

# EDUCATIONAL DISADVANTAGE IN A CHANGING ECONOMIC CONTEXT

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## Resumen

*Este artículo examina el impacto de los cambios en el contexto económico sobre la configuración de las expectativas educativas entre alumnos de 14 años. Analizamos las expectativas de los logros educativos condicionadas al rendimiento escolar y comparamos nuestros resultados entre países para distintos niveles de riqueza. Esperamos que un entorno económico cambiante tenga un impacto tanto sobre nivel general de las expectativas condicionadas como sobre el grado de desigualdad educativa por origen social. Empleando datos agrupados de encuestas TIMSS 2003, 2007 y 2011 sobre competencias de alumnos de 8.º curso, estimamos un conjunto de modelos multinivel de efectos aleatorios. Nuestros resultados confirman la existencia regularidades sistemáticas entre países y sugieren que las recesiones económicas conducen a un aumento de las desigualdades educativas por origen social.*

## Palabras clave

*Crecimiento económico, desigualdad, educación, crisis, incertidumbre.*

## Abstract

*This paper explores the impact of changes in the economic context on the configuration of educational expectations among 14 years old students. We analyze expectations of educational attainment conditional on school performance and compare our results across countries with varying levels of wealth. We expect a changing economic environment to impact both the overall level of conditional aspirations and the slope of educational inequality by*

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*social origin. Using pooled data from TIMSS 2003, 2007 and 2011 surveys of competences among 8th graders, we estimate a set of random constant multilevel models. Our results confirm the existence of systematic cross-country regularities and suggest that economic down times lead to a growth of educational inequalities by social backgrounds.*

### Key words

*Economic growth; inequality; education; crises; uncertainty.*

SUMARIO: I. Introduction; II. Economic context and educational attainment: literature review and theoretical background; III. Hypotheses; IV. Data; V. Method: random effects linear regression; VI. Results; VII. Conclusions; VIII. Bibliographical references.

## I. INTRODUCTION

THE current global crisis started to show its effects in 2007 with varying intensities and timing around the world. Sociological contributions on the influence of this crisis on a number of social indicators have started to emerge (1), particularly applied to the United States, where the first symptoms of so-called Great Recession appeared. Many of the most obvious immediate effects of the economic downturn take place through individual job loss, diminished income or poverty in the household, and ultimately through a reduction in public spending. It is too premature to analyze whether the effects of these negative experiences will disappear once the general economic climate takes a decisive turn for the better and the welfare of households improves again. Even if there is a global economic recovery and sustained growth in the future, some of the consequences might however endure. There might be lasting effects on the life course of individuals experiencing deprivation, even in the next generation. The chances that children enjoy may not only be reduced contemporarily as a direct consequence of a worsened economic situation in the parental home; their life chances in the longer run might be affected too.

One of the most relevant aspects in which these enduring effects of recession might show already is the educational prospects of children currently enrolled in education. To the extent that education correlates with other relevant outcomes throughout the life course, such as occupational attainment, earnings or family formation, a worsening in the educational prospects of children, particularly those from disadvantaged origins, could, in the long run, endanger the progress made in some OECD countries in the last decades as regards intergenerational social mobility or income equality (2).

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(1) GRUSKY, D. B., WESTERN, B. and WIMER, C. (eds.), *The Great Recession*, New York, Russell Sage, 2011.

(2) BREEN, R. AND GOLDTHORPE, J. H., «Explaining Educational Differentials: Towards a Formal Rational Action Theory», *Rationality and Society*, n.º 9, 1997, pp. 275-305.

In this paper, we are interested specifically in the impact that the Great Recession might have had on inequality of educational opportunities in a broad sample of countries with varying levels of wealth and that have been exposed to the current crisis to different extents. The global crisis can be seen as an external shock that, by definition, affects most countries to some extent. Educational transitions, that is, how far children actually proceed in non-compulsory education and what track they follow, are not readily observable for large samples of countries, and so, with the kind of data available up to date it is not possible to test the effect of recessions on actual transitions across countries. Focusing on students' expectations about continuation decisions –how far they expect to advance in their educational careers– is thus arguably the best approximation of actual transitions feasible within a comparative research design.

In the social stratification literature, the study of contextual changes on inequality of educational opportunity is scarce. Apart from the very solidly established theoretical and empirical literature on the effects of educational expansion on changes in inequality of educational opportunity (3), the other most fertile area of study of the influence of macro variables on the educational decision making process has been the examination of varied types of educational institutions –in terms of whether and when students are tracked and the level of standardization– that are known to enhance or mitigate, respectively, inequality of opportunity by social background (4). Little is known, however, about how inequality of educational attainment is affected by macro level trends such as changes in the economic cycle or in unemployment rates. One remarkable exception is the analysis of the US carried out by Reardon (5), where the effects of changes in income inequality on differences in educational achievement by social background are explored. Yet, more knowledge –including research on a greater number of countries and dimensions of educational inequality other than test scores– is necessary to evaluate the impact of the ongoing global economic downturn on advanced societies and to develop adequate policies. Up to date, the academic literature, either theoretical or empirical, on the impact of macro-economic conditions on educational aspirations of families and students is limited. There is, however, growing concern about this and related issues in international organizations (6) and non-profit organizations (7). Educational aspirations of children are not a perfect predictor of actual

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(3) BREEN, R. AND JONSSON, J. O., «Inequality of Opportunity in Comparative Perspective: Recent Research on Educational Attainment and Social Mobility», *Annual Review of Sociology*, n.º 31, 2005, pp. 223-243.

(4) VAN DE WERFHORST, H.G. and MIJS, J. J. B., «Achievement Inequality and the Institutional Structure of Educational Systems: A Comparative Perspective», *Annual Review of Sociology*, n.º 36, 2010, pp. 407-428.

(5) REARDON, S.F., «The Widening Academic Achievement Gap Between the Rich and the Poor: New Evidence and Possible Explanations», in MURNANE, R. and G. DUNCAN (eds.), *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*, New York, Russell Sage Foundation Press, 2011, pp. 91-116.

(6) See for instance ILO, *Report of the Director-General. Impact of the Global Recession on Education*, Geneva, ILO, 2011; OECD Education Ministerial Meeting, *Tackling the Effects of the Crisis on Education*, Paris, OECD, 2010; UNESCO, *The Impact of Economic Crisis on Higher Education*, Bangkok, UNESCO, 2012.

(7) RUSSELL SAGE FOUNDATION, *The Great Recession and Public Education*, 2011. See <http://www.russellsage.org/awarded-project/great-recession-and-public-education>

achievement, but they undoubtedly constitute an important determinant in the decision making process as to whether to go on in the educational system (8).

This paper aims to elucidate the interplay of family background, educational achievement –conceived as expectations regarding the highest educational qualification that young students aspire to achieve– and the macroeconomic context. Specifically, our main research question is: has the impact of family background on offspring’s educational expectations become stronger because of the current economic recession? Although the paper is originally inspired by a pressing empirical concern –has the ongoing crisis an effect on relevant aspects of educational inequalities?– one of its main objectives is to contribute to theory building in a scantily developed area of research. In this vein, we put forward a number of mechanisms potentially underlying changes in the patterns of educational inequality. We expect any relatively lasting economic downturn to modify the educational expectation of children of all social origins to some extent, but we argue that, more crucially, it might also have a stronger effect on the offspring of certain socioeconomic backgrounds. The aim of the study is therefore to systematize these two types of effects.

The paper is structured as follows. In the next section we contextualize our research question in the existing theoretical and empirical literature. We then formulate testable hypothesis about the impact of recessions on inequality of educational aspirations. The description of the data and methods used then follows. We then show and interpret our main results and conclude.

## II. ECONOMIC CONTEXT AND EDUCATIONAL ATTAINMENT: LITERATURE REVIEW AND THEORETICAL BACKGROUND

In the last 15 years, sociological attempts to explain the inequality of educational outcomes have increasingly been based on micro-level rational-action models of educational decisions. Mare (9) famously proposed to model the effects of family background on educational attainment as a series of transitions that mark students’ path through their educational careers. This theoretical approach stimulated a large amount of proposed mechanisms by means of which family background impacts on educational careers, among them the celebrated model of Relative Risk Aversion by BREEN AND GOLDTHORPE (10) or the theories of Maximally Maintained Inequality (11) or Effectively Maintained Inequality (12). All these models go back to BOUDON’s seminal theory of Inequality of Educational Opportunity-Inequality of Social Origin, which explains why higher absolute rates of attainment, contrary to common wisdom, not necessarily reduce class differentials in education (13). It suggests

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(8) See JACOB, B.A. and LINKOW, T. W., «Educational Expectations and Attainment», in DUNCAN, G.J. and J. MURNANE (eds.), *Whither Opportunity: Rising Inequality, Schools, and Children’s Life Chances*, New York, Russell Sage, 2011, pp. 133-165, for evidence on the United States.

(9) MARE, R. D., «Change and Stability in Educational Stratification», *American Sociological Review*, n.° 46, 1981, pp. 72-87.

(10) BREEN, R. AND GOLDTHORPE, J. H., «Explaining Educational Differentials: Towards a Formal Rational Action Theory». *Rationality and Society*, n.° 9, 1997, pp. 275-305.

(11) RAFTERY, A.E., AND HOUT, M., «Maximally Maintained Inequality: Expansion, Reform, and Opportunity in Irish Education, 1921-75», *Sociology of Education*, Vol. 66, n.° 1, 1993, pp. 41-62.

(12) LUCAS, S.R., «Stratification Theory, Socioeconomic Background, and Educational Attainment: A Formal Analysis», *Rationality and Society*, n.° 21, 2009, pp. 459-511.

(13) BOUDON, R., *Education, Opportunity, and Social Inequality*, New York, Wiley, 1974.

that there is a correlation between social background and individual aptitudes to succeed at school and that the independent effect of individual social position, in coalition with the characteristics of the education system, determines the costs and benefits that shape individual decisions. Accordingly, class differentials in education arise from two different sources of inequality: cognitive skills or proven ability at school (primary effects) and class-specific cost-benefit structures at each branching point (secondary effects). Class differences in academic performance persisting over the generations arguably owe to biological or socio-cultural factors, whereas class differences in educational decision-making mainly relate to the costs, payoffs and probabilities of success of alternative educational transitions (14). One focal point of the literature has since consisted in decomposing existing inequalities in educational transitions into primary and secondary effects (15).

It is uncontroversial that the impact that family background has on children's educational attainment is multi-faceted. In terms of economic endowments, there are a great number of contributions analyzing the positive association between different indicators of household resources, on the one hand, and attainment, on the other, such as parental wealth and post-secondary schooling (16), or family income and college attendance (17). Much research has also been produced analyzing the effects of parental unemployment on several measures of educational achievement: cognitive outcomes (18), educational aspirations (19), children's schooling effort (20), post-secondary educational attainment (21), or grade retention (22).

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(14) ERIKSON, R. AND JONSSON, J. O., «Explaining Class Inequality in Education: The Swedish Test Case», in ERIKSON, R. and J.O. JONSSON (eds.), *Can Education be Equalized? The Swedish Case in Comparative Perspective*, Boulder, Co., Westview, 1996, pp. 1-64.

(15) JACKSON, M., ERIKSON, R., GOLDTHORPE, J. and YAISH, M., «Primary and Secondary Effects in Class Differentials in Educational Attainment. The Transition to A-Level Courses in England and Wales», *Acta Sociologica*, n.º 50, 2007, pp. 211-229; STOCKÉ, V., «Explaining Educational Decision and Effects of Families' Social Class Position: An Empirical Test of the BREEN-Goldthorpe Model of Educational Attainment», *European Sociological Review*, Vol. 23, n.º 4, 2007, pp. 505-519; KLOOSTERMAN, R., RUITER, S., DE GRAAF, P. M. AND KRAAYKAMP, G., «Parental education, children's performance and the transition to higher secondary education: trends in primary and secondary effects over five Dutch school cohorts (1965-99)», *British Journal of Sociology*, Vol. 60, n.º 2, 2009, pp. 377-398; JACKSON, M. (ed.), *Determined to Succeed? Performance versus Choice in Educational Attainment*, Stanford, Stanford University Press, 2013.

(16) CONLEY, D., «Capital for College: Parental Assets and Postsecondary Schooling», *Sociology of Education*, n.º 74, 2001, pp. 59-72.

(17) ACEMOGLU, D. AND PISCHKE, S., «Changes in the Wage Structure, Family Income and Children's Education», *European Economic Review, Papers and Proceedings*, n.º 45, 2001, pp. 890-904.

(18) LEVINE, P. B., «How Does Parental Unemployment Affect Children's Educational Performance?», in DUNCAN, G. and R. MURNANE (eds.), *Whither Opportunity: Rising Inequality, Schools, and Children's Life Chances*, New York, Russell Sage, 2011, pp. 315-339.

(19) See REED, E.J., *An Examination of the Educational Aspirations Parents Have for their Children*, Dissertation, University of Iowa, 2012: <http://ir.uiowa.edu/etd/2972>, for a review of findings.

(20) ANDERSEN, S.H., «Common Genes or Exogenous Shocks? Disentangling the Causal Effect of Paternal Unemployment on Children's Schooling Efforts», *European Sociological Review*, first published online Dec. 6, 2011: doi:10.1093/esr/jcr088 (forthcoming).

(21) WIGHTMAN, P., «Parental Job Loss, Parental Ability and Children's Educational Attainment», *PSC Research Report*, n.º 12-761, 2012.

(22) STEVENS, A.H. and J. SCHALLER, «Short-Run Effects of Parental Job Loss on Children's Academic Achievement», *Economics of Education Review*, n.º 30: 2011, pp. 289-299.

Despite efforts to improve our understanding of how educational inequalities depend on country-specific institutions (23), little is known about the role played by the broader economic context and changing therein. Single-country studies about secular trends in achievement gaps, such as Reardon's analysis of the United States, are insightful but not suited to test the impact of contextual factors (24). To assess the influence of the economic cycle on educational outcomes in a rigorous way, large-scale comparative studies using cross-country cross-time data are required.

Educational expectations are a key element in the conventional Wisconsin model of status attainment, which views educational aspirations as important mediational variable that transmits social background factors into subsequent behavior (25). Accordingly, students internalize their educational expectations under the influence of significant others (parents, teachers, peers), taking into account their academic performance. Notably, recent research has shown that some students hold inconsistent and uncertain beliefs about their educational and occupational futures (26).

### III. HYPOTHESES

The relationship between economic environment and the social gradient in educational attainment is complex. In theoretical terms, multiple mechanisms can be identified at different levels that may shape the social background effects in opposing directions. We formulate five (partly competing) hypotheses about the impact of different levels of economic growth.

Conventional wisdom suggests that educational careers tend to be prolonged in times of recession. Due to a shortage of job openings and dwindling wages, the benefits of entering the labor market are reduced during economic down times. When the economy is weak and unemployment is high, there should hence be a larger number of potential school leavers who decide to stay in education than during times of economic growth. Therefore, students should expect to remain longer in the education system during hard times and exit education sooner when the economy is booming and there are more attractive jobs to go around.

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(23) See PFEFFER, F. T., «Persistent Inequality in Educational Attainment and its Institutional Context», *European Sociological Review*, Vol. 24, n.° 5, 2008, pp. 543-565 ; and VAN DE WERFTHORST, H.G. AND MIJS, J. J. B., «Achievement Inequality and the Institutional Structure of Educational Systems: A Comparative Perspective», *Annual Review of Sociology*, n.° 36, 2012, pp. 407-428.

(24) REARDON, S.F., «The Widening Academic Achievement Gap Between the Rich and the Poor [...]», *op. cit.*

(25) SEWELL, WILLIAM H., HALLER, A. O., AND PORTES, A., «The Educational and Early Occupational Attainment Process», *American Sociological Review*, Vol. 34, n.° 1, 1969, pp. 82-92.

(26) MORGAN, S.L., T.S. LEENMAN, J.J. TODD and K.A. WEEDEN, «Occupational Plans, Beliefs About Educational Requirements, and Patterns of College Entry», *Sociology of Education* (forthcoming).

**H1a:** *Students expect to obtain higher levels of education when the economy is contracting as compared to when the economy is growing.*

The effect of economic recessions on educational aspirations might also be the contrary. Firstly, education is costly because of the direct costs of education (especially tertiary education) as well as opportunity costs in the form of foregone earnings. Given that economic contraction brings about income losses for private households, these costs might become imperative for a larger number of students, especially when the estimated likelihood of successfully making the next transition is low. Secondly, economic crises almost inevitably lead to fiscal pressure. In the Great Recession, the response to dwindling tax revenues and slim finances of many (especially European) governments has consisted in setting up austerity programs that included cutbacks in education. Lower public spending on education leads to lower quality and/or higher fees, both of which would seem to undermine the attractiveness of post-compulsory education. In short, due to declining household incomes, rising fees or diminished quality of educational programs the costs of education may exceed its benefits for a larger share of students in economic down times.

**H1b:** *Students expect to obtain lower levels of education when the economy is contracting as compared to when the economy is growing.*

Both hypotheses H1a and H1b speculate about changes in the constant of the social inequality function producing changes in conditional expectation as a consequence of differences in the levels of economic growth (see below for a graphic summary of the hypotheses). Yet, the impact of a changing economic environment on our dependent variable, educational expectations, could be more complex. As discussed above, the model of Relative Risk Aversion maintains that the utilities students assign to the completion of a given educational milestone differ by social origins because the primary goal to prevent downward social mobility is accomplished at a lower level for working-class children. However, there is also evidence that privileged family background leads to higher expected returns to education, even after performance at school has been taken into account (27). This raises the question whether differences in expected payoffs related to successful educational transitions contribute to educational differentials by social origin. Although college students seem to hold relatively realistic perceptions regarding expected returns to college (28), eighth-grade students in secondary school have been found to hold markedly inaccurate beliefs about the returns to schooling, with expected wages being much lower than measured returns (29). At the same time, expected returns to schooling depend on institutional characteristics (30). Because education functions as insurance against the risk of unemployment, the returns to schooling are further-

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(27) BRUNELLO, G., C. LUCIFORA AND WINTER-EBMER, R., «The Wage Expectations of European Business and Economics Students», *The Journal of Human Resources*, Vol. 39, n.º 4, 2004, pp. 1116-1142.

(28) BOTELHO, A. AND COSTA PINTO, L., «Students' expectations of the economic returns to college education: results of a controlled experiment», *Economics of Education Review*, Vol. 23, n.º 6, 2004, pp. 645-653.

(29) See JENSEN, R., «The (Perceived) Returns to Education and the Demand for Schooling», *The Quarterly Journal of Economics*, Vol. 125, n.º 2, 2010, pp. 515-548.

(30) BRUNELLO *et al.*, «The Wage Expectations of European [...]», *op. cit.*

more likely sensitive to a changing economic environment (31). Inequality of educational outcomes may increase when the economy contracts if awareness about deteriorating employment opportunities and wages is unevenly distributed by socioeconomic status. Specifically, socioeconomic differences should increase if students from advantaged social backgrounds more clearly perceive the need to adjust to the changed circumstances by accumulating additional human capital to become fit for increased competition for jobs (the «privileged information» effect).

**H2a:** *Social origin effects on educational attainment become more pronounced when the economy is shrinking as opposed to when it is expanding.*

The effect of a shrinking economy on class differentials may also be the opposite. Rising levels of unemployment are often closely linked to the contraction of low-skilled jobs, whereas high-skilled jobs are more crisis-resistant (32). This implies that recessions may not reduce every student's incentives to drop out to the same extent, leading to across-the-board extensions of educational careers similarly across levels of parental socioeconomic status, as claimed by H1a. Rather, if the crisis-related loss of employment is concentrated in the low-skilled job sector, and students from lower social backgrounds attach a lower utility to educational credentials than those from higher social background as suggested by the model of Relative Risk Aversion, this «diminished outside option» effect of the crisis should disproportionately affect the former and less the latter. By incentivizing continued education, economic crisis might then paradoxically help children from lower social origins avoid myopic educational decision-making. Because there are not enough jobs available that would represent an attractive alternative to continued education, economic contraction would lead to increased educational attainment among children from lower social origins.

**H2b:** *Social background effects on educational attainment become weaker during economic downturns and stronger during economic upswings.*

The foregoing hypotheses all follow a top-down logic in that they link macro-economic factors with educational decisions. However, the crisis might also entail immediate consequences at the micro level. Specifically, there may be a negative effect of parental unemployment or wage loss on children's educational attainment. As argued in H1b, continuing in education is contingent on economic resources available in the household. Hence, children of poor parents may have to exit education and seek employment. Although this income effect should theoretically be operating at all times, its impact should become more strongly felt during economic downturns. Due to compositional effects, economic crises thus cause a larger proportion of households to be subject to income constraints leading to shortened educational careers among children. This «income loss compensation» effect can be expected to exacerbate pre-existing differences in educational aspirations by social origin.

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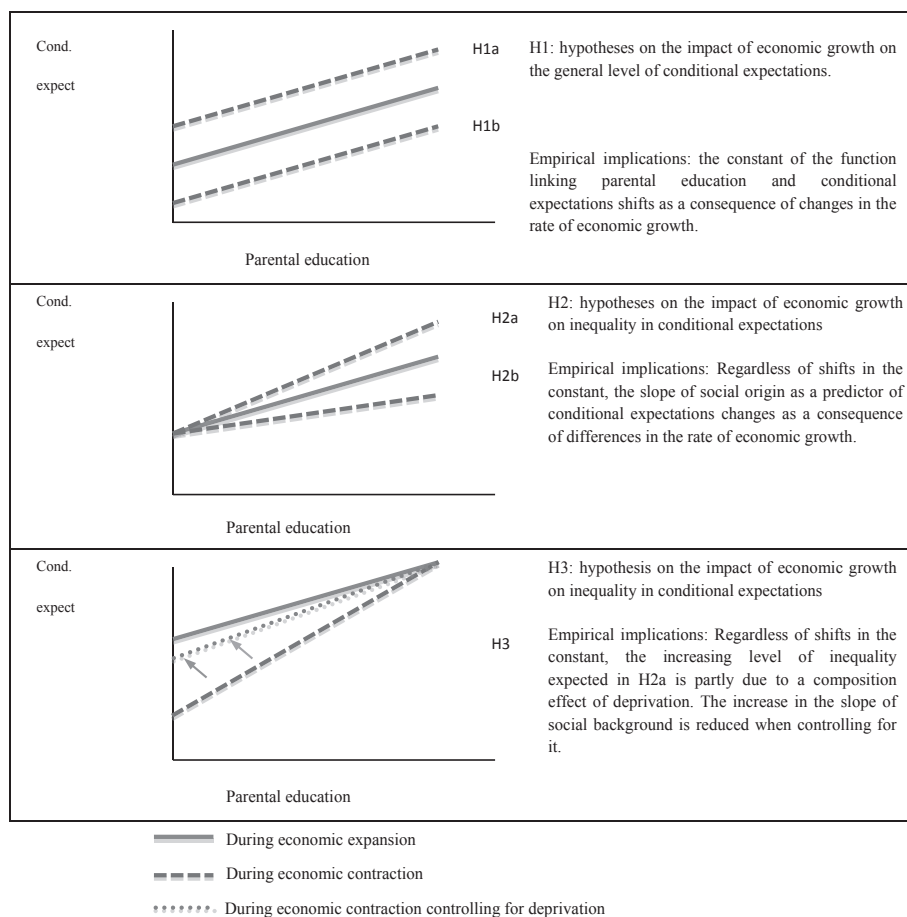
(31) Cf. BLÖNDAL, S., FIELD, S. AND GIROUARD, N., «Investment in Human Capital through Post-Compulsory Education and Training», *OECD Economic Studies*, n.° 34, 2002/I, Paris, 2002.

(32) For instance in the period 2008-11, unemployment of adults with low educational attainment grew by five percentage points in the European Union. Meanwhile, unemployment rates for adults with a high level of education rose by only 1.5 percentage points.



**H3:** *Economic hardship in the family leads to earlier exit from education. The increase in inequality in conditional expectations by social background suggested by H2a, is partially or fully due to an increase in the proportion of deprived families as a consequence of a shrinking economy.*

The following figure summarizes graphically the empirical implications of our hypotheses.



In sum, this study aims to test four (partly competing) hypotheses concerning the effect of economic contraction and weak labor markets on educational outcomes. Hypotheses H1a and H1b expect a change in the constant of the inequality function. While H1a assumes that educational careers become prolonged during recessions for all children, H1b states the contrary. The rest of the hypotheses imply an impact of a changing economy not only on the overall level of conditional expectations, but also that changes take place in the patterns of social stratification in educational attainment.

Class-based educational inequality might be reinforced during economic down times due to two reasons: on the one hand, children from privileged social background may adjust to macro-economic shocks by staying longer in education to build up additional human capital and be competitive on increasingly tight labor markets, whereas working-class children may fail to perceive the added importance of education (H2a). On the other hand, inequalities could increase because of greater resource constraints among low-status families, for instance, through parental unemployment (H3). Finally, inequality in attainment levels could also decline if the «diminished outside option» effect of the crisis prevails, effectively preventing children from lower social origins from dropping out of school in pursue of short-term labor earnings (H2b).

#### IV. DATA

TIMSS (Trends in Mathematics and Science Study) constitutes our main data source to measure students' expectations regarding continuation in education. TIMSS, developed by the Evaluation of Educational Achievement (IEA), is an international assessment of the knowledge of mathematics and science that 4th- and 8th-grade students around the world have. TIMSS was first administered in 1995, and every four years thereafter (five time points thus far). The study includes data collected from students, teachers and schools in each participating country, and is therefore well suited for hierarchical approaches.

For this paper, we use three data points (2003, 2007, 2011) (33), including all available countries, although not all countries are present in each year. Our final sample includes as many as 75 countries; see the appendix for a list of the countries taking part in the study in each year. The time span covered allows us to observe students before, during and (for some countries) after the ongoing economic crisis. Since countries around the world experienced the economic downturn with differing timings and intensities, the choice of this period is particularly well suited to capture variability of economic conditions and individual responses across countries and over time.

To be able to compare the impact of changing economic context on the prospective educational careers of youngsters across countries, we had to make concessions in terms of the available measures of educational careers. TIMSS contains limited information on future careers but, in turn, it maximizes the number of countries that can be included in the analysis and allows us to exploit variation in educational outcomes over time (2003-2011). Because the current economic downturn –affecting most advanced economies, albeit to a different extent– entails substantial variation in the context conditions of educational decision-making, it provides also a unique opportunity to improve our understanding of the driving forces of unequal educational trajectories of children at the end of compulsory education.

Since this paper addresses the effect of the economic context on continuation decisions, we choose to restrict our analysis to students in 8th grade, who are usually 13 or 14 years old and therefore close to the end of compulsory schooling. Students are asked how far they expect to proceed in the educational system, and

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(33) There is a small number of countries participating in the two studies prior to 2003.

responses are coded following ISCED educational levels 1-2, 3, 4, 5b, and 5a. We treat this variable as a continuous one. Since continuation decisions are strongly influenced by actual performance, expectations are adjusted by standardized scores in mathematics (34). Throughout the paper, we refer to these (expectations controlled for scores) as conditional expectations. This allows to proxy, albeit in a rather imperfect manner, the incidence of one of the potential sources of secondary effects among young students prior to making the choice of staying versus dropping out or choosing between educational tracks in non-compulsory education (35).

Having information on both the mother's and father's ISCED level of education, we use the highest parental ISCED (coded in 7 categories) as our measure of the socioeconomic background of students. Unfortunately, TIMSS does not provide any direct indicators of the financial situation of families such as employment status or household income. Using several country-year-specific indicators of the availability of assets that are regarded as basic for a household in each nation and year, we construct a measure of deprivation (36). Using factor analysis, the various dummy indicators were collapsed into a single factor in each of the three years and then standardized. The final deprivation measure is a single continuous variable, valid for all years and countries in our sample.

Contextual data are drawn from the World Development Indicators database. The World Bank offers historical series starting in 1960 on a number of indicators for more than two hundred countries all over the world. For this paper, in order to measure economic context, we use both data on GDP per capita (expressed in constant 2005 PPP multiplied by 1000) and on GDP growth (expressed in annual percentages, either positive or negative). The combination of these measures allows capturing not only the yearly change in the economic climate, but, crucially in such a heterogeneous sample of countries, the general level of development in the country.

The final dataset on which our analyses are based therefore shows a hierarchical structure, with students clustered in countries (37). This design allows us to test the (moderating) effect of country-level explanations on individual-level processes.

## V. METHOD: RANDOM EFFECTS LINEAR REGRESSION

Multilevel regression analysis allows for a joint estimation of individual and aggregate level explanations. This is the most appropriate methodological tool for analyzing hierarchical data, such as our merged sample of TIMSS students, and countries, in contexts in which the number of aggregate level units of analysis is large enough.

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(34) All the results shown in the paper are based on models adjusted by scores in mathematics, but they remain unaltered if scores in science are used instead. These additional results are available from the authors upon request.

(35) MORGAN *et al.*, «Occupational plans [...]», *op. cit.*

(36) For instance, in Finland 2011, the five indicators used are: having your own mobile phone, having your own computer to use, having your own television, having a musical instrument and having pets. In Botswana in the same year, six different indicators are used: having a calculator, a dictionary, running tap water, electricity, television and radio.

(37) TIMSS samples students within classrooms within schools, thus allowing for the examination of individual-, peer- and school-level explanatory factors, although for this paper the classroom and school levels are disregarded.

The so-called random regression models complement OLS regression with a correction of standard errors on selected estimators. Equation (1) is the linear regression specification, where a continuous dependent variable ( $y_i$ ; in our analysis, the individual test scores in mathematics) is estimated as a function of a number of independent variables. The effect of predictors is jointly estimated regardless of whether they operate at the aggregate ( $x_{1j}$ ) or individual level ( $x_2$  to  $x_n$ ).

$$(1) y_i = \beta_0 + \beta_1 x_{1j} + \dots + \beta_2 x_2 + \beta_n x_n + \varepsilon_i$$

Note that a single random residual adjusts our prediction to the observed value in each individual case (i). In its simplest form, the random component multilevel approach (2) includes an additional random term adjusting the constant to each cluster:

$$(2) y_{ij} = \gamma_{00} + \gamma_{1j} x_{1j} + u_{0j} + \beta_2 x_2 + \dots + \beta_n x_n + \varepsilon_{ij}$$

Here, the constant (2.1) term is the result of several separate components:

$$(2.1) \beta_0 = \gamma_{00} + \gamma_{1j} x_{1j} + u_{0j}$$

$\gamma_{00}$  is the average intercept of all clusters considered, and  $u_{0j}$  is a random noise term correcting the average intercept to each country-year observation. Aggregate level explanatory variables contribute to the understanding of the constant ( $\gamma_{1j}$ ).

Since we are primarily interested in higher-order effects, our model does not include further random corrections to adjust the impact of individual-level independent variables. In other words, we assume that  $\text{var}(\beta_2) = 0$  across countries. As a consequence, the specification of our equations has two residual terms,  $u_{0j}$  and  $\varepsilon_{ij}$ , to allow for the estimation of unbiased standard errors and the production of reliable statistical contrasts.

## VI. RESULTS

### *Description of the dependent variable and variance decomposition*

Since our research design focuses on the educational expectations conditional on prior performance. Thus, to construct our dependent variable we need to control the expectations that students report for their cognitive results. The selected measure of performance in our case is the TIMSS standardized test score in mathematics. It is thus the conditional expression of two variables, expectations and performance, which we describe in the following models.

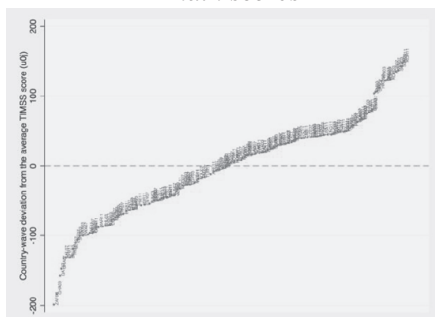
Countries differ vastly in terms of their average school performance. TIMSS gathers detailed data on the students' scores in mathematical performance within schools allowing for a proper decomposition of the variance into a country and an individual level component. This is what Model 1 does in Table A.1 in the appendix. The average level of mathematical performance is 465 for all the students in all countries and years in the sample. The indicators of variance composition provide

further information unveiling that the random terms adjusting the constant to each country-year subsample ( $\sigma^2_{u0j}$ ), is almost as important as the individual level residual variation ( $\sigma^2_{ei}$ ). In fact, the inter-class correlation coefficient, which reports the proportion of the overall variation that lies at the between-country level is 0.4.

Figure 1 ranks the specific country-wave corrections adjusting the average level of performance of students within clusters. The dashed red line starting at  $y=0$  refers to the average constant term shown in Table A.1 ( $\gamma_{00}=465$ ). Below this line, countries underperform on average by the size of the random correction. From the graph it comes evident that African and Middle Eastern countries are vastly over-represented among the worst performers: South Africa, Ghana, Qatar, Saudi Arabia, Botswana and Morocco among others. On the contrary, many Asian countries are mostly placed among the top performers: Hong Kong, South Korea, Japan or Singapore, just to mention a few.

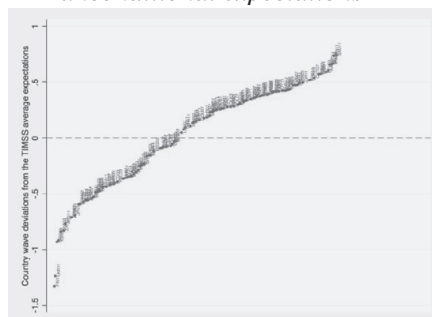
Model 2 in Table A.1 shows the same variance decomposition for the case of educational expectations. The DK answers were recoded into missing values. For the complete sample, the average expectations are relatively high with ( $\gamma_{00}=4.6$ ). A significant amount of variation adjusts this average prediction across TIMSS countries and waves, although the inter-class correlation coefficient here suggests that most of the overall variation takes place at the individual level. Actually 90% of the expected educational careers of the students in our sample are produced by individual level mechanisms. Figure 2 plots the ranking of country waves along this dimension. While rankings of countries according to their average performance are well known, this sort of evidence provides a fresh look on international differences in educational outcomes. The list of countries under-adjusting  $\gamma_{00}$  is rather heterogeneous from the point of view of educational outcomes and economic development. Finland and Ukraine are by far the countries where, on average, students report less educational aspirations followed by Georgia, the Czech Republic, Ghana, South Africa, Australia and Japan. Among the best performers in this dimension we find most of the Arab countries including Saudi Arabia, Jordan, the United Arab Emirates, Qatar, but also countries such as Lithuania, Japan or the US. Since markers are delimited by confidence intervals, the left graph in Figure 3 confirms that these cross-country-wave differences are statistically significant.

Figure 1. *Random corrections to the constant in the intercept-only model for math scores*



Calculated from estimates shown in Model 1-Table A.1

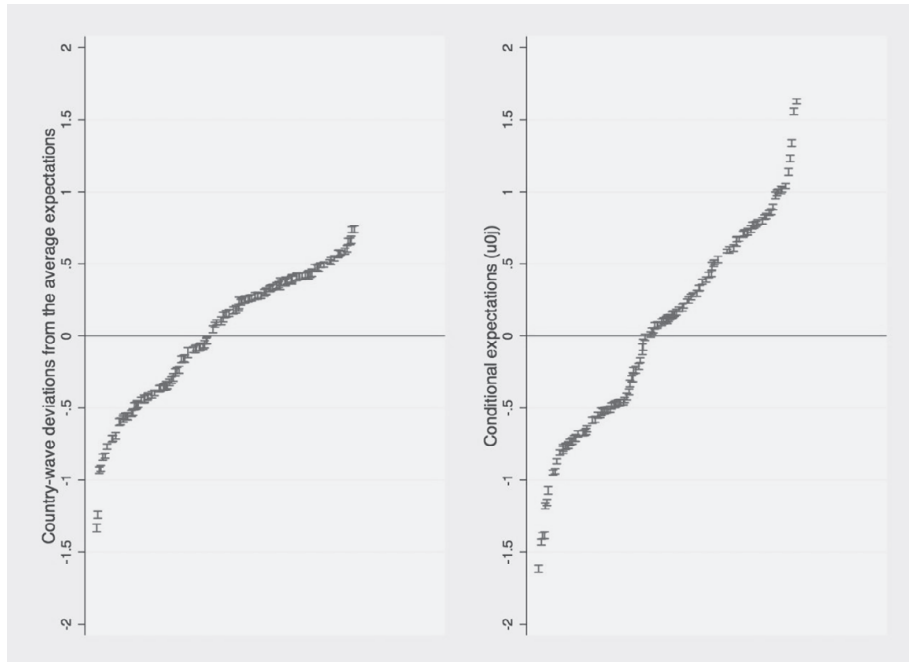
Figure 2. *Random corrections to the constant in the intercept-only model for unconditional expectations*



Calculated from estimates shown in Model 2-Table A.1.

The third model in Table A.1 shows conditional expectations. The intercept-only model is completed with the scores in mathematics as a predictor. This is our dependent variable of interest. Interestingly, the between country dispersion doubles to 0.2. The right graph in Figure 3 shows how the country effect shifts compared to the aggregate level dispersion provided by the intercept-only model for unconditional expectations.

Figure 3. *Distribution of country-wave random effects on the constant of empty models for expectations and conditional expectations*



Estimated from Models 2 and 3 in Table A.1. Markers include confidence intervals. Red lines ( $y=0$ ) mark the average constant as seen in models.

In other words, there is more room for country-level explanations in the way students formulate their expectations given their school performance than in the production of unconditional expectations. This 22% of the overall variation that lies at the between country-wave level is the focus of this paper in which we argue that the economic context shapes the type of incentives to invest in education that students have and impact his/her conditional expectations.

Given the huge international differences in performance and in other relevant characteristics of the educational systems, we shall present the results of our analysis for two separate groups of countries. We define rich countries as those with a GDP per capita above the level of \$15,000 (excluding the oil producers in the Arabian Peninsula). Developing countries are those below \$15,000 plus Saudi Arabia, Bahrain, Kuwait, Oman, Qatar and the United Arab Emirates. Table A.2 in the appendix presents the variance decomposition for these two subsamples. On average, the con-

ditional expectations are by far higher among students in developing countries. In addition, countries within the two clusters are more homogeneous now, the proportion of the variance that takes place at the country level is logically smaller compared to the full sample (12% for the rich and 9% for the developing countries).

### *Hypotheses testing*

Our hypotheses articulate a number of expectations about the existence of cross-country regularities as to how the conditional expectations adapt to the general economic circumstances that countries experience. We developed two set of hypotheses. H1 (a and b) relate to changes in the constant of the regression line in which parental background impacts the production of conditional expectations. Hypothesis 2 (a and b) and 3 relate to changes in the slope of parental background regardless of changes in the constant. We thus concentrate hereafter on fixed estimates from linear random intercept models since our main interest is not in the country-specific differences in the way predictors shape our dependent variable, but rather in processes that happen with certain regularity across countries.

Our first set of hypotheses states that changes in the economic context might impact the overall level of conditional expectations of students. We thus expect a significant change in the multilevel constant through changes in the rate of economic growth. In our models, economic growth is modeled using a dynamic measure of the country-year prosperity such as GDP growth expressed as the percentage increase from the previous year. This variable is not meaningful unless the overall wealth of countries is included in the models. We, thus, also control for GDP per capita (multiplied by 1000, for an easier interpretation of the coefficients).

Two individual level controls are also introduced in the model specification, sex (females adopt the value of 1) and the highest level of parental education (expressed as a continuous variable from the standard ISCED classification as explained earlier in the paper). From Table 1 we see that the impact of parental education seems to be stronger among rich countries than among the developing countries. The effect of sex is strikingly similar in both subsamples and turns out to be negatively associated with conditional expectations.

Table 1. *Random constant linear model. Conditional expectations.  
Hypothesis 1. Effect of GDP growth on conditional expectations*

		Rich countries	Developing countries
<b>Individual level</b>	Math scores	0.01*** (0.00)	0.01*** (0.00)
	Female	-0.27*** (0.01)	-0.28*** (0.00)
	Highest parental education	0.22*** (0.00)	0.16*** (0.00)

		Rich countries	Developing countries
<b>Country-wave level</b>	GDP per capita (x1000)	0.01* (0.01)	0.01*** (0.00)
	GDP growth	0.05** (0.02)	-0.02* (0.01)
<b>Constant</b>		0.52*** (0.20)	2.13*** (0.09)
N		183489	306073
N. cntry wave		68	81
Chi <sup>2</sup>		62461.86	70713.61
$\sigma^2(u_{0j})$		0.40	0.39
$\sigma^2(\epsilon_j)$		1.29	1.27

Legend: b(se)

\* p<.1; \*\* p<.05; \*\*\* p<.01

The models suggest that students in less developed countries are clearly more ambitious conditional on their prior performance than their counterparts in wealthier economies (note differences in the constant terms). Above and beyond this rough difference, the impact of a changing economic environment on conditional expectations is shown to be different for wealthier and developing countries. We thus have a mixed confirmation of our first set of hypotheses. For wealthier countries, H1a applies since the impact of economic growth on our dependent variable is positive. On the contrary, among developing countries, the impact of economic growth on the constant is negative, as suggested by our H1b expectation. Although the size of these effects is small, as expected when explaining cross-country differences, in both cases it is statistically significant.

Our second block of hypothesis refers to the impact of economic growth on social background inequality in conditional expectations. Our substantive interest here is, thus, not in how a shrinking economy impacts the constant of the equation modeling the configuration of conditional expectations, but more importantly, on the slope of social origin. We expect that GDP growth affects the way in which background variables produce inequality. Specifically, we use parental education to incorporate into our models the socioeconomic background of students. According to H2a, we expect an increasing level of inequality when the economy shrinks, while H2b suggests a decreasing gradient. Therefore, parental education is interacted with GDP growth in Table 2 to find out whether the slope of parental education is more or less steep as a function of the broader economic context. Two different models are presented for each subsample of countries. First, we introduce highest parental education as a continuous variable to be used as a reference model. In the models in the second column of each panel parental education is decomposed into seven dummies (being ISCED equal to 1 or lower the reference category) to account for its non-linearity, and then interacted with GDP growth.



Table 2. *Random constant linear model. Conditional expectations.  
Hypothesis 2. Slope of parental education\*GDP growth*

		Rich countries		Developing countries	
		M0	M1	M0	M1
<b>Individual level</b>	Math score	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
	Gender	-0.27*** (0.01)	-0.27*** (0.01)	-0.28*** (0.00)	-0.28*** (0.00)
	H-parental education	0.22*** (0.00)		0.16*** (0.00)	
<b>Country level</b>	GDP per capita (x1000)	0.01* (0.01)	0.01 (0.00)	0.01*** (0.00)	0.01*** (0.00)
	GDP growth	0.05** (0.02)	0.06** (0.02)	-0.02* (0.01)	-0.01 (0.01)
<b>Additive effects</b> (ISCED 1: reference)	h-ISCED 2		-0.09** (0.04)		0.12*** (0.02)
	h-ISCED 3		0.20*** (0.03)		0.31*** (0.02)
	h-ISCED 4		0.47*** (0.04)		0.52*** (0.02)
	h-ISCED 5b		0.69*** (0.04)		0.62*** (0.03)
	h-ISCED 5a		1.00*** (0.03)		0.79*** (0.02)
	h-ISCED 6		1.32*** (0.04)		1.00*** (0.02)
<b>Interactions</b> (ISCED 1: reference)	h-ISCED2*GDP growth		0.03*** (0.01)		-0.01*** (0.00)
	h-ISCED3*GDP growth		0.01 (0.01)		-0.02*** (0.00)
	h-ISCED4*GDP growth		-0.01 (0.01)		-0.02*** (0.00)
	h-ISCED5a*GDP growth		-0.03*** (0.01)		-0.02*** (0.00)
	h-ISCED5b*GDP growth		-0.05*** (0.01)		-0.02*** (0.00)
	h-ISCED6*GDP growth		-0.04*** (0.01)		-0.02*** (0.00)
<b>Constant</b>		0.52*** (0.20)	0.92*** (0.18)	2.13*** (0.09)	2.28*** (0.08)
N		183489	183489	306073	306073
N. cntry wave		63	63	81	81

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		Rich countries		Developing countries	
		M0	M1	M0	M1
Chi <sup>2</sup>		62461.86	63459.97	70713.61	71061.10
$\sigma^2(u_{0j})$		0.38	0.35	0.39	0.34
$\sigma^2(\varepsilon_i)$		1.13	1.13	1.28	1.28

Legend: b(se)

\* p<.1; \*\* p<.05; \*\*\* p<.01

Interestingly, both developing and wealthy countries behave similarly at this point, since inequality increases in both groups when the economy contracts. However, the increase in inequality in the configuration of conditional expectations when growth is slower is of a different size. The main (additive) effect of parental education is positive in both subsets of countries. However, the levels of parental education in which this process mostly concentrates differ for the two groups: whereas the impact of coming from a parental couple with less than secondary education is stronger among developing countries than among developed economies, having parents with post-compulsory education is more determinant among the latter group. This is probably due to the extent to which both groups of countries have advanced in the processes of educational expansion.

H2a is confirmed for all countries. In other words, as a consequence of a diminishing economic growth, inequality expands. However, note that, being the effect of parental education on conditional expectations positive, the change in the slope produced by a booming economy is more intense among developed countries. Here, the effects of higher levels of parental education also appear to be stronger among wealthy countries. The slope of parental educational levels 5a, 5b and 6 is more pronounced in periods of recession than during and economic expansion. There are no differences between the slopes of the lower levels of parental education as a function of the economic growth. Taken together, the results show that the periods of economic growth have an equalizing impact on the formulation of conditional expectations. Inequality is, thus, larger during recessions. A similar process happens in developing countries, although here the specific impact of the economic context on the effect of parental education is almost linear. For all the categories of the parental education variable, the reduction associated to a one-point increase of the GDP growth is -0.02 (38).

We finally test our last expectation, as formulated in H3. This hypothesis in fact seeks to provide a mechanism through which inequality increases in less successful economic settings. Our expectation is that this effect is partly due to a composition effect in the weight of the deprived population during periods of expansion and recession. Our factor of deprivation models how deprived the family is with respect to its country-wave context. Our expectation is that by considering the specific context of deprived families and their relative weight in the general population in each cluster, the above-identified expanding inequality during periods of

(38) As a robustness check, we replicated the models using migrant status as the main source of background disadvantage producing differentials in conditional expectations. Interestingly, the same pattern arises: in periods of economic expansion, the distribution of conditional expectations between migrants and natives is more equal than when facing economic hardship. Results are not shown but available upon request.

recession should be partially explained. Technically, the only change in these final models with respect to those presented in Table 2 is that the models in the second column of each panel includes our deprivation factor. For this hypothesis to hold, we expect to see a negative effect of deprivation together with a reduction in the size of the interaction terms when controlling for deprivation.

Table 3. *Random constant linear model. Conditional expectations.  
Hypothesis 3. Impact of deprivation on inequality*

		Rich countries		Developing countries	
		M1	M2	M1	M2
<b>Individual level</b>	Math score	0.01***	0.01***	0.01***	0.01***
	Gender	-0.26***	-0.26***	-0.30***	-0.30***
	Deprivation		-0.09***		-0.11***
<b>Country-wave level</b>	GDP per capita (x1000)	0.01*	0.01*	-0.00	-0.00
	GDP growth	0.09***	0.09***	0.03*	0.03**
<b>Main/additive effects</b>	h-ISCED 2	-0.02	-0.04	0.12***	0.10***
	h-ISCED 3	0.31***	0.27***	0.33***	0.28***
	h-ISCED 4	0.56***	0.52***	0.56***	0.51***
	h-ISCED 5a	0.78***	0.73***	0.70***	0.63***
	h-ISCED 5b	1.09***	1.04***	0.84***	0.76***
	h-ISCED 6	1.43***	1.37***	1.03***	0.94***
<b>Interactions</b>	h-ISCED 2*GDP growth	0.01	0.01	-0.01***	-0.01***
	h-ISCED 3*GDP growth	-0.02*	-0.02*	-0.02**	-0.03***
	h-ISCED 4*GDP growth	-0.03***	-0.03***	-0.04***	-0.04***
	h-ISCED 5a*GDP growth	-0.05***	-0.05***	-0.03***	-0.03***
	h-ISCED 5b*GDP growth	-0.08***	-0.08***	-0.03***	-0.04***
	h-ISCED 6*GDP growth	-0.07***	-0.07***	-0.03***	-0.03***
<b>Constant</b>		0.77***	0.82***	2.26***	2.38***
N		120238	120238	161275	161275
N. cntry wave		42	42	48	48
Chi <sup>2</sup>		40953.70	41515.50	38554.20	39589.56
$\sigma^2(u_{0j})$		0.32	0.30	0.31	0.31
$\sigma^2(\varepsilon_i)$		1.12	1.11	1.29	1.29

Legend: b(se)

\* p<.1; \*\* p<.05; \*\*\* p<.01

Although the effect of deprivation is negative, accounting for the degree of deprivation that families experience makes virtually no difference for social background gradients, neither in developing nor in wealthy countries (39). Note that the changing impact in the effect of parental education as a function of economic growth here compared to the estimates shown in Table 2 is due to a sizeable reduction in the analytic sample size.

## VII. CONCLUSIONS

When trying to address the impact of macro variables in shaping educational careers across countries, mainstream comparative research has mostly focused on the institutional design of the educational systems as the main explanatory factor. Our paper contributes to this literature by focusing on the role of the overall economic context in the formation of educational expectations among students in the final stages of their compulsory education.

Our analysis confirms that a country's growth trend has a twofold effect on the aspirations that students hold conditional on prior school results. To start with, growth has an impact on the average level of educational expectations, but this impact differs between developed and developing economies: a shrinking economy decreases the level of expectations that students hold in wealthier countries. Our interpretation of this finding suggests that the cost of education might represent a heavier burden for the average family when facing this negative changing context. Poorer quality of education consequent of lower public spending may play a role here as well. Meanwhile, among developing countries, the opposite effect happens. In other words, a contracting economy boosts the aspirations of students, probably reflecting the consequences of diminished labor demand. Although these effects are small in size, both appear to be robust.

Besides this general effect on the overall level of expectations, this study has shown that economic recession likely yields an impact on the amount of inequality of aspirations by social origin. In rich and developing countries alike, economic downturns lead to stronger social background effects on educational expectations. We explain this finding of accentuated social inequalities with a «privileged information effect» regarding the expected payoffs of educational credentials. While children from better social origins understand the increased importance of education in crisis times and prolong their educational careers accordingly, children from lower social origins fail to perceive that returns to education increase when labor markets are tight, offering little benefits to early school leavers. In this way, economic recession not only leads to greater social inequality in the short term; by exacerbating social background effects on children's educational attainment, it is also likely to entail enduring effects on social disparities and life chances in the long term.

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(39) This is only the case if the sample used for the estimation of models 1 in Table 3 is restricted. If the larger sample size is used instead, we see a noticeable reduction in the size of the interaction terms.

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## IX. APPENDIX

Sample size. Rich countries				
	2003	2007	2011	n
Australia	x	x	x	16,416
Belgium	x			4,970
Canada	x	x	x	35,992
Chile			x	5,835
Cyprus	x	x		8,401
Czech Rep.		x		4,845
Finland			x	4,266
Hong Kong	x	x	x	12,457
Hungary	x	x	x	12,591
Israel	x	x	x	12,311
Italy	x	x	x	12,665
Japan	x	x	x	13,582
Korea, Rep.	x	x	x	14,715
Lithuania		x	x	8,738
Malta		x		4,670
Netherlands	x			3,065
New Zealand	x		x	9,137
Norway	x	x	x	12,622
Singapore	x	x	x	16,544
Slovenia	x	x	x	12,036
Spain	x	x		4,810
Sweden	x	x	x	15,044
UK	x	x	x	18,283
United States	x	x	x	32,628
Sample size. Developing countries				
	2003	2007	2011	n
Algeria		x		5,447
Armenia	x	x	x	16,261
Bahrain	x	x	x	13,069
Bosnia & Herz.		x		4,220
Botswana	x	x	x	14,758
Bulgaria	x	x		8,136
Chile	x			6,377
Colombia		x		4,873
Egypt, Arab Rep.	x	x		13,677

## EDUCATIONAL DISADVANTAGE IN A CHANGING ECONOMIC CONTEXT

	2003	2007	2011	n
El Salvador		x		4,063
Estonia	x			4,040
Georgia		x	x	8,741
Ghana	x	x	x	17,717
Honduras			x	4,418
Indonesia	x	x	x	15,760
Iran, Islamic Rep.	x	x	x	14,952
Jordan	x	x	x	17,434
Kazakhstan			x	4,390
Kuwait		x		4,091
Latvia	x			3,630
Lebanon	x	x	x	11,574
Lithuania	x			4,964
Macedonia, FYR	x		x	7,955
Malaysia	x	x	x	15,513
Moldova	x	x		4,033
Mongolia		x		4,499
Morocco	x	x	x	14,989
Oman		x	x	14,294
Philippines	x	x		6,917
Qatar		x	x	11,606
Romania	x	x	x	13,825
Russian Federation	x	x	x	14,032
Saudi Arabia	x	x	x	12,882
Serbia	x			4,296
Slovak Republic	x			4,215
South Africa	x		v	20,921
Syrian Arab Republic	x	x	x	13,958
Thailand		x	x	11,536
Tunisia	x	x	x	19,070
Turkey		x	x	11,426
Ukraine		x	x	7,802
United Arab Emirates		x	x	21,657



Descriptives: rich countries

	Obs	Mean	Std.Dev.	Min	Max
Expectations	235022	4.5	1.4	1	6
Mathematics score	296623	518.0	85.9	65.9	851.0
Gender	296582	1.5	0.5	1	2
GDP per capita	296623	32115.1	8927.7	15250.7	53591.1
Highest par. education	212597	4.4	1.8	1	7
GDP growth	296623	3.0	2.0	-0.7	9.8
Deprivation	184899	-0.22	0.9	-1.7	2.8

Descriptives: developing countries

	Obs	Mean	Std.Dev.	Min	Max
Expectations	378751	4.7	1.5	1	6
Maths	470032	422.3	106.3	38.3	873.0
Gender	468859	1.5	0.5	1	2
GDP per capita	422936	13024.5	14332.01	1134.15	77987.1
Highest par. education	405593	3.7	2.0	1	7
GDP growth	422936	6.0	3.5	-1.8	18.8
Deprivation	255569	0.16	1.01	-1.7	2.8

Table A.1. *Test scores, expectations and conditional expectations. Intercept only models and variance decomposition*

	Mathematics	Expectations	Conditional expectations
Math score			0.01*** (0.00)
Constant	465.40*** (5.71)	4.61*** (0.04)	1.38*** (0.06)
N	766655	613773	613773
N. cntry wave	156	155	155
Chi <sup>2</sup>	–	–	113424.7***
$\sigma^2(u_{0j})$	71.32	0.20	0.47
$\sigma^2(\varepsilon_i)$	80.99	1.96	1.65
P	0.43	0.10	0.22

Legend: b(se) \* p<.1; \*\* p<.05; \*\*\* p<.01

Table A.2. *Linear random constant models. Conditional expectations for rich and developing countries*

	Rich countries	Developing countries
Math score	0.01*** (0.00)	0.01*** (0.00)
Constant	0.63*** (0.06)	1.83*** (0.05)
N	235022	378751
N. cntry wave	65	90
Chi <sup>2</sup>	48942.86	65697.23
$\sigma^2(u_{0j})$	0.45	0.42
$\sigma^2(\varepsilon_i)$	1.22	1.32
P	0.12	0.09

Legend: b(se) \* p<.1; \*\* p<.05; \*\*\* p<.01

Table A.3. *Average expectations among rich countries over time.*

	2003/3007	2011
Australia	4.17	3.83
Belgium	4.01	-
Canada	4.90	4.95
Chile	-	4.75
Cyprus	4.86	-
Czech Republic	3.68	-
Finland	-	3.26
Hong Kong	5.00	4.92
Hungary	4.58	4.03
Israel	4.935	5.05
Italy	4.16	4.04
Japan	3.89	3.90
Korea, Rep.	5.01	4.95
Lithuania	4.53	4.21
Malta	4.17	-
Netherlands	4.03	-
New Zealand	4.26	3.93
Norway	4.75	4.44
Singapore	4.66	5.07
Slovenia	4.25	4.15
Spain	4.49	-
Sweden	4.16	4.06
United Kingdom	4.17	4.11
United States	4.99	5.18