

Local labour market and parental perceived returns to schooling: Evidence from panel data*

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Abstract

This paper investigates the role of local unemployment and local returns to schooling on parental expected returns to schooling, which have been shown in the literature to be important determinants of future schooling decisions. We make use of unique longitudinal data, collecting information about expected returns to secondary schooling among poor households in the Republic of Macedonia for the periods 2010, 2012 and 2013. We match this information with monthly-level administrative data about unemployment at the local level and with local returns to schooling among poor households. We provide evidence that variations in the local labour market affect significantly the way parents update their expectations, with both increases in unemployment and in local returns to schooling translating into increased expected returns. We show that when observing schooling decisions two and three years after the collection of information about expected returns, parental subjective expectations are strong predictors for the probability of the child to be enrolled in secondary school.

JEL codes: D13, J12, J16, D8, I2, J16, O15

Keywords: subjective expectations; returns to schooling; cognitive biases.

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1 Introduction

Parental investment in their children's human capital determines many of their later-life outcomes, such as health, earnings and marriage. While taking such decision, parents face high uncertainty about their children's future income possibilities and form subjective expectations about the returns to their investment in human capital. Parents make such investment considering expected returns rather than actual returns to schooling (Manski, 2004). For example, a parent holding low expectations on the returns to education is less likely to invest in it. This is particularly relevant in developing countries, where the measured returns to education are high, but low expected returns to education drive low investment in human capital (Jensen, 2010; Attanasio and Kaufmann, 2014).

Realized earnings data have been used to proxy expected returns to education. This approach relies on the assumption that parents can predict future shocks and react to them in an obvious way. Dominitz and Manski (1996) open a new strand of literature when they measure subjective expectations directly through survey questions. After this study, survey instruments to elicit subjective expectations are increasingly included in questionnaires.¹ Many studies use these data to explain the schooling decision. For example, Jensen (2010) and Attanasio and Kaufmann (2014) use these data to predict the school enrolment decision, respectively in the Dominican Republic and Mexico. Arcidiacono et al. (2012) and Stinebrickner and Stinebrickner (2014) use similar data to predict college major decision and Giustinelli (2016) to predict the high school track. The literature has also attempted to measure non-pecuniary factors to study the trade-off in the schooling decision between expected earnings and the marriage market (Attanasio and Kaufmann, 2017) and between expected earnings and non-pecuniary factors, such as parental approval and expected job satisfaction, in the schooling decision (Delavande and Zafar, 2018; Boneva and Rauh, 2018).

While the literature focused mainly on linking subjective expectations to choices, evidence on the mechanism driving belief formation is still scarce. The above studies explain an observed choice, based on the expectations held in that moment, using cross-sectional data. Predicting an observed choice based on the expectations held in that moment may be problematic if we wish to extrapolate from the observed behaviour. To be able to extrapolate, we must be willing to assume that changes in the environment and information set do not affect the measured expectations. Such assumption can be difficult to justify because subjective expectations are likely to evolve over time as parents acquire new information. The lack of longitudinal datasets is an important reason why expectation formation and updating are still unexplored.²

Our study exploits a unique longitudinal dataset on parental subjective expectations about returns to secondary school education and local labor market information to study how parents update expectations about returns to secondary schooling and how this in turn affects the investment in their children's education. Data were collected in the Republic of Macedonia along with the evaluation of a Conditional Cash Transfer (CCT) program. The longitudinal dataset allows us to

¹For a survey about subjective expectations related to education, refer to Giustinelli and Manski (2018).

²There is some work done by economists and psychologists on how people update objective probabilities in the lab. However, it is difficult to extrapolate some principles from this work on how expectations form in the real life.

study how the subjective expectations change over time in response to changes in the environment.

We provide evidence that parents exhibit large heterogeneity in the way they update expectations with changes in the local labour market and relate this heterogeneity to observable characteristics. For example, we explore whether learning about future income is happening locally, by observing other individuals belonging to the same socio-economic or ethnic group. Parents from different socio-economic groups can form beliefs differently because they have a different ability to understand the local labour market, but also a differential experience and limited information in specific branches of the labour market. On the other hand, parents belonging to the same ethnic group might learn only about returns in specific activities and update expectations differently from another ethnic group. Understanding this heterogeneity can provide useful insights to design effective information campaigns and predict their impact.

[Jehiel \(2018\)](#) has showed that investors can be over-optimistic when making an investment decision because they benchmark their current projects only against past-implemented projects. Intuitively, investors look at past implemented projects to decide whether to invest in a new one. The sample of implemented projects is a selected sample, which contains a high proportion of successful projects since unsuccessful projects are usually not implemented. This problem is even more pronounced if an investor is living among other rational investors because the sample of past implemented projects that the investor observes is even more selected (i.e. the rational investors invest only if the project is deemed successful).

A similar intuition applies to how parents form expectations and invest in their children education. While forming expectations, parents are influenced by external information as a usual investor, but also by how other parents around them are updating expectations. For example, parents who attended secondary school are more likely to know other parents who also attended secondary school. These parents see a selected sample of people when they are updating expectations and are more likely to update the expectations in a similar way.

To our knowledge, no studies investigate how individuals update expectations to changes in the local environment in the real world. Our study can be related to a small literature exploring a similar problem, i.e. how individuals update expectations when they are exposed to the true distribution of information. For example, in India, [Sequeira et al. \(2016\)](#) study how being exposed to successful students and being recognized for educational achievements affect expectations about earnings. They show that parents revise their beliefs, while students do not. [Wiswall and Zafar \(2014\)](#) study what drives the choice of a college major by providing information about the true earnings associated with each major. Students update their expectations after receiving this information. [Dizon-Ross \(2019\)](#) conducts a field experiment where parents are provided with the true information and revise their expectations and adjust their investment in their children's human capital.

Some studies also explore how subjective expectations are updated in different contexts when individuals receive new information. For example, [Dominitz \(1998\)](#) collects data on subjective expectations on earnings each 6 months and explores how these expectations evolve over time when individuals experience realized earnings. [Dominitz and Manski \(2011\)](#) study how expecta-

tions about mutual-fund investment respond to realized shock in the stock market. [Armantier et al. \(2016\)](#) investigate how expectations about inflation change when people receive new information about prices in an randomized control trial.³

Section 2 presents the data used in the paper and section 3 describes the empirical strategy. Section 4 shows the main results and presents the robustness checks. The paper concludes with a brief discussion.

2 Data

2.1 Parental expectations about returns to schooling

The data used in the paper come from different sources. The main datasets are the Macedonian Household Surveys collected by the Ministry of Labour and Social Protection (MLSP), which contain detailed information on a variety of household information (demographics, expenditures, durable goods, housing characteristics) and individual level information on household members (education, health, labour supply). For children enrolled in secondary school, the Household Survey is supplemented with administrative data about attendance and performance at school.⁴ Additionally, we make use of different aggregated data at municipality level, supplied by Macedonian State Statistical Office, to construct measures of sex ratios, local labour market characteristics and other marriage market indicators.

Three waves of the Household Survey were collected for the scope of a conditional cash transfer program evaluation: one baseline in 2010 and two follow-up surveys in 2012 and 2013.⁵ At baseline, a sample of eligible households was produced using the Ministry of Labour and Social Policy's electronic database of the recipients of all types of social financial assistance (SFA).⁶ The use of the electronic database for sampling allowed identifying 12481 SFA households with at least one child of secondary school age, from which we drew a random sample. The same sample was interviewed in the follow-up surveys during the Fall of 2012 and 2013.⁷ We restrict the sample to children in all Social Financial Assistance households born from 1993 to 1998, for which data about subjective expectations are available at baseline.⁸

³Other studies that attempt to study expectations updating are [Delavande \(2008\)](#), [Dominitz and Hung \(2009\)](#), [Stinebrickner and Stinebrickner \(2014\)](#).

⁴Administrative data on student attendance and performance were collected by visiting secondary schools and collecting school records. This allowed double-checking the validity of self-reported information on school enrolment.

⁵Further details on the conditional cash transfer program and the evaluation can be found in [Armand and Carneiro \(2016\)](#).

⁶The electronic database has been assembled during Summer 2010 along with the implementation of the program. The population frame has been produced using the hardcopy archives at Social Welfare Centres (SWCs), which are the main territorial units for social welfare provision. There are 27 inter-municipal SWCs and they function as the key public providers of professional services in social work.

⁷Education is compulsory between the ages of six to 19 for general secondary education. Primary education is compulsory and comprises all children in the age cohort 6 to 15 years. The secondary education is compulsory and comprises all children in the age cohort 15 to 19 years for the general secondary education.

⁸In order to minimise attrition, we made use of the detailed tracking information collected at baseline. We collected and updated contact information of at least two relatives or neighbours of the surveyed households, including addresses and telephone numbers. This allowed us minimising the risk of not finding the household in case they moved to another

Table 1: Descriptive statistics on child and parent characteristics

PANEL A. CHILD-LEVEL CHARACTERISTICS							
	All students		Boys (B)		Girls (G)		B-G p-value (7)
	Mean (1)	St.Dev. (2)	Mean (3)	St.Dev. (4)	Mean (5)	St.Dev. (6)	
Child and household demographics							
Age	14.84	2.14	14.87	2.08	14.81	2.21	0.57
Years of schooling	8.19	2.32	8.25	2.26	8.12	2.38	0.27
Missed classes (total)	63.06	63.24	70.76	66.78	55.18	58.48	0.00
Missed classes (justified)	50.40	51.06	53.64	50.38	47.13	51.62	0.15
Missed classes (not justified)	11.32	19.34	14.54	23.14	8.05	13.82	0.00
Macedonian	0.41	0.49	0.39	0.49	0.42	0.49	0.21
Albanian	0.31	0.46	0.32	0.47	0.31	0.46	0.62
Roma	0.12	0.32	0.12	0.33	0.11	0.32	0.62
Turk	0.16	0.37	0.16	0.37	0.15	0.36	0.55
Other ethnicity	0.05	0.22	0.06	0.23	0.05	0.21	0.45
Household size	4.69	1.21	4.64	1.17	4.76	1.24	0.04
Male household head	0.79	0.41	0.79	0.41	0.79	0.41	0.96
Parental expectations							
Return to secondary schooling	0.52	0.33	0.53	0.34	0.52	0.33	0.55
Expected income (prim.)	8.54	0.44	8.57	0.44	8.51	0.44	0.00
Expected income (sec.)	9.07	0.35	9.10	0.34	9.03	0.35	0.00
Var. income (prim.)	0.02	0.03	0.02	0.03	0.02	0.03	0.90
Var. income (sec.)	0.01	0.02	0.01	0.02	0.01	0.02	0.69
Prob. of employment (prim.)	0.21	0.19	0.22	0.19	0.20	0.19	0.01
Prob. of employment (sec.)	0.49	0.20	0.49	0.20	0.48	0.20	0.18
Local returns to secondary schooling							
Local Return (0-10km)	0.21	0.27	0.21	0.27	0.21	0.28	0.56
Local Return (0-50km)	0.18	0.07	0.18	0.07	0.18	0.07	0.51
Municipality characteristics							
Unemployment	17.42	1.56	17.40	1.51	17.44	1.61	0.61
Living in rural municipality	0.47	0.50	0.48	0.50	0.45	0.50	0.31
Living in urban settlement	0.36	0.48	0.35	0.48	0.37	0.48	0.48
Part of City of Skopje	0.14	0.34	0.13	0.34	0.14	0.34	0.85
PANEL B. PARENT-LEVEL CHARACTERISTICS							
	All parents		Boys (B)		Girls (G)		B-G p-value (7)
	Mean (1)	St.Dev. (2)	Mean (3)	St.Dev. (4)	Mean (5)	St.Dev. (6)	
Parents descriptive statistics							
Expected household income next month	8.98	0.83	8.99	0.81	8.93	0.87	0.28
- lower bound	8.31	0.88	8.32	0.87	8.27	0.91	0.38
- upper bound	9.36	0.83	9.37	0.82	9.32	0.88	0.37

Note. Means are reported in columns 1, 3 and 5, standard deviations are reported in columns 2, 4 and 6. Parental expectations are described in section 2.1 and appendix A. Local returns to schooling and unemployment are described in section 2.2. Column 7 presents the p-value of a t tests on the equality of means between boys and girls assuming unequal variances.

A specific section of the Household Survey was designed to collect parental expectations about returns to secondary schooling, using the methodology proposed by Guiso et al. (2002). The questionnaire asked parents information over the expected income conditional on completion of primary or secondary school (and conditional on being employed at age 25). The information was collected for the youngest male and female adolescent children in the household (if available) in the age range 10-17 years old (at baseline). The interviewer referred to each child in the question using the first name of the child. Appendix A presents the specific set of questions asked to the respondent.

This method has already been implemented in different surveys in developing countries (Attanasio et al., 2005; Attanasio and Kaufmann, 2014). For each scenario, we observe the lower (y^L) and the upper (y^U) bounds of the distribution of expected income and the reported mass probability between y^L and the midpoint $(y^L + y^U)/2$. Assuming the distribution of expected income follows a triangular distribution, we can construct the distribution of the expected income and calculate its first moments. Results are robust to considering instead a step-wise uniform distribution or a bi-triangular distribution.

Table 1 presents the descriptive statistics about parental expectations. Expected returns to secondary schooling are 52 percent for girls and for boys. In appendix E, we document that perceived returns are realistic by comparing expected income with average market wages and the minimum wage. For both boys and girls, the average sample expected income is lower than the national average for the age group 25-34 and has the same magnitude as the minimum wage. The interviewed parents are poor and expect their children to be at the bottom of the distribution as well. In terms of probability of employment, parents expect their children to be employed with a higher probability if they complete secondary school (49 percent probability of being employed) than if they only complete primary school (21 percent). On average, children miss 60 days of classes out of 180.

To understand whether expectations are correlated with future behaviour, we estimate probit regressions for attending secondary school in 2012 and 2013 on parental expectations in 2010. In all specifications, the dependent variable is an indicator variable that is equal to 1 if the child is enrolled or has completed any secondary school at the beginning of the school year 2012/2013 and is equal to 0 otherwise. Controls include gender and age of the child, education, gender and age of the household head, ethnicity, religion, household size and number of children, household asset group and distance from the closest school⁹ and indicator dummies for households living in rural areas and in the capital city Skopje. Year and semester of birth dummies and Regional dummies are included.

address or are not present at home during the attempt to interview them and to limit attrition to non-response due to refusal. This methodology proved to have worked acceptably well during the follow-up data collection. In terms of SFA recipients, 1205 households were interviewed at baseline and, among those, 126 households were not found or refused to answer at 2012 follow-up, resulting in an attrition rate of 11.7 percent.

⁹In order to construct a measure of distance from the household dwelling to the secondary school, we make use of geographic coordinates collected for each household and for each secondary school in the country. I compute road distance and time required to reach the school by car for each school in the country, in order to identify the closest secondary school.

Table 2 shows that expectations matter for enrolment. The coefficients on returns to secondary school are significantly positive only for the component of expected income conditional on the completion of secondary school. Doubling the expected income conditional on completion of secondary school lead to an increase of 20.7 percent in the probability of being enrolled in secondary school. When we control for measures associated to the variance of expected income, we do not find any significant effect, while the coefficients associated with expected income are robust. Additionally, controlling for the probability of being employed at the age of 25 after completing primary or secondary school shows that part of the effect of higher expected income conditional on completion of secondary school is captured by a higher probability to be employed when completing secondary school. The coefficients are robust when controlling for individual and municipality characteristics. These results are consistent with the literature providing evidence that perceived returns are important to explain how individuals take educational choices (Jensen, 2010; Attanasio and Kaufmann, 2014).¹⁰

Table 2: Enrolment regression and parental expectations of returns to secondary schooling

	Dep.var.: Enrolled or completed secondary school					
	Probit (1)	Probit (2)	Probit (3)	Probit (4)	Probit (5)	Probit (6)
Expected income (prim.)	-0.066 (0.048)	-0.070 (0.047)	-0.073 (0.055)	-0.077 (0.053)	-0.027 (0.058)	-0.043 (0.057)
Expected income (sec.)	0.243*** (0.071)	0.202*** (0.066)	0.247*** (0.073)	0.207*** (0.067)	0.190** (0.076)	0.163** (0.075)
Var. income (prim.)			-0.211 (0.536)	-0.185 (0.520)	-0.178 (0.533)	-0.225 (0.532)
Var. income (sec.)			0.218 (0.690)	0.279 (0.695)	0.308 (0.695)	0.458 (0.690)
Prob. of employment (prim.)					-0.225* (0.137)	-0.174 (0.110)
Prob. of employment (sec.)					0.269** (0.107)	0.220** (0.108)
Observations	1022	1022	1022	1022	1022	1022
Regional and birthyear dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Note. Marginal effects. Standard errors clustered at municipality level in parenthesis. *** denotes significance at 1%, ** at 5%, and * at 10%. The dependent variable is an indicator variable that is equal to 1 if the child is enrolled or has completed any secondary school at the beginning of the school year 2012/2013 and is equal to 0 otherwise. Returns to schooling and expected incomes are computed assuming a triangular distribution and using log-income. Where indicated, we include controls for gender and age of the child, education, gender and age of the household head, ethnicity, religion, household size, number of children, rural and Skopje dummies, household asset group and distance from the closest school. Year and semester of birth dummies and Regional dummies are included.

We also provide evidence that expectations matter for school attendance. Table 3 presents estimates of the impact of parental expectations on the number of missed days at secondary school. In columns 1,2 and 3, we do OLS regressions, while in columns 3,4, and 5 we introduce individual

¹⁰Parental expectations are not only correlated with schooling decision, but with decisions that are closely related to education, such as early marriages. In appendix, Figure E9 presents a local polynomial smooth for the probability of being married in 2012 or 2013 using parental expectations about the returns to schooling at 2010. Note that at baseline none of these girls are married. We observe a clear negative relationship between subjective returns and the share of girls married two or three years after expectations are measured.

fixed effects and we differentiate them out. An increase in the expected income conditional on primary school has a positive effect on the number of missed days at secondary school. ¹¹

Table 3: Perceived returns to secondary school on attendance

Dependent variable	Number of missed days at school					
	(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FE
Expected income (prim.)	6.393 (4.817)	9.753** (4.842)	11.530** (4.861)	12.950*** (4.890)	14.648*** (4.898)	14.738*** (5.090)
Expected income (sec.)	-4.343 (6.193)	-5.653 (6.213)	-4.809 (6.176)	-8.748 (6.274)	-8.375 (6.154)	-9.141 (6.425)
Var. income (prim.)		153.102** (77.335)	161.766** (77.196)		70.516 (66.871)	69.164 (67.126)
Var. income (sec.)		44.067 (89.708)	58.586 (90.187)		86.487 (100.923)	83.309 (101.066)
Prob. of employment (prim.)			-12.785* (6.574)			1.273 (6.548)
Prob. of employment (sec.)			-5.181 (6.598)			2.197 (6.978)
Observations	1795	1795	1792	1795	1795	1792
R^2	0.055	0.060	0.063	0.088	0.093	0.093
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for the effect of parental expected returns to secondary school rate on the number of missed days at school. The dependent variable is the number of missed days at school (administrative data). The sample includes the students enrolled in secondary school up to the age of 19 in the last follow-up. First and second moments on the distribution of expected income are estimated assuming a triangular distribution.

¹¹The choice of whether not to enrol in secondary school is a one-time choice. The students, not enrolled in 2012, do not usually go back to school in 2013. Out of the students that are not enrolled in school in 2012 only 10 students re-enroll in 2013 (this is around 0.3 per cent of the entire sample of students). The enrolment choice can be seen as the extensive margin of the investment in education. On the other hand, we can interpret the intensive margin of such decision as the number of days of school that the student misses once enrolled in secondary school.

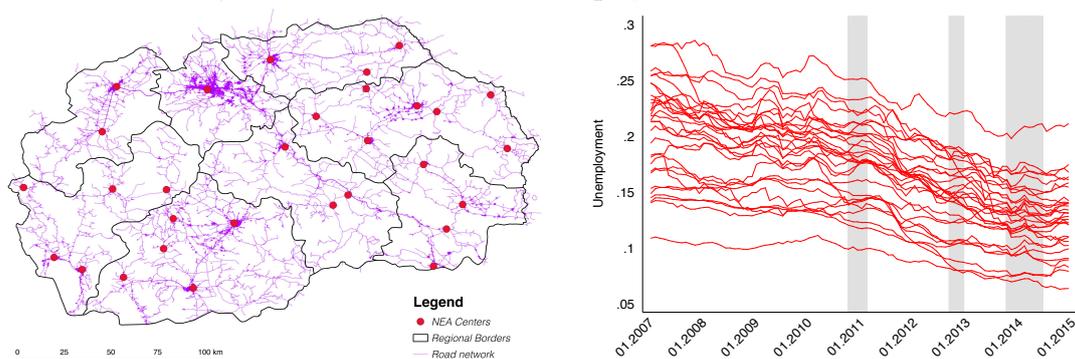
2.2 Local labour market conditions

We supplement the household survey and the data about parental perceived returns to schooling with measures characterizing the local labour market.

First, we build a measure of local unemployment. Following the definition of the International Labour Organization, unemployment rate is measured as the share of unemployed over the total active population.¹² Standard measures of unemployment are generally measured at national or subnational level, but are rarely provided at higher disaggregated level because the overall active population is generally collected using labour force surveys. These surveys are generally designed to build statistics at regional or national level and therefore not available at municipality level. To overcome this limitation, we build local unemployment by using administrative data at the highest level of disaggregation.

We use information about the number of registered unemployed people for each of the 29 offices of the [National Employment Agency \(NEA\)](#) of the Republic of Macedonia. Unemployed people need to register in these offices to gain the unemployed status. Figure 1 shows the geographical distribution of NEA centers. The data were obtained from each NEA center and digitized into a time series of unemployed for each center (see figure A1 for an example of the source data). However, data about active population are not available at this level. We proxy for them using working-age population data from the census at the level of the municipality. We then build National Employment Center population by summing the population in the municipalities of competence for each NEA center. Our measure, which is interpreted as the unemployed share of population, is therefore under-estimating real unemployment since it assumes that the active population is equal to the working-age population.

Figure 1: NEA's centers and unemployment rates, 2009-2014



Note. The left panel shows the geographical distribution of NEA centers, presented as red dots. The figure presents in addition the regional administrative division and the road network. The right panel presents monthly data of unemployment rates, defined as the number of people registered at unemployment centers divided by the population in the area of competence. Vertical lines highlight the periods of data collection. Source: Author's calculation using Macedonian National Employment Center unemployment data and the Macedonian State Statistical Office population data (see section 2.2).

In the appendix, we provide some empirical evidence to sustain our measure. Namely, the

¹²An individual is considered unemployed when did not work during a reporting week, has searched actively for a job or has taken concrete activities to find a job, and was prepared to accept work in the next two weeks that followed the reporting week.

right panel in figure B2 provides a comparison between the official figure for unemployment provided by The World Bank (2012) and the measure of unemployment computed using the NEA administrative data about unemployed and the Macedonian State Statistical Office population data (see section 2.2). While the two measures differ in levels, they behave almost identically over time, with a temporal correlation equal to 0.95.

In order to link individuals to unemployment, we use geo-coded coordinates of the household dwelling and of NEA centers to build road and line distances. For each household, we then construct local unemployment as the average of each centres unemployment weighted by the inverse of the distance at the time of the interview. This corresponds to imputing unemployment across Macedonia using inverse distance interpolation. Figure 2 presents the geographical distribution of unemployment resulting from this procedure at four points in time.

Second, we build a measure of returns to schooling in the neighbourhood of each household. Wages are not directly observed at such disaggregated level, nor this statistic is provided annually by the State Statistical Office. In order to build local returns to schooling, we therefore make use of the household survey. Specifically, we first identify two levels of schooling: individuals with primary school or no education at all, and individuals with secondary school or higher education. We then build returns to schooling by averaging household expenditure in households where the household head has a primary education or no education at all and in household where the household head has a secondary or higher education. For each household, we select only observations from the households living within 40km from the household's dwelling. Figure 3 presents the distribution of individual-level local returns to secondary schooling, comparing the raw mean and estimated mean of the local returns to secondary schooling using a regression with control variables.

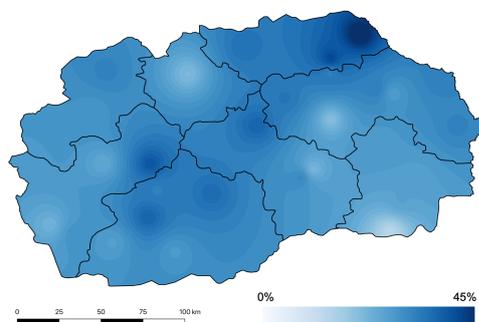
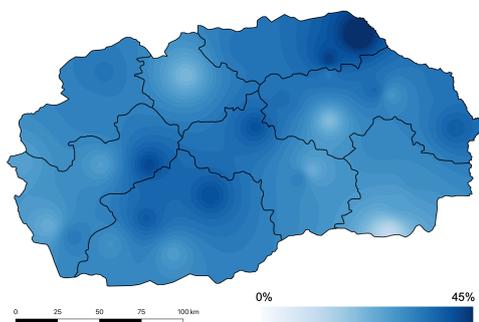
Both variables have direct impact on the probability of the child to be enrolled in school and on the household welfare. Table 4 presents estimates of OLS regression in which the dependent variables are indicator variables equal to 1 if the child is currently enrolled (columns 1-2), if the child was enrolled in the previous year (columns 3-4) and on food expenditure (column 5-6). While unemployment negatively affect all variables, returns to schooling are closely related to schooling outcomes only. In terms of distance, unemployment is affecting this variables especially when measured at the very local level (within 50km from the household).

Table 5 presents estimates of FE regression in which the dependent is the number of missed days at secondary schooling on perceived returns and local labour market. This tables shows that besides a potential *direct* impact of unemployment on attendance, there is an *indirect* impact of changes in expectations which contribute significantly to the reduction in attendance in secondary schooling. The reduced form effects of unemployment on attendance capture the sum of such *indirect* and *direct* effects. A key empirical challenge is to disentangle these two. Unemployment has a *direct* effect on attendance because the higher unemployment is, the less likely the kid is to find a job and hence is more likely to go to school. Unemployment has also an *indirect* effect on attendance through expectation. We investigate this *indirect* mechanism by showing how expectations change in response to unemployment.

Figure 2: Geographical distribution of unemployment rates

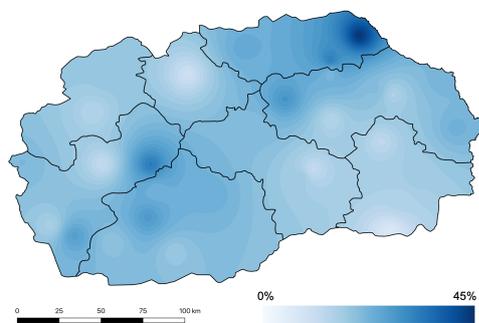
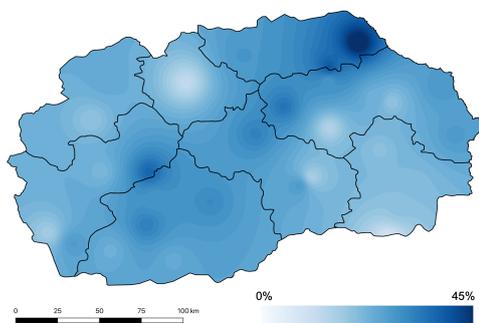
November 2010

November 2011



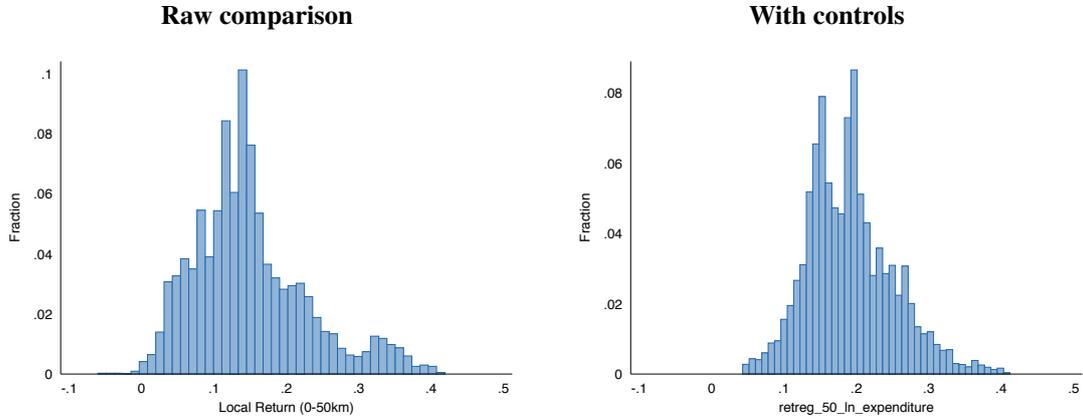
October 2012

May 2014



Note. The figure presents the geographical distribution of unemployment. The figures are computed using inverse distance weighting to interpolate unemployment rates among NEA centers. We use all observations to interpolate the data.

Figure 3: Returns to secondary schooling



Note. The figures show the distribution of local return to schooling for the period 2010-2013. In the left panel, returns are computed as raw comparison, while in the right panel, returns are computed using OLS regressions. We fix the distance limit for selecting observations at 50 kilometres.

Table 4: Labour market characteristics, schooling and household welfare

Dependent variable	Currently enrolled in school		Enrolled in school the previous year		Food Expenditure	
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
Unemployment	-0.066*** (0.023)		-0.007 (0.017)		-0.110*** (0.029)	
Unemployment (0-50km)		-0.042*** (0.016)		-0.003 (0.012)		-0.059*** (0.021)
Unemployment (50-100km)		-0.020 (0.024)		0.000 (0.017)		0.109*** (0.041)
Unemployment (>100km)		-0.027 (0.025)		0.014 (0.018)		-0.016 (0.032)
Return to Schooling	0.031* (0.018)	0.031* (0.018)	0.027** (0.013)	0.027** (0.014)	-0.065*** (0.024)	-0.070*** (0.024)
Observations	3198	3187	3198	3187	3642	3632
R^2	0.273	0.273	0.129	0.129	0.116	0.121
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1), expected income and variance conditional on completion of primary school only (columns 2 and 4), expected income and variance conditional on completion of secondary school (columns 3 and 5). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table 5: Perceived returns to secondary school on secondary school attendance

Dependent variable	Number of missed days at secondary school					
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	FE
Expected income (prim.)	12.950*** (4.890)			12.363** (4.987)	14.053*** (4.921)	14.627*** (5.143)
Expected income (sec.)	-8.748 (6.274)			-10.286 (6.492)	-10.176 (6.431)	-12.093* (6.751)
Expected household income next month		5.130** (2.318)		4.348* (2.340)	4.054* (2.251)	4.372* (2.298)
Unemployment			-9.082** (3.574)	-8.437** (3.598)	-8.116** (3.646)	-8.162** (3.677)
Return to Schooling			0.246 (2.714)	0.072 (2.770)	0.294 (2.747)	0.561 (2.743)
Var. income (prim.)					67.207 (65.568)	68.011 (65.455)
Var. income (sec.)					42.360 (100.289)	36.036 (100.100)
Prob. of employment (prim.)						-0.940 (7.167)
Prob. of employment (sec.)						5.725 (7.415)
Observations	1795	1748	1795	1748	1748	1745
R ²	0.088	0.083	0.088	0.100	0.102	0.103
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for the effect of parental expected returns to secondary school rate on the number of missed days at school. The dependent variable is the number of missed days at school (administrative data). The sample includes the students enrolled in secondary school up to the age of 19 in the last follow-up. First and second moments on the distribution of expected income are estimated assuming a triangular distribution.

2.3 Additional controls

We supplement our main dataset with an yearly municipality-level wage based on country-level sectoral wages, provided by the State Statistical Office, and the share of the municipality economy attributed to each sector. This measure is built using the National Firm Registry, which provides the population of firms operating in a specific year, their location of activity and their sector. We build the wage index by averaging sector-specific country-level wages weighted by the share of each sector in a municipality.

We also supplement the dataset with municipality-level variation in prices using a Stone price index for food. The index is built using municipality level information about unit values and expenditure shares obtained from the household survey. See [Armand et al. \(2016\)](#) for a detailed discussion on how expenditure and price data is collected and built.

Since half of our sample lives in rural municipality and information about local labour markets is limited, we also build controls for weather shocks that could affect agriculture and therefore income and employment in more rural municipalities. To this purpose, we use satellite imaging to build daily average precipitations in each municipality. To obtain information about daily precipitations at the highest possible resolution, we use the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) database. CHIRPS provides 0.05x0.05 latitude/longitude degrees resolution satellite imagery supplemented with in-site monitoring station data ([Funk et al., 2015](#)). For precipitations, we first obtain the information at the grid cell level for all Macedonia and we then average cells at the municipality level. This allows observing for each day of the year the precipitations in a specific municipality.

3 Empirical strategy

We are interested in measuring how contemporaneous variations in local labour market affect expected returns to schooling. We therefore estimate the effect of local labour market shocks on expectations for child i of parent j at time t living in the macro-region r using the following model:

$$y_{ijrt} = \beta U_{jrt} + \gamma R_{jrt} + \mathbf{X}'_{ijrt} \delta + \tau_t M_r + \mu_t + \alpha_i + \epsilon_{ijrt} \quad (1)$$

where U_{jrt} is local unemployment, and R_{jrt} is the local return to secondary schooling. \mathbf{X}'_{it} is a matrix of time-varying individual and municipality characteristics, including population living in the municipality, average net wage in the municipality, precipitations on the day and on the year of interview. We include macro-region-specific time fixed effects by introducing interaction terms between the year fixed effects, τ_t , and macro-region indicators, M_r . Since the implementation of each household survey round lasted for more than one month, we also observe within-year variation, for which we control using months fixed effects, μ_t . The advantage of using panel data is the possibility to control for individual fixed effect, α_i , which captures time-invariant unobservable characteristics of children, such as ability. This also eliminates the possibility that individuals living in a specific municipality might be affected by different market conditions at time t due to

the peculiarity of their residence. Finally, ϵ_{it} are idiosyncratic error terms.

We need to take into account that data can be spatially and temporally correlated with our unit of observation. When estimating equation (1), we are therefore concerned not only about serial correlation of perceived returns to schooling, but also about spatial correlation between adjacent households. To correct for this, we estimate standard errors using [Conley \(1999, 2008\)](#) correction. We allow for correlation to be over the full time window of the dataset and we allow for spatial correlation across households within 50 kilometres. Our results are robust to using alternative cut-offs.

Our parameters of interest are β and γ , which capture the effect of changes in local unemployment and local returns to schooling on subjective expectations, once we control for the available observable characteristics and for individual-specific unobservable characteristics.

4 Results

4.1 Unemployment and returns to schooling

We begin by looking at the effect of the characteristics of the local labour market on parental perceived returns to secondary school and on expected incomes conditional on completing primary or secondary school. [Table 6](#) presents estimates of equation (1) using these outcomes. In columns 1-3, we focus on the whole sample, while in columns 4-6 and 7-9 we focus on boys and girls respectively.

Increases in unemployment affect positively the expected return to secondary school. A 1 percentage point increase in unemployment translates into a 4.3 percentage points increase in expected returns. This effect is similar across boys and girls. Both expected incomes conditional on primary and secondary education decrease when unemployment increase. The increase in expected returns to secondary schooling can therefore be explained by a larger drop in expected income conditional on primary education. A 1 percentage point increase in unemployment reduces expected income conditional on primary by 8.8 percentage points, while expected income conditional on secondary drops by 4.5 percentage points. The drop in both expected incomes tend to be larger for boys as compared to girls.

A rise in local returns to schooling also increases expected returns to secondary education. A 7 percentage points increase in returns to schooling translates into an increase in expected return by 5.3 percentage points. This effect derives from an increase in the expected income conditional on secondary and a decrease in the expected income conditional on primary schooling. Again, this is comparable across boys and girls.

Table 6: Local labour market characteristics and the subjective expectations of returns to schooling

Dependent variable	Full sample			Boys			Girls		
	Expected return (1)	Expected income Primary FE (2)	Expected income Secondary FE (3)	Expected return (4)	Expected income Primary FE (5)	Expected income Secondary FE (6)	Expected return (7)	Expected income Primary FE (8)	Expected income Secondary FE (9)
Unemployment	0.043*** (0.015)	-0.088*** (0.020)	-0.045*** (0.016)	0.045** (0.020)	-0.102*** (0.027)	-0.057*** (0.021)	0.042** (0.021)	-0.079*** (0.028)	-0.037 (0.024)
Return to Schooling	0.053*** (0.013)	-0.031* (0.016)	0.022* (0.013)	0.056*** (0.018)	-0.029 (0.023)	0.027 (0.018)	0.051*** (0.017)	-0.034 (0.022)	0.017 (0.018)
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087
R ²	0.084	0.155	0.099	0.093	0.176	0.117	0.082	0.142	0.094
Only students enrolled in secondary school									
Unemployment	0.025 (0.025)	-0.063* (0.033)	-0.038 (0.032)	0.068** (0.035)	-0.117** (0.047)	-0.049 (0.042)	-0.024 (0.036)	-0.016 (0.045)	-0.040 (0.049)
Return to Schooling	0.002 (0.020)	-0.001 (0.027)	0.000 (0.021)	0.040 (0.029)	0.002 (0.040)	0.042 (0.030)	-0.034 (0.026)	-0.001 (0.035)	-0.034 (0.030)
Observations	1918	1918	1918	1047	1047	1047	871	871	871
R ²	0.102	0.145	0.092	0.181	0.217	0.167	0.085	0.119	0.076
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction (*** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1, 4, 7), expected income on completion of primary school only (columns 2, 5, 8), expected income on completion of secondary school (columns 3, 6, 9). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

The possibility to control for individual fixed effects in analysing subjective expectations is unique to panel data, which is rarely available in the case of subjective expectations. This feature allows understanding the importance of individual time-invariant unobservable characteristics, such as child's intelligence or ability, on the relationship between expectations and labour market changes. We therefore estimate the relationship between perceived returns to schooling and local labour market conditions using different specifications. Table C8 in appendix presents the results. In columns 1 and 5, we include year and month fixed effects, and additional time-varying controls. In columns 2 and 6, we add household fixed effects. In column 3 and 7, we include individual fixed effects. In column 4 and 8, we also control for macro-region trends by adding interactions between year indicator variables and macro-region indicator. In columns 1-4, we include unemployment linearly in the specification, while in columns 5-8, we include it a quadratic term. By comparing OLS and FE estimates, we can conclude that most of the individual unobserved characteristics are captured by the household fixed effects. This suggests that learning about the child's future returns is rather an household-level process, with a relatively small child-specific component.

To understand whether the updating is happening throughout the distribution of perceived returns, we estimate a quantile fixed effect regressions (Firpo et al., 2009), in which the dependent variable is the probability that the perceived return is larger than the 25th, the 50th and the 75th percentile. Table C17 presents the estimates. In columns 4-6, we restrict the sample to boys, while in columns 7-9 we restrict the sample to girls. The effect of unemployment on the updating of perceived returns is distributed throughout the distribution of perceived returns. The effect tends to be larger for the lower and central part of the distribution, while for the top 25 percentile tends to be lower. This result is similar among boys and girls. In terms of variations in returns to schooling, we observe a significant effect only for the upper part of the distribution of perceived returns. This suggests that unemployment is a measure that is affecting a larger share of the sample, while updating through returns to schooling is only affecting the parents that already have higher perceived returns.

An important feature of the data is that we can go beyond the mean and study how the standard deviation of expected income conditional on primary and secondary schooling is affected by the local labour market. Table 7 presents estimates for equation 1 on the effect of local unemployment rate and the standard deviation of local expenditure conditional on primary and secondary schooling on the standard deviation of the expectation. In columns 1-2, we focus on the whole sample, while in columns 3-4 and 5-6 we focus on boys and girls respectively. A decrease in the variance of expectations means that some of the uncertainty regarding returns to secondary education has been resolved. A 1 per cent increase in unemployment does not seem to affect significantly the standard deviation of expected income, except for the expected income conditional on secondary schooling.

Table 7: Effect of local unemployment on standard deviation of subjective expectations

Dependent variable	Full sample			Boys		Girls	
	Standard deviation of income		Standard deviation of income				
	Primary (1) FE	Secondary (2) FE	Primary (3) FE	Secondary (4) FE	Primary (5) FE	Secondary (6) FE	
Unemployment	-0.004 (0.003)	-0.006** (0.003)	-0.002 (0.004)	-0.006 (0.004)	-0.006 (0.004)	-0.007* (0.004)	
Std. expenditure (prim.)	-0.014 (0.034)	-0.008 (0.029)	-0.034 (0.045)	-0.003 (0.039)	0.011 (0.053)	-0.013 (0.044)	
Std. expenditure (sec.)	0.046 (0.030)	-0.011 (0.025)	-0.002 (0.042)	-0.015 (0.034)	0.101** (0.041)	-0.010 (0.035)	
Observations	4421	4421	2334	2334	2087	2087	
R ²	0.104	0.072	0.121	0.077	0.094	0.077	
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction *** p<0.01, ** p<0.05, * p<0.1. The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: variance of expected income conditional on completion of primary school only for full sample (column 1), for boys (column 3) and for girls (column 5), variance of expected income conditional on completion of secondary school for full sample (column 2), for boys (column 4) and for girls (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

4.1.1 Heterogeneity in belief formation by socio-economic status

Parents from different socio-economic groups can form beliefs differently through a different ability to understand the local labour market, but also through a differential experience and limited information in specific branches of the labour market. Our measure of socio-economic status (SES) is parents' education. Parental education is the least noisy measure of SES in the data. In addition, limited education provides a potential channel for why low-SES parents are not aware of the returns to investment in education. We therefore study heterogeneity by focusing on parents with only primary education (low SES) and parents with secondary education (high SES).¹³

Table 8 presents estimates of equation (1) when perceived returns to schooling is the dependent variable. In columns 1,3 and 5, we select only households in which parental education is equal to primary school or lower, while in columns 2, 4, and 6 we restrict the sample to parents with secondary education or higher. In columns 1-2, we focus on all children, in columns 3-4 on boys, and in columns 5-6 on girls. Parents with lower education (low SES) are much more responsive to variations in unemployment, but less responsive in terms of returns to secondary schooling. A 1 percentage point increase in unemployment raises perceived returns by 5.6 percentage points when the parent has primary or lower education, while for parents with secondary or higher, the increase is equal to 3.7 percentage points. For variations in returns to schooling, an increase by 7 percentage points leads to an increase by 3 percentage points if the parent has primary or lower education, and 8.5 percentage points when parents have secondary or higher.

When comparing boys and girls, we can observe that for both, the updating in expectations to changes in unemployment is significant only for less educated parents. On the contrary, increases in returns to schooling leads to increases in perceived returns only for more educated parents in the case of boys and girls. For boys, an increase of 7 percentage points in returns to schooling leads to a 1.9 change in perceived returns for lower educated parents and an increase of 9.2 percentage points for more educated parents. For girls instead, an increase of 7 percentage points in returns to schooling leads to a 4.3 percentage points increase in perceived returns for less educated parents and 7.1 percentage points for more educated parents.

¹³We focus on the education of the household head. These results are robust to considering mother's education or father's education.

Table 8: Updating of expectations and socio-economic status (SES)

Dependent variable	Expected returns to secondary school when at least one parent has:					
	Full sample		Boys		Girls	
	Low SES (1) FE	High SES (2) FE	Low SES (3) FE	High SES (4) FE	Low SES (5) FE	High SES (6) FE
Unemployment	0.056** (0.023)	0.037 (0.023)	0.052* (0.028)	0.052 (0.033)	0.066* (0.039)	0.032 (0.032)
Return to Schooling	0.030** (0.015)	0.085*** (0.025)	0.019 (0.021)	0.100*** (0.034)	0.043* (0.022)	0.071** (0.033)
Observations	2362	1805	1296	900	1066	905
R^2	0.094	0.092	0.097	0.138	0.095	0.076
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school when parents do not have secondary education (column 1), expected return to secondary school compared to primary school when at least one parent has secondary education (column 2), expected return to secondary school compared to primary school for boys when parents do not have secondary education (column 3), expected return to secondary school compared to primary school for boys when at least one parent has secondary education (column 4), expected return to secondary school compared to primary school for girls when parents do not have secondary education (column 5) and expected return to secondary school compared to primary school for girls when at least one parent has secondary education (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table 9: Updating of expectations and socio-economic status (SES)

Dependent variable	Expected income conditional on primary education when at least one parent has:					
	Full sample		Boys		Girls	
	Low SES (1) FE	High SES (2) FE	Low SES (3) FE	High SES (4) FE	Low SES (5) FE	High SES (6) FE
Unemployment	-0.106*** (0.030)	-0.072** (0.030)	-0.103*** (0.039)	-0.101** (0.042)	-0.122** (0.049)	-0.057 (0.043)
Return to Schooling	-0.040** (0.020)	-0.015 (0.032)	-0.019 (0.027)	-0.029 (0.043)	-0.064** (0.029)	0.004 (0.045)
Observations	2385	1814	1311	904	1074	910
R^2	0.149	0.198	0.159	0.248	0.153	0.175
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school when parents do not have secondary education (column 1), expected return to secondary school compared to primary school when at least one parent has secondary education (column 2), expected return to secondary school compared to primary school for boys when parents do not have secondary education (column 3), expected return to secondary school compared to primary school for boys when at least one parent has secondary education (column 4), expected return to secondary school compared to primary school for girls when parents do not have secondary education (column 5) and expected return to secondary school compared to primary school for girls when at least one parent has secondary education (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table 10: Updating of expectations and socio-economic status (SES)

Dependent variable	Expected income conditional on secondary education when at least one parent has:					
	Full sample		Boys		Girls	
	Low SES (1) FE	High SES (2) FE	Low SES (3) FE	High SES (4) FE	Low SES (5) FE	High SES (6) FE
Unemployment	-0.042* (0.024)	-0.038* (0.022)	-0.042 (0.030)	-0.054* (0.028)	-0.044 (0.042)	-0.025 (0.033)
Return to Schooling	-0.015 (0.017)	0.077*** (0.022)	-0.002 (0.024)	0.080** (0.032)	-0.033 (0.024)	0.082** (0.032)
Observations	2469	1896	1347	948	1122	948
R^2	0.065	0.156	0.078	0.166	0.066	0.171
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school when parents do not have secondary education (column 1), expected return to secondary school compared to primary school when at least one parent has secondary education (column 2), expected return to secondary school compared to primary school for boys when parents do not have secondary education (column 3), expected return to secondary school compared to primary school for boys when at least one parent has secondary education (column 4), expected return to secondary school compared to primary school for girls when parents do not have secondary education (column 5) and expected return to secondary school compared to primary school for girls when at least one parent has secondary education (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

4.1.2 Heterogeneity in belief formation by ethnicity

In Macedonia there are two main ethnicities: Macedonians and Albanians. Ethnicity can be a proxy of the household's network since individuals from the same ethnicity are more likely to interact. We study heterogeneity by splitting the sample in two based on the household's ethnicity.

Table 11 presents estimates of equation (1) when perceived returns to schooling is the dependent variable. In columns 1,3 and 5, we select only Albanian, while in columns 2, 4, and 6 we restrict the sample to Macedonian parents. In columns 1-2, we focus on all children, in columns 3-4 on boys, and in columns 5-6 on girls. Albanian parents are much more responsive to variations in unemployment, but less in terms of returns to secondary schooling compared to Macedonians. A 1 percentage point increase in unemployment raises perceived returns by 9.4 percentage points when the parents are Albanians, while for Macedonian parents, the increase is equal to 2.2 percentage points. For variations in returns to schooling, an increase by 7 percentage points leads to an increase by 3.4 percentage points if the parents are Albanians, and 7.4 percentage points when parents are Macedonians.

Table 11: Updating of expectations and ethnicity

Dependent variable	Expected returns to secondary school when ethnicity is:					
	Full sample		Boys		Girls	
	Albanian (1) FE	Macedonian (2) FE	Albanian (3) FE	Macedonian (4) FE	Albanian (5) FE	Macedonian (6) FE
Unemployment	0.094*** (0.022)	0.022 (0.020)	0.102*** (0.031)	0.026 (0.027)	0.084*** (0.032)	0.029 (0.029)
Return to Schooling	0.034** (0.017)	0.074*** (0.021)	0.034 (0.023)	0.096*** (0.030)	0.034 (0.025)	0.056** (0.028)
Observations	2539	1882	1389	945	1150	937
R^2	0.082	0.109	0.085	0.143	0.089	0.107
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school when parents are Albanians (column 1), expected return to secondary school compared to primary school when parents are Macedonians (column 2), expected return to secondary school compared to primary school for boys when parents are Albanians (column 3), expected return to secondary school compared to primary school for boys when parents are Macedonians (column 4), expected return to secondary school compared to primary school for girls when parents are Albanians (column 5) and expected return to secondary school compared to primary school for girls when parents are Macedonians (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table 12: Updating of expectations and ethnicity

Dependent variable	Expected income conditional on primary schooling when ethnicity is:					
	Full sample		Boys		Girls	
	Albanian (1) FE	Macedonian (2) FE	Albanian (3) FE	Macedonian (4) FE	Albanian (5) FE	Macedonian (6) FE
Unemployment	-0.150*** (0.031)	-0.053** (0.025)	-0.174*** (0.043)	-0.064* (0.035)	-0.130*** (0.046)	-0.059 (0.037)
Return to Schooling	0.013 (0.023)	-0.067** (0.027)	0.023 (0.031)	-0.091** (0.036)	-0.001 (0.035)	-0.047 (0.036)
Observations	2568	1887	1404	949	1164	938
R^2	0.153	0.184	0.172	0.227	0.143	0.182
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected income conditional on primary schooling when parents are Albanians (column 1), expected income conditional on primary schooling when parents are Macedonians (column 2), expected income conditional on primary schooling for boys when parents are Albanians (column 3), expected income conditional on primary schooling for boys when parents are Macedonians (column 4), expected income conditional on primary schooling for girls when parents are Albanians (column 5) and expected income conditional on primary schooling for girls when parents are Macedonians (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table 13: Updating of expectations and ethnicity

Dependent variable	Expected income conditional on secondary schooling when ethnicity is:					
	Full sample		Boys		Girls	
	Albanian (1) FE	Macedonian (2) FE	Albanian (3) FE	Macedonian (4) FE	Albanian (5) FE	Macedonian (6) FE
Unemployment	-0.055** (0.025)	-0.024 (0.021)	-0.072** (0.032)	-0.029 (0.028)	-0.037 (0.039)	-0.024 (0.031)
Return to Schooling	0.038* (0.020)	0.016 (0.019)	0.048* (0.027)	0.020 (0.028)	0.023 (0.029)	0.014 (0.025)
Observations	2686	1941	1460	977	1226	964
R^2	0.082	0.110	0.103	0.123	0.074	0.115
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of income conditional on secondary schooling. Dependent variables are: expected income conditional on secondary schooling when parents are Albanians (column 1), expected income conditional on secondary schooling when parents are Macedonians (column 2), expected income conditional on secondary schooling for boys when parents are Albanians (column 3), expected income conditional on secondary schooling for boys when parents are Macedonians (column 4), expected income conditional on secondary schooling for girls when parents are Albanians (column 5) and expected income conditional on secondary schooling for girls when parents are Macedonians (column 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

4.2 Probability to find a job

Evidence suggests that parental expectations of expected incomes conditional on employment are strictly related with variations in local labour market characteristics. We are also interested in understanding whether this variation affects the perceived probability of the child to find a job in the future. Table 14 presents estimates of equation (1) using these variables as dependent variables. In columns 1,3 and 5, the probability to find a job is conditional on completing primary school, while in columns 2, 4 and 6, the probability is conditional on completing secondary school. In columns 3-4, we restrict the sample to boys, while in columns 5-6 we restrict the sample to girls.

Increases in unemployment lead to decreases in the perceived probability to find a job after completing secondary school. This effect is small. An increase by 1 percentage points in unemployment decreases the probability to find a job by 2.7 percentage points when completing secondary school. Decreases in the probability to find a job are generally larger conditional on completing secondary school, but not statistically different.

Table 14: Local labour market characteristics and the perceived probability to find a job

Dependent variable	Full sample		Boys		Girls	
	Probability to find a job if:		Probability to find a job if:		Probability to find a job if:	
	Primary (1) FE	Secondary (2) FE	Primary (3) FE	Secondary (4) FE	Primary (5) FE	Secondary (6) FE
Unemployment	-0.019* (0.011)	-0.027** (0.012)	-0.019 (0.015)	-0.020 (0.017)	-0.019 (0.015)	-0.035* (0.018)
Return to Schooling	0.010 (0.008)	-0.000 (0.009)	0.016 (0.010)	0.005 (0.012)	0.003 (0.012)	-0.005 (0.013)
Observations	4832	4830	2517	2517	2315	2313
R^2	0.060	0.074	0.069	0.083	0.057	0.073
Only students enrolled in secondary school						
	FE	FE	FE	FE	FE	FE
Unemployment	-0.025 (0.021)	-0.027 (0.022)	-0.032 (0.027)	-0.013 (0.030)	-0.018 (0.030)	-0.049 (0.031)
Return to Schooling	0.021 (0.014)	-0.023 (0.016)	0.040** (0.018)	0.010 (0.022)	0.003 (0.021)	-0.058*** (0.020)
Observations	2054	2054	1117	1119	937	935
R^2	0.061	0.074	0.079	0.084	0.081	0.103
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: probability to find a job when only primary school is completed (columns 1 and 2), probability to find a job when secondary school is completed (columns 3 and 4). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview. Regional unemployment rate is the unemployment rate provided by the Macedonian State Statistical Office for the Region of residence of the respondent.

4.3 Unemployment and household expected income

Finally, schooling investments are also indirectly affected by the allocation of household income to different purchases, which in turns depend on the expectations about future income. To understand whether variations in the characteristics of the local labour market affect schooling only through expectations about returns to schooling, we focus on expectations about household income in the month following the interview. Table 15 presents estimates of equation (1) using expected income for the household in the month following the interview as the dependent variable. In columns 1-2 we focus on the expected income, in columns 3-4 on the lower bound of income and in columns 5-6 on the upper bound. In columns 2, 4, and 6 we allow for non-linear effects of unemployment. We observe that both unemployment and returns to schooling have a significant effect on the expected income. A 1 percentage point increase in unemployment translates into a decrease of 22 percentage points in the expected income. This effect is driven by a reduction of both the lower and the upper bound of the expected income. In terms of returns to schooling, an increase of 4 percentage points raises expected income by 14 percentage points. This effect is driven mainly by an increase in the lower bound of the expected income when returns to schooling increase.

Table 15: Local labour market characteristics and subjective expectations about household income

Dependent variable	Expected Income		Lower bound		Upper bound	
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	FE
Unemployment	-0.222*** (0.037)	-0.120 (0.076)	-0.250*** (0.046)	-0.283*** (0.092)	-0.201*** (0.036)	-0.155** (0.075)
Unemployment (squared)		-0.003 (0.002)		0.001 (0.002)		-0.001 (0.002)
Return to Schooling	0.142*** (0.027)	0.135*** (0.028)	0.178*** (0.031)	0.180*** (0.032)	0.107*** (0.027)	0.104*** (0.028)
Observations	3506	3506	3333	3333	3506	3506
R^2	0.263	0.264	0.188	0.188	0.297	0.298
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: household expected income for the month following the interview (columns 1 and 2), expected household income in the worst case scenario for the month following the interview (columns 3 and 4), expected household income in the best case scenario for the month following the interview (columns 5 and 6). Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

4.4 Robustness checks

A plausible concern is whether migration can affect the way parents form expectations in response to the local labour market. Migration can affect belief formation for several reasons. For example, parents may plan to migrate to leave a local labour market characterized by high unemployment and low returns to education. Alternatively, parents may form expectations in response to the

urban labour market instead of the local labour market. We tackle these concerns by showing that households seem to be stuck where they were born, only a small fraction of our sample has ever moved from where they were born (around 20 percent). In addition, in the appendix, we report two tests to verify whether the local labour market affects beliefs updating. Section C.5 shows that only the closest local labour market has a statistically significant effect on belief updating and section C.6 shows that the local labour market has a statistically significant effect on belief updating whereas the urban labour market does not.

In addition, we show that the results are not driven by variations in contemporaneous schooling status that could be affected by either unemployment and returns to schooling. In fact, estimates are robust to controlling for educational outcomes. Table C9 in appendix shows estimates for equation (1) when we add control variables for whether the child is enrolled in school and for the number of years of schooling. Adding these controls does not affect our main estimates.¹⁴ Additional robustness checks can be found in the appendix C.

5 Conclusion

This study investigates the role of local unemployment and local returns to schooling on parental expected returns to schooling. We exploit the longitudinal data about perceived returns to secondary schooling among poor households in the Republic of Macedonia for the periods 2010, 2012 and 2013. This information is matched with monthly-level administrative data about unemployment at local level and with local returns to schooling among poor households. We provide evidence that variations in the local labour market affect significantly the way parents update their expectations, with both increases in unemployment and in local returns to schooling translating into increased perceived returns. We show that when observing schooling decisions two and three years after the collection of information about perceived returns, parental subjective expectations are strong predictors for the probability of the child to be enrolled in secondary school.

These results contribute to the literature on the role of subjective expectations on decision making in two ways. First, we provide evidence about the importance of individual-specific unobservable characteristics in models in which expectations enter directly as function of decision making. The possibility to use longitudinal data allows us controlling for individual fixed effects and quantify its importance. In this paper we showed that the process of updating of subjective expectations has a strong household-level component, suggesting that returns to schooling are formed from features observed by parents that go beyond child's ability.

Secondly, the evidence provided suggests that local labour market conditions are particularly important not only in the way they affect household income, but also in the way they influence parental expectations about the returns to schooling, a fundamental measure to predict future investments in schooling.

¹⁴Since these variables are potentially correlated to idiosyncratic shocks, we do not include them in our main specification.

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Appendices to “Local labour market and subjective returns to schooling”

A Subjective expectation module

A.1 Returns to schooling

In order to elicit subjective probabilities, a 0-100 ruler was used as visual aid and was initially presented using an example linking the chances of rain with the chosen scale. The precise text read by the interviewer is the following:

We are now going to deal with events in the future that may happen or not. We have a RULER with a scale from 0 to 10 which we will use to indicate how likely do you think one event might happen. For example: If I ask you “How likely is it that tomorrow will rain?” and you are fully sure that it will rain, then you’ll indicate 10. If, on the contrary, you think that it is not going to rain, you will indicate 0. In case you’re not sure whether it is going to rain or not, you will give me a low value in the scale if you think that the event is not very likely, or a high value if you think it is very likely. Let’s try now. “How likely is it that tomorrow will rain?”.

The specific set of questions asked to the respondent is the following:

1. Imagine that at age 25, your child’s highest level of education attained is primary (secondary).
 - (a) How likely it is that at age 25, he/she will be employed?
2. Now imagine that, at age 25, your child completed only primary (secondary) school and he/she finds a job. Try to imagine which possible job could he/she be employed in and imagine which could be the maximum and the minimum that he/she could earn, given
 - (a) In the worst of the cases, how much do you think he/she could earn per month?
 - (b) In the best of the cases, how much do you think he/she could earn per month?
 - (c) Now using the ruler, could you indicate how likely it is that:
 - i. he/she is going to earn at least (equal or less) than $[(2a) + (2b)]/2$ Denars?
 - ii. he/she is going to earn more than $[(2a) + (2b)]/2$ Denars?

A.2 Household income

The specific set of questions asked to the respondent is the following:

1. Imagine that next month, the members of your household cannot find a good job or your main activities are going bad, and your household has to live with public help and help from others. How much money do you think your household could obtain in total?

2. Imagine that next month, the members of your household that want to work can find a good work or your household main activities (for example, agriculture) yield good benefits. How much money do you think your household could obtain in total?
3. Now using the ruler, could you indicate how likely it is that your household is going to obtain:
 - (a) at least (equal or less) than $[(2a) + (2b)]/2$ Denars?
 - (b) more (equal or less) than $[(2a) + (2b)]/2$ Denars?

A.3 Response Rates

Table A1 reports the response rates for the section about expectations. Response rates are high and above 90% for all type of questions. Rates are slightly higher for boys and for questions that involve a single answer.

Table A1: Complete response rates for expectations, by gender of the child

	2010		2012		2013	
	Boys	Girls	Boys	Girls	Boys	Girls
Expectations for primary school	0.95	0.93	0.97	0.94	0.90	0.87
Expectations for secondary school	0.96	0.95	0.97	0.94	0.96	0.93
Expectations about employment	0.98	0.97	1.00	1.00	0.99	1.00
Probability to go to university	0.98	0.97	1.00	0.99	1.00	1.00
Expectations about household income	0.97	0.97	0.95	0.93	0.97	0.98

Note. An observation is considered complete if the respondent answers all requested information to compute expectations. Response rates are divided by gender since some households report expectations for more than one child when children in the age range for completing the expectations section have different gender.

Figure A1: Administrative data about unemployed people

АГЕНЦИЈА ЗА ВРАБОТУВАЊЕ НА РЕПУБЛИКА МАКЕДОНИЈА

П - 1 - 1

ПРЕГЛЕД
на невработени лица
со состојба на 31.03.2014 година

1	2	3=4+5	4	5
1	Берово	1575	884	691
2	Битола	6987	5392	1595
3	Валандово	546	253	293
4	Велес	3734	3220	514
5	Виница	819	520	299
6	Гевгелија	1566	1063	503
7	Гостивар	4110	2997	1113
8	Дебар	1335	997	338
9	Делчево	1651	1281	390
10	Демир Хисар	1194	351	843
11	Кавадарци	3020	2196	824
12	Кичево	3611	2876	935
13	Кочани	3384	2228	1156
14	Кратово	1016	794	222
15	Крива Паланка	3455	2361	1094
16	Крушево	804	622	182
17	Куманово	7582	5947	1635
18	Македонски Брод	1224	748	476
19	Неготино	1307	920	387
20	Охрид	4269	3530	739
21	Прилеп	7241	6276	965
22	Пробиштип	1612	1287	325
23	Радовиш	1672	1089	583
24	Ресен	1575	956	619
25	Свети Николе	1961	1375	586
26	на град Скопје	17216	14474	2742
27	Струга	3363	1635	1728
28	Струмица	2596	1444	1152
29	Тетово	10763	5537	5226
30	Штип	2879	2649	230
	Вкупно	104067	75682	28385

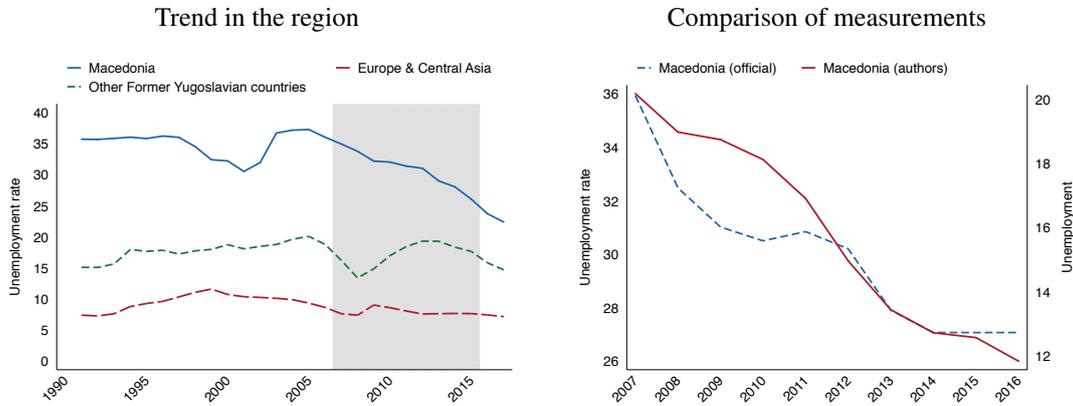
Note. The figure shows an example of document used to obtain unemployed data from paper registries obtained from the employment centers. The document provided here shows the total number of unemployed for each employment center at the end of March 2014. Source: Macedonian National Employment Centers. The data is publicly available from the website of the NEA. The source of the data are the following links: [2009-2013](#), [2014](#). Until 2013 the information is available in pdf format and was digitized. For these years, the information is disaggregated across different categorical groupings, such as gender, education, time unemployed, ethnicity and age. From 2013, the NEA changed the accounting practice by distinguishing between active job seekers and other job seekers. From this year, the information is available in electronic format, but disaggregated only by gender and by job search status. The right panel in figure 1 presents monthly data for each of the NEA's centres over the period 2009-2014, while the shaded area represents the period in which the household survey was carried out.

B Unemployment in Macedonia

B.1 Overall trend in the region

Macedonia has a long history of high unemployment. Since the division of Yugoslavia, Macedonia has shown a very high rate of unemployment, ranging from 35 to 30 percent. The left panel in figure B2 shows the unemployment rate in former Yugoslavian countries compared to the Europe and Central Asia aggregate during the period 1990-2017. Starting in 2005, Macedonia has slowly reduced its unemployment rate, while other Former Yugoslavian countries have shown a reduction in 2006-2008 and an increase during the world economic crisis from 2009. A similar pattern is observed in the Europe and Central Asia aggregate.

Figure B2: Unemployment rate in Macedonia and in the region



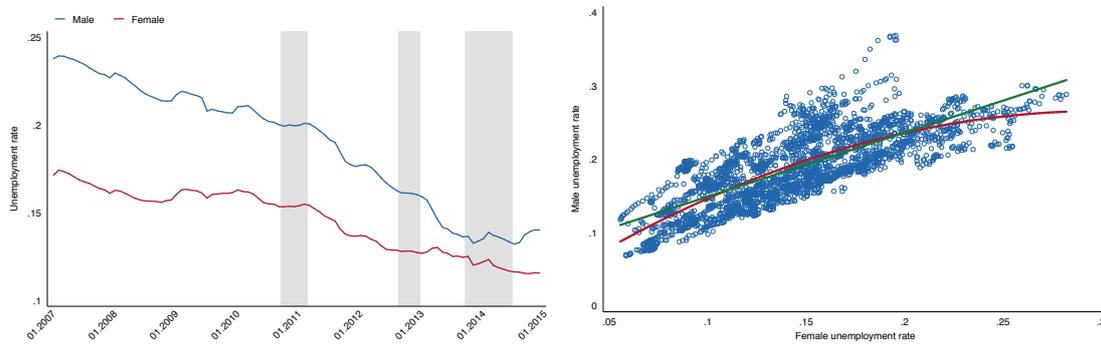
Note. The left figure shows the time series of unemployment rates in Macedonia, Europe and Central Asia aggregate, and other Former Yugoslavian countries over the period 1990-2017 (source: [The World Bank, 2012](#)). Unemployment rate in other Former Yugoslavian countries is computed as unweighted average on the unemployment rates in Serbia, Bosnia and Herzegovina, Montenegro, Croatia, and Slovenia (data for Kosovo is not available). Shaded area represents the period in which we have access to administrative data of unemployed people from the National Employment Agency. The right figure shows a comparison for Macedonia over the period 2009-2014 of the unemployment rate provide by [The World Bank \(2012\)](#) and the measure of unemployment based on NEA administrative data (see section 2.2).

B.2 Male-female unemployment relationship

Figure B3 presents the relationship between male and female unemployment in Macedonia using the data of the National Employment Center. The left panel shows the times series of unemployment in the period 2009-2014, while the right panel shows a scatterplot of male and female unemployment, in which each point is a combination of these variables in a specific employment center at a specific time.

Table B2 estimates the relationship between male and female unemployment. We estimate linear models in which the dependent variable is male unemployment and the main regressor is female unemployment using different specifications. Column 1 presents a simple correlation between the two variables, column 2 adds year and month indicator variables, column 3 adds additional controls, and column 4 adds employment center fixed effects. We observe that one per-

Figure B3: Male and female unemployment rate in Macedonia, 2009-2014



Note. The left panel presents monthly data of unemployment rates, defined as the number of people registered at unemployment centers divided by the population in the area of competence, distinguishing between male and female unemployed. Shaded areas highlight the periods of data collection. The right panel shows a scatterplot of male and female unemployment and linear/quadratic fit of the relationship between the two variables. Each point is a combination of these variables in a specific employment center at a specific time. Source: Author's calculation using Macedonian National Employment Center unemployment data and the Macedonian State Statistical Office population data.

centage point increase in male unemployment rate is associated with an increase of half percentage point in female unemployment rate.

Table B2: Relationship between male and female unemployment

Dependent variable:	Unemployment rate (male)			
	(1)	(2)	(3)	(4)
Unemployment rate (female)	0.926*** (0.011)	0.714*** (0.011)	0.648*** (0.014)	0.674*** (0.132)
Observations	3600	3600	3600	3600
R^2	0.620	0.761	0.823	0.812
Year and month FE	No	Yes	Yes	Yes
Additional controls	No	No	Yes	Yes
NEA center FE	No	No	No	Yes

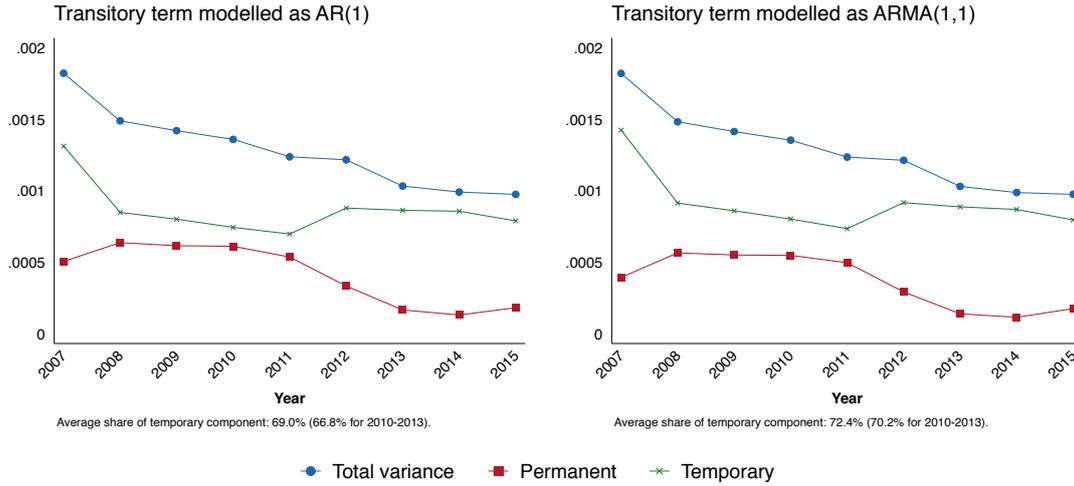
Note. Estimates based on OLS and FE regressions. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parenthesis. Unemployment rates are computed using Macedonian National Employment Center unemployment data and the Macedonian State Statistical Office population data. Other controls includes population, ethnic composition and education achievement in the municipalities of competence of each NEA center.

B.3 Covariance structure of unemployment

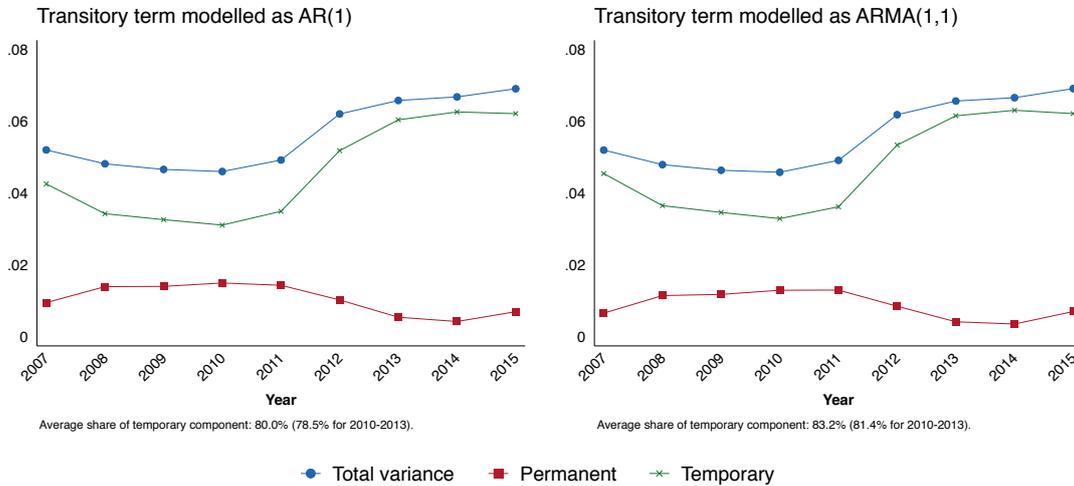
In this section, we decompose the panel series of unemployment into the sum of a permanent component (for example, due to employment center-specific fixed characteristics) and a transitory component reflecting temporary shocks. We follow the decomposition procedure in Doris et al. (2011) by allowing for time and cohort effects in both the permanent and the transitory component, and modelling the transitory term as either an AR(1) or an ARMA(1,1). Figure B4 presents the decomposition for the period 2007–2015. The upper panel presents the covariance structure for unemployment measured in levels. For robustness, in the lower panel, we also present the results using the logarithm of unemployment. Variations in unemployment are mainly driven by its temporary component, which represents for the period used in the paper 67-81% of total variance, depending on the assumptions used for the decomposition.

Figure B4: Covariance structure of unemployment, 2007-2015

Unemployment rate in levels



Unemployment rate in logarithm



Note. The figures present the decomposition of the total variance of unemployment in its permanent and the transitory component. We follow the decomposition procedure in Doris et al. (2011) by modelling the transitory term as either an AR(1) or an ARMA(1,1). The upper panel presents the covariance structure for unemployment measured in levels, while the lower panel presents the results using the logarithm of unemployment. Unemployment is demeaned for the decomposition procedure. The period is restricted to 2007–2015.

Table B3: Returns to schooling and gender

Dependent variable	Boys			Girls		
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
Unemployment	0.213*** (0.049)			0.253*** (0.048)		
Unemployment (squared)	-0.005*** (0.001)			-0.007*** (0.001)		
Unemployment (male)		0.168*** (0.041)	0.151** (0.068)		0.210*** (0.039)	0.176*** (0.058)
Unemployment (male, squared)		-0.004*** (0.001)	-0.004** (0.002)		-0.005*** (0.001)	-0.004*** (0.002)
Unemployment (female)			0.102 (0.088)			0.096 (0.072)
Unemployment (female, squared)			-0.001 (0.003)			-0.002 (0.002)
Return to Schooling	0.046** (0.018)	0.042** (0.018)	0.041** (0.018)	0.038** (0.017)	0.035** (0.017)	0.035** (0.017)
Observations	2334	2334	2334	2087	2087	2087
R^2	0.104	0.102	0.107	0.106	0.104	0.106
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables is expected return to secondary school compared to primary school for boys (columns 1, 2 and 3) and girls (columns 4, 5 and 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

C Additional analysis

C.1 Different specifications for the expectation updating

Tables [C4](#), [C5](#), [C6](#) and [C7](#) show estimates for equation (1) when we allow for a different specification of the signals. The results are robust.

C.2 Robustness to different sets of controls

The possibility to control for individual fixed effects in analysing subjective expectations is unique to panel data, which is rarely available in the case of subjective expectations. To understand the importance of controlling for individual time-invariant unobservable characteristics, we estimate the relationship between perceived returns to schooling and local labour market conditions using different specifications. Table [C8](#) presents the results. In columns 1 and 5, we include year and month fixed effects, and additional time-varying controls. In columns 2 and 6, we add household fixed effects. In column 3 and 7, we include individual fixed effects. In column 4 and 8, we also control for macro-region trends by adding interactions between year indicator variables and macro-region indicator. In columns 1-4, we include unemployment linearly in the specification,

while in columns 5-8, we include it a quadratic term. By comparing OLS and FE estimates, we can conclude that most of the individual unobserved characteristics are captured by the household fixed effects.

C.3 Adding controls for child education

Table C9 shows estimates for equation (1) when we add control variables for child education. We control for whether the child is enrolled in school and for the number of years of schooling. Adding these controls do not affect our main estimates. Since these variables are potentially endogenous, we do not include them in our main specification.

C.4 Unemployment at regional level

Table C10 presents estimates for our main specification when using region-level unemployment as our main measure of local labour market shock. This variable is provided by the State Statistical Office yearly, for each of the 8 regions composing Macedonia. We can observe that results are in line with our main specification.

Table C4: Local labour market characteristics and the subjective expectations of returns to schooling

Dependent variable	Full sample						Boys			Girls		
	Expected return		Expected income		Expected return		Expected income		Expected return		Expected income	
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE	(7) FE	(8) FE	(9) FE			
Unemployment	0.066*** (0.017)	-0.098*** (0.023)	-0.033* (0.018)	0.074*** (0.023)	-0.102*** (0.032)	-0.028 (0.024)	0.058** (0.024)	-0.103*** (0.033)	-0.045* (0.027)			
Percentage change in unemployment with respect to 1 year ago	-0.010*** (0.003)	0.004 (0.004)	-0.006* (0.003)	-0.012*** (0.004)	0.002 (0.005)	-0.010** (0.006)	-0.009** (0.004)	0.007 (0.006)	-0.002 (0.005)			
Percentage change in unemployment with respect to 1 year in the future	-0.001 (0.004)	-0.000 (0.005)	-0.001 (0.004)	0.003 (0.005)	0.003 (0.007)	0.006 (0.006)	-0.004 (0.006)	-0.004 (0.007)	-0.008 (0.006)			
Return to Schooling	0.054*** (0.013)	-0.032*** (0.016)	0.023* (0.013)	0.057*** (0.018)	-0.029 (0.022)	0.028 (0.018)	0.053*** (0.017)	-0.035 (0.022)	0.018 (0.018)			
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087			
R ²	0.088	0.155	0.100	0.100	0.176	0.121	0.086	0.144	0.096			
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction (*** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1, 4, 7), expected income on completion of primary school only (columns 2, 5, 8), expected income on completion of secondary school (columns 3, 6, 9). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C5: Local labour market characteristics and the subjective expectations of returns to schooling

Dependent variable	Full sample						Boys			Girls		
	Expected return (1)	Expected return (2)	Expected income (3)	Expected return (4)	Expected income (5)	Expected return (6)	Expected return (7)	Expected income (8)	Expected return (9)	Expected income (10)	Expected return (11)	
Unemployment	0.057*** (0.015)	-0.083*** (0.020)	-0.026 (0.016)	0.059*** (0.020)	-0.094*** (0.029)	-0.035 (0.022)	0.055*** (0.022)	-0.079*** (0.028)	-0.025 (0.025)			
Percentage change in unemployment with respect to 6 months ago	-0.011** (0.004)	-0.004 (0.006)	-0.016*** (0.005)	-0.013** (0.006)	-0.007 (0.008)	-0.020*** (0.006)	-0.010 (0.006)	-0.001 (0.008)	-0.011 (0.007)			
Percentage change in unemployment with respect to 6 months in the future	0.005 (0.004)	-0.010** (0.004)	-0.005 (0.004)	0.006 (0.005)	-0.003 (0.006)	0.003 (0.006)	0.005 (0.005)	-0.019*** (0.006)	-0.014** (0.006)			
Return to Schooling	0.056*** (0.013)	-0.033** (0.016)	0.024* (0.013)	0.060*** (0.018)	-0.028 (0.023)	0.032* (0.018)	0.054*** (0.017)	-0.038* (0.022)	0.016 (0.017)			
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087			
R ²	0.088	0.157	0.104	0.098	0.176	0.125	0.085	0.148	0.102			
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction (*** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1, 4, 7), expected income on completion of primary school only (columns 2, 5, 8), expected income on completion of secondary school (columns 3, 6, 9). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C6: Local labour market characteristics and the subjective expectations of returns to schooling

Dependent variable	Full sample				Boys		Girls		
	Expected return (1)	Expected return Primary (2)	Expected income Secondary (3)	Expected return (4)	Expected income Primary (5)	Expected income Secondary (6)	Expected return (7)	Expected income Primary (8)	Expected income Secondary (9)
Average unemployment over the last year	0.035*** (0.007)	-0.036*** (0.010)	-0.001 (0.008)	0.036*** (0.010)	-0.038*** (0.014)	-0.002 (0.011)	0.034*** (0.010)	-0.036*** (0.014)	-0.002 (0.012)
Return to Schooling	0.056*** (0.012)	-0.029* (0.016)	0.027** (0.013)	0.059*** (0.018)	-0.026 (0.023)	0.033* (0.018)	0.053*** (0.017)	-0.033 (0.022)	0.021 (0.018)
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087
R ²	0.089	0.152	0.096	0.099	0.172	0.112	0.087	0.141	0.092
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1, 4, 7), expected income on completion of primary school only (columns 2, 5, 8), expected income on completion of secondary school (columns 3, 6, 9). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C7: Local labour market characteristics and the subjective expectations of returns to schooling

Dependent variable	Full sample				Boys		Girls		
	Expected return (1) FE	Expected return (2) FE	Expected income (3) FE	Expected return (4) FE	Primary (5) FE	Expected income (6) FE	Expected return (7) FE	Primary (8) FE	Expected income (9) FE
Unemployment	0.063*** (0.015)	-0.087*** (0.021)	-0.024 (0.017)	0.066*** (0.022)	-0.098*** (0.030)	-0.032 (0.023)	0.060*** (0.021)	-0.083*** (0.030)	-0.023 (0.026)
Percentage change in unemployment with respect to 1 year ago	-0.009*** (0.003)	0.003 (0.004)	-0.006* (0.003)	-0.011*** (0.004)	0.002 (0.005)	-0.009** (0.004)	-0.007* (0.004)	0.005 (0.006)	-0.002 (0.005)
Return to Schooling	0.087*** (0.022)	-0.123*** (0.026)	-0.036* (0.021)	0.094*** (0.032)	-0.114*** (0.037)	-0.019 (0.031)	0.081** (0.031)	-0.132*** (0.037)	-0.051* (0.030)
Return to schooling (10th percentile)	-0.074 (0.071)	0.305*** (0.087)	0.231*** (0.071)	-0.103 (0.098)	0.301** (0.125)	0.199** (0.098)	-0.042 (0.102)	0.303** (0.119)	0.262** (0.102)
Return to schooling (90th percentile)	-0.185*** (0.066)	0.300*** (0.080)	0.115* (0.064)	-0.170* (0.095)	0.229*** (0.112)	0.059 (0.087)	-0.196** (0.091)	0.366*** (0.114)	0.170* (0.094)
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087
R ²	0.092	0.161	0.104	0.102	0.181	0.124	0.090	0.151	0.100
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction (*** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1, 4, 7), expected income on completion of primary school only (columns 2, 5, 8), expected income on completion of secondary school (columns 3, 6, 9). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C8: Returns to schooling and specifications

Dependent variable	Perceived return to secondary schooling							
	(1) OLS	(2) FE	(3) FE	(4) FE	(5) OLS	(6) FE	(7) FE	(8) FE
Unemployment	-0.000 (0.003)	0.040*** (0.014)	0.039*** (0.014)	0.043*** (0.015)	0.064*** (0.021)	0.206*** (0.033)	0.205*** (0.034)	0.234*** (0.034)
Unemployment (squared)					-0.002*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)	-0.006*** (0.001)
Return to Schooling	-0.024*** (0.005)	0.024*** (0.009)	0.025*** (0.009)	0.053*** (0.013)	-0.028*** (0.005)	0.012 (0.009)	0.014 (0.009)	0.041*** (0.012)
Observations	4421	4421	4421	4421	4421	4421	4421	4421
R ²	0.037	0.458	0.049	0.084	0.040	0.465	0.062	0.100
Year and month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Individual FE	No	No	Yes	Yes	No	No	Yes	Yes
Year x Macro-region FE	No	No	No	Yes	No	No	No	Yes

Note. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction *** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1), expected income and variance conditional on completion of primary school only (columns 2 and 4), expected income and variance conditional on completion of secondary school (columns 3 and 5). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C9: Effect of local unemployment on subjective expectations of returns to schooling: adding schooling information

Dependent variable	Expected return (1) FE	Expected income		Variance of income	
		Primary (2) FE	Secondary (3) FE	Primary (4) FE	Secondary (5) FE
Unemployment	0.043*** (0.015)	-0.085*** (0.019)	-0.041*** (0.015)	-0.002 (0.001)	-0.002** (0.001)
Return to Schooling	0.053*** (0.013)	-0.032** (0.016)	0.022* (0.012)	0.000 (0.001)	0.000 (0.001)
Enrolled	0.022 (0.032)	-0.024 (0.037)	0.022 (0.031)	-0.001 (0.003)	0.001 (0.002)
Years of schooling	-0.005 (0.010)	0.033*** (0.013)	0.025** (0.011)	-0.001 (0.001)	-0.001* (0.001)
Observations	4421	4455	4627	4455	4627
R ²	0.084	0.155	0.091	0.066	0.042
Individual FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction *** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1), expected income and variance conditional on completion of primary school only (columns 2 and 4), expected income and variance conditional on completion of secondary school (columns 3 and 5). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C10: Effect of local unemployment on subjective expectations of returns to schooling

Dependent variable	Expected return (1) FE	Expected income		Variance of income	
		Primary (2) FE	Secondary (3) FE	Primary (4) FE	Secondary (5) FE
Regional unemployment rate	-0.000 (0.003)	0.013*** (0.003)	0.013*** (0.003)	0.000 (0.000)	-0.000 (0.000)
Return to Schooling	0.051*** (0.017)	0.007 (0.022)	0.058*** (0.016)	-0.001 (0.002)	0.001 (0.001)
Observations	3275	3275	3275	3275	3275
R^2	0.099	0.175	0.136	0.083	0.045
Individual FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1), expected income and variance conditional on completion of primary school only (columns 2 and 4), expected income and variance conditional on completion of secondary school (columns 3 and 5). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Regional unemployment rate is the unemployment rate provided by the Macedonian State Statistical Office for the Region of residence of the respondent.

C.5 Local returns and unemployment at different distances

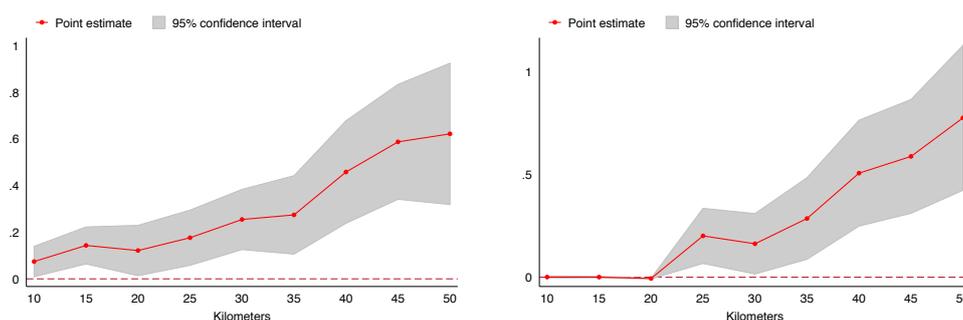
Tables C11 and C12 present estimates for our main specification when unemployment and returns to schooling at different distances.

Table C11: Parental subjective expectations and unemployment at different distances

Dependent variable	Expected return		Expected income			
			Primary		Secondary	
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE	FE	FE	FE
Unemployment	0.043*** (0.015)		-0.088*** (0.020)		-0.045*** (0.016)	
Unemployment (0-50km)		0.027** (0.011)		-0.051*** (0.014)		-0.025** (0.011)
Unemployment (50-100km)		0.033** (0.016)		-0.035* (0.021)		-0.002 (0.018)
Unemployment (>100km)		-0.005 (0.016)		0.005 (0.021)		-0.000 (0.017)
Return to Schooling	0.053*** (0.013)	0.054*** (0.012)	-0.031* (0.016)	-0.031* (0.016)	0.022* (0.013)	0.023* (0.013)
Observations	4421	4407	4421	4407	4421	4407
R ²	0.084	0.084	0.155	0.153	0.099	0.097
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction *** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (columns 1 and 2), expected income conditional on completion of primary school only (columns 3 and 4), expected income conditional on completion of secondary school (columns 5 and 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Figure C5: Local returns to schooling and perceived returns to schooling



Note. The figure estimates of OLS regressions in which the dependent variable is the perceived return to schooling and the independent variable is local return to schooling computed within different radiuses. Each point corresponds to a different regression. In the left panel returns to schooling are computed as raw comparison, while in the right panel they are computed using control variables.

Table C12: Parental subjective expectations and returns to school at different distances

Dependent variable	Currently enrolled in school					
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
Unemployment	-0.065*** (0.023)	-0.064*** (0.023)	-0.063*** (0.023)	-0.034 (0.050)	-0.040 (0.052)	-0.035 (0.050)
Local Return (0-30km)	0.031*** (0.012)					
Local Return (0-40km)		0.036** (0.015)				
Local Return (0-50km)			0.054*** (0.018)			
Lagged Local Return (0-30km)				-0.014 (0.022)		
Lagged Local Return (0-40km)					-0.018 (0.025)	
Lagged Local Return (0-50km)						-0.016 (0.026)
Observations	3198	3198	3198	2058	2058	2058
R ²	0.275	0.274	0.276	0.199	0.199	0.199
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1), expected income and variance conditional on completion of primary school only (columns 2 and 4), expected income and variance conditional on completion of secondary school (columns 3 and 5). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

C.6 Urban vs. local unemployment

An important concern when it comes to studying expectation formation is that urban unemployment can drive belief formation. Parents may not consider the unemployment in the local area but focus on the unemployment in the main urban areas because they would like their child to move to the city to earn more.

We tackle this concern and show that the unemployment in the local area is the one that matters when it comes to forming expectations. A possible test is to estimate equation 1, dividing the measure of unemployment in local and city unemployment. Only 3 cities have a population of more than 70,000 inhabitants (Skopje, Bitola and Kumanovo). The measures of urban and local unemployment are built by using the inverse distance method as outlined in 2.2. ²

Table C13 shows that only local unemployment has statistically significant effect on the expectations, whereas city unemployment is not statistically significant and the sign does go in the correct direction. Intuitively, the reason of this finding is that Macedonia is a rural country where most of the people are employed in agriculture. In our sample, the majority of households report that they live in the same place that they were born. This implicitly implies that households are usually stuck in the place that they were born and consider the local labour market when it comes to forming expectations.

²We consider 3 cities to build the urban unemployment measure. These cities have more than 70,000 inhabitants, while other cities have much fewer inhabitants.

C.7 Education-specific unemployment

Table C14 presents estimates for our main specification when using education-specific unemployment. This variable is recorded up to 2012; therefore, it does not use the data from 2013.

C.8 De-trended unemployment

Table C15 presents estimates for our main specification when using de-trended unemployment.

C.9 Interaction between returns to schooling and unemployment

Table C16 presents estimates for our main specification when using the interaction between returns to schooling and unemployment.

C.10 Effect of local labour market on expectations, by quantile

Table C17 presents estimates for the quantile regression.

Table C13: Effect of city and local unemployment on subjective expectations of returns to schooling

	Full sample								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FE	FE	FE	FE	FE	FE	FE	FE	FE
Local unemployment (no cities>70k inhabitants)	0.046*** (0.015)	-0.086*** (0.020)	-0.040*** (0.015)				0.047*** (0.015)	-0.086*** (0.020)	-0.039*** (0.015)
City unemployment (cities>70k inhabitants)				0.007 (0.014)	-0.021 (0.018)	-0.013 (0.017)	0.005 (0.014)	-0.017 (0.018)	-0.011 (0.017)
Return to Schooling	0.055*** (0.013)	-0.034** (0.016)	0.021 (0.013)	0.048*** (0.012)	-0.020 (0.016)	0.028** (0.013)	0.055*** (0.013)	-0.033*** (0.016)	0.022* (0.013)
Observations	4420	4420	4420	4418	4418	4418	4418	4418	4418
R ²	0.084	0.155	0.098	0.081	0.148	0.095	0.084	0.155	0.098
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using Conley (1999, 2008) correction (*** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of city and local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school, expected income conditional on primary schooling and secondary schooling. First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C14: Subjective expectations and education-specific unemployment

Dependent variable	Expected return (1) FE	Expected income		Variance of income	
		Primary (2) FE	Secondary (3) FE	Primary (4) FE	Secondary (5) FE
Unemployment (Primary or less)	0.090*** (0.024)	-0.085** (0.035)	0.005 (0.027)	-0.006*** (0.002)	-0.005*** (0.001)
Unemployment (Secondary or more)	0.070 (0.085)	-0.203* (0.123)	-0.133 (0.091)	0.005 (0.008)	-0.001 (0.005)
Return to Schooling	0.068*** (0.018)	-0.020 (0.023)	0.048*** (0.017)	-0.002 (0.002)	0.000 (0.001)
Observations	3275	3275	3275	3275	3275
R^2	0.110	0.176	0.124	0.087	0.053
Individual FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes

Note. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (column 1), expected income and variance conditional on completion of primary school only (columns 2 and 4), expected income and variance conditional on completion of secondary school (columns 3 and 5). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C15: Effect of de-trended local unemployment on subjective expectations of returns to schooling

Dependent variable	Full sample						Boys			Girls		
	Expected return (1)	Expected return (2)	Expected income Secondary (3)	Expected return (4)	Expected income Primary (5)	Expected income Secondary (6)	Expected return (7)	Expected income Primary (8)	Expected income Secondary (9)	FE	FE	FE
Unemployment rate (quadratic trend)	0.020** (0.008)	-0.019* (0.010)	0.002 (0.009)	0.017 (0.011)	-0.023 (0.014)	-0.006 (0.012)	0.024** (0.012)	-0.015 (0.015)	0.010 (0.013)			
Return to Schooling	0.051*** (0.012)	-0.024 (0.016)	0.027** (0.013)	0.053*** (0.018)	-0.020 (0.023)	0.033* (0.018)	0.050*** (0.017)	-0.028 (0.022)	0.022 (0.018)			
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087			
R ²	0.083	0.149	0.096	0.092	0.168	0.112	0.082	0.137	0.093			
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are clustered at individual level (*** p<0.01, ** p<0.05, * p<0.1). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C16: Interaction between returns to schooling and unemployment

Dependent variable	Expected return		Expected income			
			Primary		Secondary	
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
Unemployment	0.047*** (0.015)	0.047*** (0.015)	-0.084*** (0.020)	-0.091*** (0.020)	-0.037** (0.016)	-0.044*** (0.016)
* Return to Schooling (year)	0.007 (0.005)		0.008 (0.007)		0.015*** (0.005)	
* Return to Schooling (2010-13)		-0.030*** (0.008)		0.023** (0.010)		-0.007 (0.008)
Return to Schooling	-0.056 (0.075)	0.026** (0.013)	-0.142 (0.097)	-0.010 (0.017)	-0.199** (0.079)	0.016 (0.014)
Observations	4421	4421	4421	4421	4421	4421
R^2	0.085	0.090	0.155	0.157	0.102	0.099
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year x Macro-region FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. Estimates based on fixed effects regressions, all specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Standard errors in parenthesis are estimated using [Conley \(1999, 2008\)](#) correction *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The table presents estimates for equation 1 on the effect of local unemployment rate on parental subjective expectations of returns to secondary schooling. Dependent variables are: expected return to secondary school compared to primary school (columns 1 and 2), expected income conditional on completion of primary school only (columns 3 and 4), expected income conditional on completion of secondary school (columns 5 and 6). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

Table C17: Effect of local unemployment on the distribution of subjective expectations of returns to schooling

Dependent variable	Full sample			Boys			Girls		
	25 pct. (1) FE	50 pct. (2) FE	P(return> (0.025)	75 pct. (3) FE	25 pct. (4) FE	P(return> (0.033)	75 pct. (6) FE	25 pct. (7) FE	P(return> (0.037)
Unemployment	0.066*** (0.025)	0.078*** (0.025)	0.011 (0.017)	0.085*** (0.035)	0.068*** (0.033)	0.005 (0.025)	0.042 (0.034)	0.093*** (0.037)	0.018 (0.024)
Return to Schooling	0.046** (0.018)	0.059*** (0.018)	0.061*** (0.014)	0.047* (0.024)	0.053** (0.024)	0.056*** (0.019)	0.049* (0.027)	0.069** (0.027)	0.065*** (0.021)
Observations	4421	4421	4421	2334	2334	2334	2087	2087	2087
R ²	0.043	0.069	0.068	0.052	0.082	0.074	0.047	0.066	0.068
Individual FE	Yes								
Year FE	Yes								
Other controls	Yes								
Year x Macro-region FE	Yes								

Note. Estimates based on quantile fixed effects regressions (Firpo et al., 2009). All specifications include individual FE, year and month FE, year-by-macro-region FE, and additional time varying control. Estimates based on the following specification:

$$P(y_{jrt} \geq y) = \beta U_{jt} + \gamma R_{ijt} + \mathbf{X}'_{it} \delta + \tau_t M_r + \mu_t + \alpha_i + \epsilon_{it} \quad (2)$$

Standard errors in parenthesis are estimated using Conley (1999, 2008) correction *** p<0.01, ** p<0.05, * p<0.1). First and second moments on the distribution of expected income are estimated assuming a triangular distribution. Unemployment share is defined as the number of people registered at the national employment center competent for the municipality of residence of the respondent divided by the number of people living in the area at the time of the interview.

D Cognitive dissonance bias

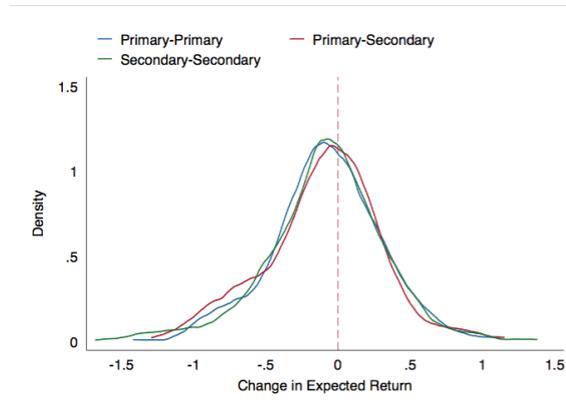
One of the main reasons why subjective expectations have not been used in choice models is that they might suffer from cognitive dissonance, i.e. respondents reports expectations that are consistent with their decisions. If the collected data suffer from cognitive dissonance we would therefore face the following situation. Imagine that $E^*[Y|E_i = 1, J]$ is the real expected income conditional on being employed after having achieved education level j , while $E[Y|E_i = 1, J]$ is the reported expectation. Data would suffer from cognitive bias if an individual who opted to enrol in education $J = j$ (in our case, secondary school) would report expectations such that the expected income consistent with the decision is higher than the real expectations. We would therefore have the following case:

$$E[Y|E_i = 1, J = j] > E^*[Y|E_i = 1, J = j] \quad (3)$$

Using subjective expectations affected by cognitive dissonance in choice models would therefore upward bias our estimates on reported subjective expectations. In order to test for cognitive dissonance, We make use of the panel dimension of the dataset and we compare the expectations reported at 2010 and the expectations for the same child reported at 2012, after a decision is taken. [Zafar \(2011\)](#) provides a similar evidence against cognitive dissonance in his study on major choice and subjective expectations by comparing expectations before and after the decision is taken. We compare the expectations associated to children whose highest educational level achieved at 2010 is primary school (independently from the grade they have achieved) and it is unchanged at 2012, with children whose highest educational level achieved at 2010 is primary school and whose highest educational level achieved at 2012 is secondary school (independently from the grade they have achieved). In presence of cognitive dissonance we would expect expectations for children who transitioned from primary to secondary school to have a positive difference compared to the children who didn't transition from primary to secondary. [Figure D6](#) presents the distribution of the change in expected return from secondary school education (defined as the difference between the expected return at 2012 and the expected return at 2010). In both cases, we cannot reject the Kolmogorov-Smirnov test for equality of distributions. This test would be invalid in the case in which parental expectations reported at baseline are already consistent with the enrolment decision of their children. This might be related to the fact that some students are already enrolled in secondary school at the time in which we collect subjective expectation. However, the decision to enrol at baseline is not permanent, since the cases of drop outs are high and the cost to enrol is relatively low.

To complement this test, we compare the reported expected return for children in primary school age and for children in secondary school age (older than 15) by looking at differences across age. [Panel A of Figure D7](#) shows estimates of two local polynomial regressions of the return to secondary schooling for the children in primary school age (younger than 15) and for the children in secondary school age (older than 15). By comparing means at the cut-off point of 15 years old,

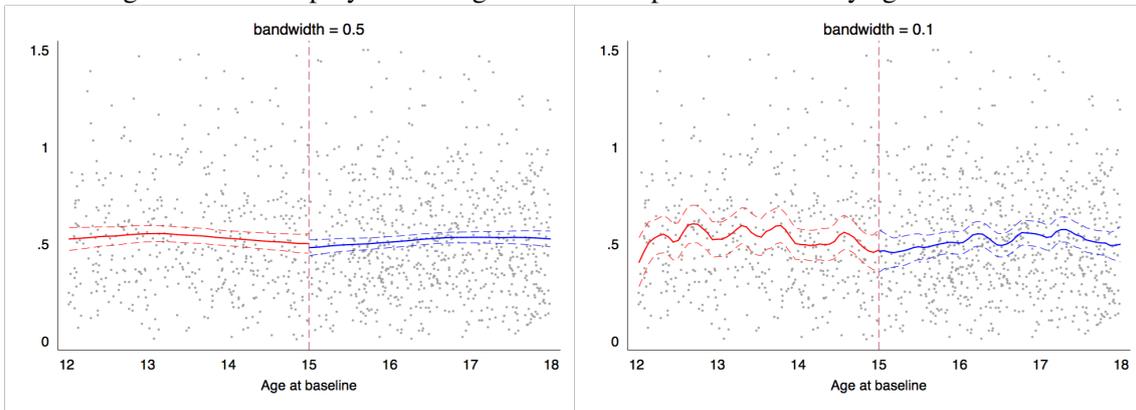
Figure D6: Change in expected return from 2010 to 2012



Note. Change in expected return is defined as the difference between the monetary return to secondary school education collected in 2012 and the one collected in 2010 for the same child. “Primary-Secondary” refers to children that went from being in primary school in 2010 to being enrolled or having completed secondary school in 2012. “Primary-Primary” refers to children that were enrolled or had completed primary school in 2010 and their status is unchanged in 2012.

we can observe that there is no significant difference across the two groups. Similarly, Panel B presents a local polynomial smooth for the returns to schooling in terms of employment. Both figures provides evidence that parents with children in primary school age at baseline had similar expectations compared with children in secondary school age, even when comparing children at the margin.

Figure D7: Local polynomial regression for Expected Returns by age of the child

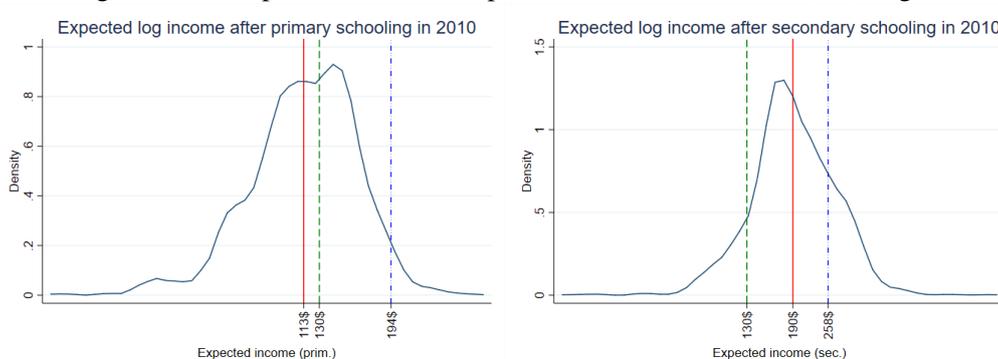


Note. The Figure presents local polynomial regressions (using different bandwidths) around the cut-off age of 15, which divides the age group 12-17 years old into a primary school age group and a secondary school age group. Panel A presents the return to secondary school, computed as the difference between expected incomes after primary and secondary school (reported in logarithms and computed using triangular distribution). Panel B presents the return to schooling in employment terms, defined as the difference in the probability to find a job after secondary and after primary school. 95% confidence interval is represented using dotted lines, while the local regression is represented by the solid line. Age is determined from date of birth at December 31st 2010 and is expressed in years as a continuous variable.

E Expectations and market returns

In order to compare parental expected income and market returns, figure E8 presents a comparison between the sample distribution of expected income conditional on completion of primary or secondary school with the Macedonian national average net wage for the correspondent education and age group 25-34 group (blue dotted-dashed line) and the national minimum wage (green dashed line).³ The average sample expected income is lower than the national average and has the same magnitude as the minimum wage. This comparison shows that parents expect their children to be at the bottom of the wage distribution and earn the minimum wage. It is important to notice that interviewed parents are a marginalized group of poor households.

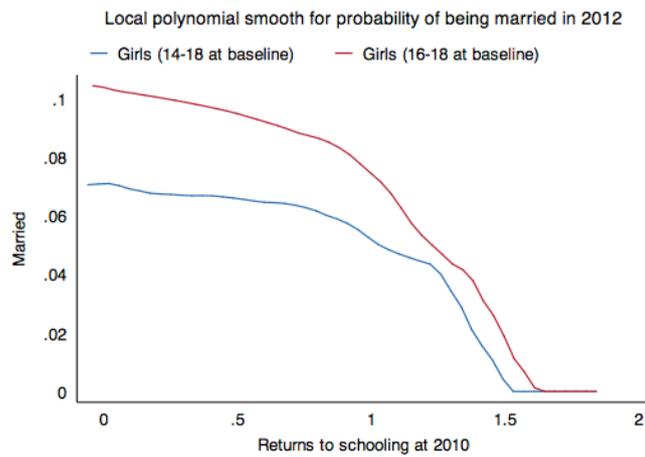
Figure E8: Comparison between expected income and market (net) wages



Note. The figure presents the sample distribution of expected (log)-income conditional on completing primary on the left and completing secondary school on the right, the national average net wage for the correspondent education and age group 25-34 in 2010 (blue dotted-dashed line), the national minimum wage (green dashed line) and the correspondent sample mean in USD (solid line). It is important to note that expected income is asked for age 25, while average wages are reported for the age group 25-34 year old. Data about wages has been made available by the Macedonian State Statistical Office. The magnitude of the minimum wage is the same as the parents' average expected wage conditional on primary and slightly lower than the expected wage conditional on secondary. Intuitively, this hints to parents having realistic expectations because the interviewed sample is a sample of poor households who expect their children to be poor as well in the future and be at the bottom of the wage distribution.

³It is however important to note that no national data is currently available to compute average wages at age 25 for different education group, while the only available comparison is with the age group 25-34 year old.

Figure E9: Parental perceived returns to schooling and marriage status



Note. The graph shows the local polynomial smooth of the probability to be married in 2012 on the perceived parental return to schooling at 2010. Dependent variable is equal to 1 if the girl is married in 2012 and 0 otherwise. In 2010 none of the girls is married.