37	$463,650	$5,728,082,720	$348,422
38	$463,650	$7,389,226,709	$345,742
39	$463,650	$9,532,102,455	$343,082
40	$563,056	$14,932,752,243	$413,434
41	$563,056	$19,263,250,393	$410,253
42	$563,056	$24,849,593,007	$407,098
43	$563,056	$32,055,974,979	$403,966
44	$563,056	$41,352,207,723	$400,859

IRR	12.3%
NPV	$219,400

Policy impact: results from tax exercise

A new exercise of social returns is established now including this tax deduction for tuition and different education fees, in order to understand if this larger expenditure could be retrieved as future public funds, maintaining the positive social returns highlighted in the above sections. Assuming that the deduction begins to operate from the initial level until the completion of the university studies, the proposed policy is fully repaid in 37 years, in per capita terms. Given that only a few years are mandatory for the initial level, if the choice was to attend 5 years (instead of 2), the deduction would have a repayment term of 42 years (20 years after graduating from higher education.) If the policy is successful in this way, it may suggest that the ratio of students graduating increases [41-43]. Assuming a 1-1 relationship between educational premium and graduation ratio variation, any increase in the skilled labour force supply (workers with a bachelor's degree) would reduce the premium to the same extent. So, considering the number of students who drop out of university, the global IRR of the project (higher public education) would vary according to Table 2. Note that each increase in the graduation ratio would imply an equal decrease in the ratio of university students dropping out, since the latter are understood as "potential skilled labour force" (a kind of reserve of future graduates) Also, the salary premium for those who spend a few years attending higher education but do not complete their studies was not modified, in order to capture the true effect of the graduation ratio increase (Table 2).

The results suggest that the IRR is more sensitive to a change in the skilled labour force supply (quantity), rather than a change in its price (educational premium.) This is congruent with an economy with a low level of young people actually completing their university studies and a government highly dependent on salary taxes, which would leave it more exposed to ups and downs in recessions and/or times of high inflation, such as that experienced in recent years in Argentina. According to this outcome, the same exercise is repeated, but this time modifying the non-graduated university students' salary premium in a 1-1 relationship. This means that if the graduation rate increases 10%, the university dropout rate decreases 10%, with the same impact on the salary premium (Table 3).

In this example, it is seen that the global IRR seems fairly stable regardless of the sign of the change in the premium or graduation rate. It appears somewhat more sensitive to negative supply shocks, in line with the same result as the preceding table. However, to estimate the overall rate of the project (at 5.3% as mentioned above), a generational analysis was conducted. Since the number of graduates is a variable flow, a group of students was taken including complete and incomplete university graduates on a weighted basis. In this way, the discounted cash flow that the government would receive as public returns was calculated, including the income differential and associated costs.

Among the latter, the university budget is included along with the opportunity cost linked to the absence of labour income for schooling reasons. However, given that the proposed policy is transversal to all educational levels, if the total annual cost of the measure were applied to university returns, the overall rate of the project would decrease to 4.6%. In this way, social profitability remains a positive field, concluding in a policy that intertemporal pays for itself. Additionally, it is relevant to measure the current tax revenues loss that this proposal implies. For fiscal reserves, the direct cost of the measure is equal to 0.1% in terms of GDP. This latter mechanism, however, will be subject to the expenditure-income elasticities of the beneficiary families and the ex-ante situation of each case. Although it is not the purpose of this document to carry out this analysis, nor is there a database that allows us to distinguish a treatment group from a control group, students' dropout rate from private schools during the pandemic shows that the admission (or at the least its reduction) would be a relevant variable.

The change in tax implementation implies a redistributive result that, despite its apparent regressivity, complements, albeit partially, the benefit granted by PROGRESAR scholarships to low-income individuals and families. Thus, the lower distribution tail is overtaken by some kind of educational stimulus measure (larger than the proposed deduction), while in the middle and upper tail of the income distribution agents do not have any kind of benefit. While this could generate some controversy, it should again be noted that an average wage in the 9th decile is only three times the basic consumption basket needed to overcome the poverty line. Thus, the authors believe that an analysis of tax benefits as a form of educational boost is pertinent as, although they are in the upper middle segments of the distribution, they have much lower purchasing power than what might be presumed from other countries' experiences [44-50].

Conclusions

Education is one of the greatest explanatory variables when it comes to revealing countries' growth. Its scope is not limited to individual private returns, but rather presents multiple externalities for society and a notable social return. Our calculations show a positive internal rate of return (IRR) close to 12.4% for a public sector with a payback on the investment calculated in 13 years, and a remaining working life as a net profit. Even considering a significant university dropout rate, ratios remains in positive field, despites decreasing. Otherwise, the results suggest that the IRR is more sensitive to a change in the skilled labour force supply (quantity), rather than a change in its price (educational premium). Moreover, a special tax treatment for education preserves positive social returns and a dynamic growth in the public budget, especially for higher education, posing serious challenges to increase not only enrolments but also

graduations. Education public financing is a Pareto optimal decision insofar as its present investment triggers future income maximization, in which efforts to increase insertion, and especially retention in the educational system, has its subsequent reward. In this sense, policies that incentivize college-going decisions (and families' spending on education) will enable an increase in future income levels. This is especially important in a context of decreasing educational expenditure, and an atypical distributive pyramid in relation to total basic consumption baskets. For these reasons, a special treatment is suggested for educational investment that not only seeks to favour its promotion by reducing the relative price between it and other consumer items. Considering it as a deductible figure could generate a better allocation of resources towards educational activities. At the same time, this type of design makes it possible to compensate for the higher relative costs that recessive contexts imply for family budgets, such as during the pandemic. On the other hand, the policy intertemporarily pays for itself. It was verified that the discounted cash flow that the government would receive remains a positive field not only as social return but also implementing a tax deduction, even after including income differentials, university budgets and opportunity cost linked to the absence of labour income. In the simulation exercise proposed, a high productivity of public education spending, as well as a rapid recovery, correspond to a rate of return above those usually observed in our economy. Thus, rebuilding a high social mobility does not prevent growth driven by human capital and a sustainable fiscal projection.

Appendix

Methodological annex

As mentioned, the Permanent Household Survey (EPH) corresponding to the third quarter of 2019 is used. Firstly, is created a variable that shows, by household, how many individuals are attending school (or university.) Likewise, the income received from the main occupation of the household is taken and organized based on a non-taxable minimum wage (NTMW) and the different scales of income tax rates. Where a person has more than one job/income, the tax falls on the main activity, which is usually the one with the highest income. Finally, only the head of the household is considered, since the deduction will reach a single parent. Having created both variables (schooling and earnings), the number of households with family members studying that are excluded from income tax is analysed and, where they are taxed, the category in which they are located. Subsequently, with the socioeconomic distribution obtained, the participation share of each group is extracted (example: 3 children studying - 12% rate; 1 child studying - 31% rate) of the total sample. Using these participation coefficients,

the sample distribution is extrapolated to the total number of enrolments. That is, the total sum of enrolments (from kindergarten to postgraduate) is measured, and the corresponding coefficient is applied. Having the number of households affected (considering each particular situation, that is, number of children and income level), the way in which taxpayer distribution would change after a deduction equal to a minimum wage is analysed. In other words, whether the head of the household would be exempt from paying income tax or whether they would be included in another category. Once the exemption or category change has been determined, the decrease in collection is calculated following a maximum scenario. This scenario assumes that all individuals, regardless of attending a private or public institution, deduct the entire benefit. In addition, it assumes that they are at the lower limit of the income category, which causes them to automatically fall out of the category at the slightest deduction. Finally, since the tax is composed of a fixed sum and a variable rate, in order to estimate the tax loss both tranches have to be considered. For the latter, since each rate applies within each income interval (category), it is assumed that the individual used to pay the maximum possible before changing category (maximizing the worst-case scenario) (Table 4).

Conflicts of Interest

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