

# Gender Wage Gap in Expectations and Realizations<sup>\*†</sup>

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May 19, 2004

## Abstract

Realized wages are affected by investments and signals concerning productivity, which workers undertake on the basis of expectations on future job prospects. Thus, also the gender wage gap is likely to depend on workers' expectations. Using data on wage expectations of students and wage realizations of graduates from the same University (Bocconi, Italy), we show that the expected gender gap one year after graduation is consistent with the realized gap. There is instead a misperception later in the career because students expect the gap to be roughly constant while realizations indicate an increasing gap with experience. There is also evidence that the gender gap at the beginning of a career is particularly high in the most recent cohorts and lower in the previous ones. Finally, our results suggest that the careers of females are characterized by "glass ceilings" in particular at high skill levels, and by "sticky floors" at the opposite end of the skill spectrum.

JEL Classification: J3, J7

Keywords: gender wage gap, expectations

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**\*This paper was submitted and a revision was requested by the then Editor Alison Booth before Andrea Ichino was invited to become editor of this journal. We would like to thank Alison Booth and two anonymous referees for very helpful comments and suggestions.**

<sup>†</sup>We would like to thank Bocconi University and Giorgio Brunello, Daniele Checchi, Claudio Lucifora and Rudolf Winter-Ebmer for providing us with some of the data analysed in this paper. The data used for the analysis are available from the authors with detailed information on the computations that are necessary to replicate results. We would like to thank also seminar participants at EALE 2003, AIEL 2002, Turin, Modena and European Commission for their valuable suggestions.

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# 1 Introduction

Realized wages are in part determined by investments in human capital and by costly signals concerning productivity, which workers undertake on the basis of their expectations concerning future job prospects. For this reason also the gender wage gap is likely to be affected in important ways by workers' expectations, as recently suggested by Breen and Garcia Penalosa (2002) and by Filippin (2003).

Consider for example a young couple of college graduates who are about to enter the labor market but who also want to form a family and have children. It is likely that soon or later in their life this couple will face the problem of deciding which member should take a more prestigious but demanding career and which one should instead accept a job more compatible with rearing children at the cost of a lower wage. If, for whatever reason, the expectation is that, in terms of returns, males will have a comparative advantage with respect to females in the prestigious career, it is conceivable that the couple will decide to let the male take it instead of the female. If this happens, later in the life of this couple we will observe a gender wage gap and different career paths which will depend ex post on undisputable differences in terms of labor market attachment and productivity, even if the two spouses were basically identical ex ante except for gender. Moreover, the observed different outcomes would be the result of perfectly "voluntary" and "conscious" choices. Thus it would be difficult to describe this situation as one of "conventional" discrimination because, ex post, it would not imply a "different pay for equal productivity". And yet, the fact that expectations diverge ex ante for the two genders affects the different outcomes ex post, and this may not be desirable and efficient depending on what determines

the original difference in expectations.

To explain why workers expectations may be an important determinant of the realized gender gap, Breen and Penalosa (2002) propose a model based on Bayesian updating in which, for each gender, the corresponding parent provides the information used by children to form expectations. Thus, past differences in preferences and choices over occupations across genders affect the beliefs of the current generation and may have long lasting consequences. Even when men and women become identical in their preferences, their career choices differ. Filippin (2003) goes one step further showing that expectations of being discriminated against can even be self-confirming in a game theoretical equilibrium and therefore may not fade away in the long run. Suppose that females infer from the available information that they are less likely to be promoted than males, because there are some discriminatory employers. The expectation of being discriminated against implies a lower return on some choice variables like for example labor market attachment. As a result females may be induced to change their decisions concerning these choice variables with respect to the situation in which no discrimination is expected. Observing a lower labor market attachment of females, also unbiased employers are more likely to promote males. Thus, in equilibrium, beliefs of being discriminated against are not contradicted by the evidence even if they are wrong.

These theoretical arguments are inspiring and plausible, but it is ultimately an empirical problem to establish whether the expectations of males and females concerning wages and career prospects can explain diverging ex post outcomes as suggested by Breen and Penalosa (2002) or by Filippin (2003). The goal of this paper is to shed light on this issue by providing evidence from a gender perspective on the correspondence between wage

expectations of students and wage realizations of graduates, using data collected from students and graduates of Bocconi University, a business and economics school in Milan, Italy. These subjects constitute a very homogeneous and selected group of high skilled individuals, which we have chosen on purpose to concentrate on workers whose characteristics and potential productivity should not differ very much by gender at the moment of entering the labor market. Moreover, in our data, the population of students is very similar to the population of graduates, so that the latter can be safely used to construct a good image of the realized wages for which students form their expectations. For individuals as homogeneous and high skilled as these ones we would think that there should be no reason to observe a gender gap in expectations and realizations, but this is not what we find.

Indeed, when we ask students to give an “explicit” indication of the gender gap they anticipate *coeteris paribus* one and ten years after graduation (the “explicit expected gap” in the rest of the paper), we find that these expectations range between 7.2% and 11.1%, depending on gender and distance from graduation. Moreover we also find that females always expect a higher gap than males. Interestingly, while more males than females think that “differences between men and women” explain this gap, a larger fraction of females points towards “employers’ discriminatory tastes” as one of its causes. It is plausible that such a combination of beliefs, whether right or wrong, might lead females to invest less in what is needed to perform well in the labor market (e.g. by allowing for the possibility to have more frequent interruptions in their careers).

We also ask students to indicate the wage that they expect to receive in the future and we use this information to compute the gender gap which is implicit in these expectations. When we compare this “implicit expected

gap” with wage realizations in the sample of graduates, we find a close correspondence between expectations and realizations one year after graduation. There is instead a misperception of the gender gap ten years after graduation because students wage expectations imply a gender gap which is roughly constant along the career, while realizations point towards a gap which increases with experience. The gender gap diminishes but does not disappear when several controls such as family background, place of birth, high school diploma, university program attended, performance at university, civil status and number of children are taken into account. Moreover, quite surprisingly, there is no evidence of a diminishing realized gender gap between subsequent cohorts of Bocconi graduates. On the contrary, the gender gap measured immediately after graduation shows a puzzling upward trend across cohorts.

When we distinguish between different levels of students performance, the best students appear to be characterized by a significant gender gap at the beginning of their careers, which is underestimated in expectations but which remains approximately constant with experience. For the worse students, instead, the gender gap is smaller and correctly anticipated at the beginning of a career, but it increases significantly with their working life and this growth is not expected. These differences between the best and the worse students, suggest that the careers of females are characterized by “glass ceilings” at high skill levels (i.e. females observe the higher wage levels of males in the same positions but can never reach those levels) and by “sticky floors” at the opposite end of the skill spectrum (i.e. males and females start from the same initial wage levels, but females remain stuck into these levels while males experience a more significant wage growth).<sup>1</sup>

It could be argued that our findings concerning wage realizations among

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<sup>1</sup>This terminology is borrowed from the article by Booth, Francesconi and Frank (2003).

graduates are biased by the fact that we cannot observe wages for females who have left the labor force after obtaining the degree. If this were the case, however, the gap we observe should be lower than the real one, because it is likely that the females who abandoned the market are those with the worse realized outcomes. Some of the females in our sample experienced work interruptions after graduation, but our point is that this may happen precisely because of diverging initial expectations. In any case, even when we focus on females and males with no children in order to restrict the analysis to individuals who are less likely to have experienced career interruptions, our results concerning wage realizations do not change much.

This collage of facts suggest that even in a very homogenous group of high skilled workers in which gender differences should not matter much for labor market outcomes, ex post wage realizations differ substantially between males and females and are at least partially reflected in their ex ante expectations. The finding of both an expected gap and a realized gap supports the hypotheses proposed by Breen and Penalosa (2002) and by Filippin (2003). It seems possible to conclude that females invest less in what is needed to perform well in the labor market also because they expect that for them the return on such investment would be lower than for males. Nevertheless, the observation of a realized gap immediately after graduation suggests that other explanations, such as discriminatory tastes, statistical discrimination or foreseen maternity leaves, matter as well.

The paper is organized as follows. Section 2 describes the dataset while Section 3 shows the econometric evidence and discusses the main results of the paper in connection with the existing literature. Section 4 analyzes whether the perception of the gender wage gap differs according to students' performance. Section 5 checks the robustness of our findings. Concluding

remarks follow in Section 6.

## 2 The dataset

Bocconi University is a private school of business and economics located in Milan. It is typically ranked among the best Italian universities in the field and attracts relatively skilled high school graduates from all over the country. There is no comprehensive comparative study on the placement records of different Italian universities in Economics, but the common perception is that Bocconi graduates typically do very well on the job market.<sup>2</sup>

As explained in more detail below, our data have three components. The first component concerns students expectations and has been obtained circulating an anonymous questionnaire (reported at the end of the paper) among second year Bocconi students. The questionnaire collects information concerning wage expectations as well as personal characteristics and family background. The second component originates from a questionnaire administered to a sample of Bocconi graduates, who have been asked about their current and past working situation, in addition to personal characteristics and family background. Finally, the third component comes from the administrative archives of Bocconi University where we obtained the educational curricula of the students and the graduates. Thanks to these different sources of data we have been able to obtain a clean matching between similar

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<sup>2</sup> A comparison of our data for Bocconi University with the data used by Checchi (2002) for the State University of Milan, shows that 92% of Bocconi graduates find a job within one year from graduation, while the analogous proportion is 46% among students of the other institution. Low response rates in the State University sample suggest, however, that the corresponding figure should be taken with caution.

It should also be noted that, on average 85 percent of the students who enroll at Bocconi University graduate within 6 years, and in some years the graduation rate is as high as 90 percent. As shown for example by Becker (2001), in other Italian universities graduation rates are typically much lower.

Bocconi students and Bocconi graduates.

## 2.1 Students: expected working situation

The questionnaire concerning students expectations was circulated by Bocconi staff attached to the course evaluation forms of the fall 2001. In this way most of the 2497 second year students received the questionnaire.<sup>3</sup> We got back complete reliable answers for 1154 questionnaires. Since the questionnaires were anonymous we had to use personal information like gender, date and province of birth to merge them with administrative data. Matching was successful for 887 observations. The remaining observations could not be merged either because of the incompleteness of the personal information (e.g. wage expectations, gender and/or date and/or province of birth missing) or because it was not possible to identify a unique counterpart of the questionnaire in the administrative data.

Despite this loss of observations, it is reassuring that descriptive statistics of the merged questionnaires do not significantly differ from those of the questionnaires which could not be merged. The only relevant difference that emerges is that among non-matched questionnaires there are fewer females (42.8 vs. 49.7 percent). Given that one of the purposes of this project is to check whether there are gender differentials in the expected working situation this might be a problem at first sight. However, breaking down matched and non-matched questionnaires across gender, the descriptive statistics of matched and non-matched males are similar. The same is true for the statistics of matched and non-matched females. So we can safely conclude that the missing information is missing almost randomly.

The questionnaire consists of three parts. The first part concerns the

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<sup>3</sup>Bocconi estimates that 75% of the students were attending the courses.

student's expected wage, occupation and sector of employment both one and ten years after graduation. The second part focuses directly on the gender wage gap, asking students about the percentage gender wage differential they expect. In more detail, students are asked to use their expected wage (set equal to one hundred) as a benchmark and to report what is the wage that they think would be earned by a student with the same characteristics as theirs but of the other gender. This is what we call the "explicit gender gap" in what follows, to stress the difference with respect to the gender gap implied by the comparison between the average expected wages of males and females in the sample, collected in the first part of the questionnaire.

Moreover, students who report an "explicit" gender gap different from zero are asked to choose among some possible explanations for such gap. The proposed explanations are tightly linked with different theories in the discrimination literature (e.g. discriminatory tastes, statistical discrimination, human capital approach).

Finally, the role of the last section, which collects information about personal data and family background, is twofold. On the one hand it makes it possible to merge the questionnaires with the administrative data. On the other hand, it provides a way to check the reliability of the responses to the other parts of the questionnaire, because some answers, like those concerning school performance, can be verified using the administrative data.

We have unfortunately no way to say how the students form their expectations. However, for the purpose of this paper, what matters is whether expected wages imply a gender gap independently of the base on which the expectations are formed. Moreover, what matters is how this expected gap, however formed, compares with the best proxy of its realisation, which, given the available information, can only be offered by the data on graduates. Of

course, if students were using information on the graduates they know to form their expectations, any evidence of difference between expectations and realizations (particularly ten years ahead) would have to be interpreted with greater care. However, our questionnaire asks each student to indicate the expected wage without saying anything on the information that he or she should use to answer. More specifically, the possibility to use information on previous Bocconi graduates to form expectations was never mentioned to the students.

## **2.2 Students and graduates: administrative data**

As already mentioned, information coming from the questionnaires circulated among students have been merged with Bocconi's administrative records. In addition to information about date of birth, place of birth, place of residence, etc. Bocconi's files keep track of students' high school background (name and place of the high school, type of diploma, grade obtained) and of all the details about student's university career (degree program; specialization; code, date and grade of all the passed exams). For the graduates, information about graduation (date, grade, etc.) is also available.

## **2.3 Graduates: working situation**

A sample of Bocconi graduates has also been interviewed in 2001 on behalf of the University Administration, collecting information about their current and past working situation. This dataset contains a large number of information, to be used also in other research projects. Here we use only the variables which are available also for students. It is important to keep in mind that the questionnaire circulated among Bocconi students has been designed to be compatible with the information available for graduates. Therefore, questions

have been designed to be as similar as possible to those asked in the survey of graduates. This latter has been conducted by the Research Institute CIRM. The target sample included all the 5091 graduates in four years: 1985, 1989, 1993 and 1997. CIRM selected a sample of 2802 students. However, 697 observations are disregarded because they contain missing values for crucial variables like wages, leading to a final sample of 2105 observations.

## 2.4 Interval measures for wages

Both students and graduates were asked to report their expected and actual wage choosing between income classes according to the scheme described in Table 1.<sup>4</sup>

Regressions in the paper are based on income measures obtained assigning a point estimate to every class. To be precise, we used the following rule. 75 percent of the upper bound was imputed for the lowest class; the mid point was imputed for each intermediate class and 125 percent of the lower bound was imputed for the highest class. This rule, as any other, is certainly arbitrary but it follows from the plausible assumption that the income distribution is uniform within each intermediate class, while being skewed toward the upper (lower) bound in the lowest (highest) class.<sup>5</sup> Robustness

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<sup>4</sup>The reason why Table 1 involves Euro cents is that in the questionnaires amounts were denominated in Lira, given that questionnaires have been circulated before the Euro became the official currency.

<sup>5</sup>It would be nice to cross-check the reliability of the self reported wages in our data set with more conventional data, but unfortunately the Italian Labor Force Survey does not contain information on wages and other representative surveys do not have sufficiently large cells for young college graduates. What we can do is to compare our data with the already mentioned data used by Checchi (2002) (see footnote 2) for the State University of Milan. This survey, for students who graduated in 1997, shows that the current net monthly wage (in 2001) is around 1132 euros on average, vs. 2093 euros for those who graduated in 1997 at Bocconi University (in the same year), as emerging from our data. However, this gap is likely to overestimate the actual difference, because in the survey of the State University of Milan the intervals of income were truncated at a relatively low level and roughly one third of graduates were in the highest income class. Keeping into

checks have been performed on this rule, with particular attention to the implications for gender differentials. Whenever possible, “Interval regressions”<sup>6</sup> have been compared to OLS regressions based on income data constructed with this rule, obtaining very similar results. Note, however, that it was possible to compare these two types of results only when current wages were used.<sup>7</sup> Yet, the similarity of OLS and Interval regression results when both were feasible is reassuring.

## 3 Results

### 3.1 Students’ expectations

Our first set of results concerns student expectations about the gender gap. Each student in our sample was asked the following question: “Setting to 100 your wage one year after graduation, how much do you think would be earned by a student with the same characteristics as yours but of the other gender?” (see questions 5 and 6), and similarly for the expectations ten years after graduation. On the basis of this question we could compute an “explicit expected gap” which is reported in Table 2. What appears immediately evident in this table is that both males and females explicitly expect a gap ranging from 7% to 11%.

The third row of the same table shows instead the gender gap which is implicit in the wages that the students expect to receive (see questions 2 and

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account the likely downward bias of the State University survey and the fact that Bocconi graduates have typically better labor market outcomes (see again footnote 2), we think that the self reported wages in our data are sufficiently reliable.

<sup>6</sup>See Stewart (1983).

<sup>7</sup>In fact, the wage at the time of graduation needs to be corrected for the CPI because in the sample of graduates individuals started working in different years even within the same cohort. This causes the intervals to be different (and overlapping) across individuals. Furthermore, when wage growth is used interval regressions are either useless or not feasible regardless of the correction for the CPI.

4). Also this implicit gap is substantial and actually higher than the explicit one.

The discrepancy between implicit and explicit gap might be due to the fact that while students have been asked to indicate the explicit gender gap referring to identical students of different genders, in the sample on which the implicit gap is computed males and females have different characteristics. It is however reassuring that among those who expect explicitly a gap one year after graduation the implicit gap is 16.1%, while for those who do not expect any gap explicitly, the implicit gap is 3.6% and is not significantly different from zero, controlling for observable characteristics. Results are similar for expectations 10 years after graduation where the corresponding figures are 22.2% and 4.9%. We interpret these results as evidence in favor of the internal consistency of the dataset.

Independently of this discrepancy the important point is that, whether implicitly or explicitly, the students in our sample expect a substantial gap even if they are very homogeneous in terms of human capital and personal characteristics. This first result is in itself striking and worth attention.

Moreover, it is interesting to see how students themselves explain these expectations. This is done in Table 3 which reports the fraction of positive answers to question 7 of the questionnaire reported in the Appendix. In this question, students who had previously indicated explicitly to expect a gender gap were asked whether they agreed on the fact that one or more of four possible reasons might be responsible for the gap. While more males than females think that “actual differences between men and women” matter, a larger fraction of females points towards “employers’ discriminatory tastes” as one of the causes for the expected gap. No gender differences emerge in the fraction of students who consider the existence of “different household

duties” or the fact that “employers expect different productivities” for the two genders as the reasons for the gap. Thus, not only females expect a higher gap than males, but they are also more likely than males to think that the gap is due to discriminatory tastes of employers. It is plausible that such a combination of beliefs, whether right or wrong, might lead females to invest less in what is needed to perform well in the labor market.<sup>8</sup>

To what extent these expectations correspond to realizations is discussed in the next section.

### 3.2 Comparison between expectations and realizations

Table 4 shows the gender wage gap derived from:

1. the wages that students in 2001 expect to earn one and ten years after graduation (respectively  $t_0$  and  $t_1$ );
2. the wages earned by the four cohorts of Bocconi graduates. For these cohorts  $t_0$  stands for the first wage earned, while  $t_1$  stands for the current (2001) wage. Note, therefore, that for graduates the number of years between  $t_0$  and  $t_1$  is not necessarily equal to nine. All the wages are real, having the wages in  $t_0$  been corrected for the variation of the CPI.

Results in Table 4 are obtained, without controls, from the following basic regression

$$W_{\tau}^k = \alpha^k + \beta^k F + \varepsilon^k \quad (1)$$

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<sup>8</sup>We have in mind in particular sector choices and career interruptions, since in our data there seems to be no evidence that females exert less effort in school. In all our cohorts, females and males have very similar average grades. This finding might also indicate that education, in our sample, has a strong consumption component.

where  $W$  is the logarithm of expected or actual wages at  $\tau = t_0$  or  $\tau = t_1$ ,  $F$  is a dummy taking value one for females,  $\varepsilon$  is a disturbance term and  $k$  is the cohort. For each expected or actual wage measure the coefficient reported in the table is  $\beta$ , which approximates the percentage gender wage gap: for example -0.097 in the top left part of the table means that wage expectations of females are 9.7 percent lower than wage expectations of males. Note that in this table, and in the similar ones that follow, figures in the  $t_0$  row are comparable being measures of the gender gap at the beginning of a career. Figures in the  $t_1$  row are less easily comparable because they are measures of the gender gap at different levels of experience (10 years for students' expectations, 16 years for the 1985 cohort, etc.). However, comparisons within columns are possible as long as it is kept in mind that they give measures of how the gender gap evolves during the working life in different cohorts and for different intervals of experience.

Four facts are immediately evident in Table 4. First, the gender gap expected by students one year after graduation is very similar to the gender gap experienced by the youngest cohort of graduates (1997). Second, the expected gender gap ten years after graduation seems to heavily underestimate the actual gender wage gap. The gap that students expect ten years after graduation is even lower than the gap that those graduated in 1997 experienced only four years after graduation. Third, the actual gender gap immediately after graduation shows a rather intriguing upward trend across subsequent cohorts: this gap is three times larger for the 1997 cohort than for the 1985 cohort. Fourth, both the actual and the expected gender gap increase with labor market experience, but the former seems to increase more.

How does the picture change when controls are included? Table 5 displays the percentage gender wage gap when several characteristics, like family back-

ground, place of birth, high school diploma, university program attended, performance at university, civil status and number of children are added to equation 1. The magnitude of the gender gap decreases in most of the cases when controls are included. This is not surprising given the important role played in particular by the civil status and the number of children in explaining the different achievement of males and females in the labor market. However, there is a remarkable exception: the youngest cohort. Although it is intuitive that the younger the cohort the smaller the importance of civil status and number of children as controls, it is striking that for those who graduated in 1997 the gender wage gap is even higher when controls are included. Moreover, the upward trend across cohorts in the gender gap immediately after graduation is still present when controls are included, which is a result worth particular attention.

As far as expectations are concerned, the expected gender gap one year after graduation is roughly correct even when individual characteristics are controlled for. Similarly, the inclusion of controls does not alter the finding that students heavily underestimate the expected gender gap ten years after graduation. Even when controls are included the gap that students expect ten years after graduation is lower than the gap characterizing those who graduated in 1997 only four years after graduation. In the light of the theory proposed by Filippin (2003), this result implies that beliefs are contradicted by the evidence as long as the realizations of the previous cohorts are a good indicator of the realizations for current students. Hence, the conditions behind the self-confirming equilibrium would be violated and the learning process should continue.

As we said, the figures in the  $t_1$  row are not directly comparable across columns because the time since first job is different for every cohort. Table

6 gets rid of the problem using the annual growth of expected and actual wages as dependent variable. More specifically, the basic estimated equation is

$$\frac{\Delta W^k}{t_1 - t_0} = \delta^k + \gamma^k F + \eta^k \quad (2)$$

where, for every cohort  $k$ ,  $\Delta W^k$  is the difference of the logarithm of expected or actual wages between  $t_1$  and  $t_0$  and  $t_1 - t_0$  is measured in years without rounding. For each expected or actual wage measure, the coefficient reported in the table is  $\gamma$ , which approximates the gender gap in the yearly growth of wages. The first row of the table reports the uncontrolled estimates, while the second row reports results obtained controlling for observable characteristics like family background, place of birth, high school diploma, university program attended, performance at university, civil status and number of children. For example -0.037 in the bottom right part of the table means that within the cohort of those who graduated in 1997 wages of females grew 3.7% less than wages of males for every year once controls are included. Table 6 confirms that students do not guess correctly the growth over time of the gender gap. In fact, they do not expect the gender gap to increase significantly, while this is an undisputable fact observable in the wage realizations of graduates.

### 3.3 Three main findings

Summarizing the findings of this section, a first important result is that in our data there is no evidence of a decreasing gender gap over time, i.e. across subsequent cohorts of Bocconi graduates, at the beginning of a career. On the contrary, our evidence points toward an increase of the gender gap in recent years, and in particular for the 1993 and 1997 cohorts.

This result is striking because several recent studies indicate that the

gender wage gap has been narrowing since the '70s in most industrialized countries (see for example Blau and Kahn, 1996 and 1997). Specifically for the US, Datta Gupta, Oaxaca and Smith (2001) show a clear decline of the gender wage gap during the 1980s. As far as the United Kingdom is concerned, Blundell, Gosling, Ichimura and Meghir (2002) show that gender wage differentials have fallen for younger highly educated workers between 1978 and 1998. Similarly, Fitzenberger and Wunderlich (2002) find that the gender wage gap for full-time employed workers decreased considerably during the period 1975-95, particularly in the lower part of the wage distribution. Also in Italy the gender gap has been estimated to be narrowing by Flabbi (1997) who reports that gender differentials decreased from about 30% in 1977 to less than 20% in 1995. Only Scandinavian countries do not display a similar pattern, as reported by Datta Gupta, Oaxaca and Smith (2001), but in these countries the gender wage gap was already very small and still is among the lowest in the world.

Moreover, evidence of a narrowing gender gap between subsequent cohorts is somehow in line with the predictions of the most representative theoretical contributions within the discrimination literature. For example, both the discriminatory taste approach (Becker, 1957) and the statistical discrimination model (Arrow, 1973) have been criticized on the ground that gender differentials should not survive in the long run. A gender wage gap could persist in the long run in the presence of self-confirming expectations, as suggested by Filippin (2003). But even in this case there would be no reason to expect an increasing gap. Hence, it is rather puzzling to find such a pattern in the data analysed in this paper.

We can think of only one plausible reason explaining the difference of our results with respect to the literature. The increasing gender wage gap dis-

played in our data could be a consequence of the fading effects of the cost of living adjustment called *Scala Mobile* which prevailed in Italy during the '80s and which was abolished in 1992. As explained, for example, in Erickson and Ichino (1994) the design of this adjustment scheme implied a strong compression of wage differentials of all kinds and in particular on the gender wage gap. The abolition of the *Scala Mobile* is likely to have allowed an expansion of wage differentials which had been previously artificially compressed.

A second result of this section is that the gender wage gap is increasing in the first part of the working life. In the literature, a few longitudinal studies provide evidence about the time profile of the gender gap within cohorts. Loprest (1992) finds an 11 percent gender wage gap at hiring within a sample of US young workers of all education levels during the period 1978-83. This gap increases in the first years after hiring and then decreases later during the working life. Light and Ureta (1995) present similar evidence. Kunze (2002) studies the evolution of the gender wage gap within the early stages of careers in Germany. She finds a gender gap of approximately 25 percent for the entry wages of skilled workers trained in vocational schools, but in contrast with the above studies, this gap remains roughly constant during the first eight years after hiring.

A third result is that students' expectations appear to internalize correctly the existence of a gender gap at the beginning of the career, but fail to capture that such a gap is increasing during the working life. We are aware of only one paper to which this result can be compared, i.e. the paper by Brunello, Lucifora and Winter-Ebmer (2001) who collected a dataset containing information about wage expectations of more than 6000 European college students, although they do not have information on wage realizations and they are not interested in a gender perspective. The authors kindly gave

us access to summary statistics of their data from which we could analyse wage expectations by gender. Focussing on the countries where at least 500 observations are available, data suggest the existence of large differences in expectations across countries. The expected gender gap one year after graduation ranges from 9.2% in Switzerland to 18.7% in Germany, with Italy and Portugal situated in the middle with a gap of 12.6% and 16% respectively. As far as Italy is concerned, their figure differs from ours (9.7% in Table 4) but it should be noticed that their sample of Italian students does not include Bocconi University. The cross country differences are less evident when looking at the expected gender gap ten years after graduation. In this case the gap is very similar in Germany and Switzerland (23.3% and 23.8%, respectively) while it is slightly higher in Portugal (26.5%) and Italy (28.3%). The corresponding figure in our dataset is 13.9%, which indicates that Bocconi students have expectations about the shape of the gender gap during the working life that significantly differ from the expectations of other Italian students.

## **4 Wage expectations and realizations at different levels of educational performance**

In order to deepen our analysis of the relationship between wage expectations and wage realizations, in this section we stratify the sample of students and graduates according to their educational performance. Two slightly different stratification procedures have been used for graduates and students.

Using administrative data on the entire population of Bocconi graduates (i.e. not just the graduates interviewed by CIRM) the average grade in all exams that separates the top 25% and the bottom 25% of the population is used to define the best and the worse performing students. This is done

separately for each cohort, since grades are likely to be comparable only within cohorts (see the last four rows of Table 7, for the relevant percentiles of the distributions of graduates).

As far as students are concerned, using again population data from administrative records, the top and bottom 25% thresholds are identified according to a performance variable that summarizes how many exams have been passed during the first year, weighted according to their difficulty and the grade obtained (see the first row of Table 7 for the relevant percentiles of the distribution of students ).<sup>9</sup>

Table 8 shows the frequencies of top and bottom performers in our samples of graduates and students, using the thresholds defined above for the respective populations. If the samples corresponded exactly to the populations these frequencies should always be equal to 25%, but this is clearly not the case. In particular, they are slightly smaller for the top group of graduates and this might be due to the fact that top graduates are more likely to earn higher wages and, for this reason, to be under-represented in the sample since they refused to answer the income question in the CIRM questionnaire. As far as students are concerned the frequency in the top group is almost 10 points higher than 25%, which may be due to the fact that students not

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<sup>9</sup>To provide more information on the dispersion of the performance indicators for students and graduates, Table 7 displays also other percentiles of the corresponding distributions.

Note that the average grade during the university career, which has a support from 18 to 30, is a statistic that summarizes quite well the performance of Bocconi graduates. In fact, the study plan of all graduates across degree programs is comparable in terms of difficulty and time required to pass exams. For students, on the other hand, the average grade would be a very bad statistic. In fact, at the beginning of the second year there is a huge variation in the number of passed exams and in their difficulty. For this reason, we decided to construct a variable that weights all these aspects, with a support from 0 to 100. This “performance” variable is a summary statistic of the grades obtained, weighted by the difficulty of each exam as measured by the number of credits assigned by Bocconi University. In this way a precise proxy is derived, capturing both the number of exams and their difficulty, as well as the grade obtained.

attending classes are more likely to be worse performers and did not receive the questionnaire.<sup>10</sup>

On the basis of the stratification described above we have replicated the analysis of the previous section separately for top, intermediate and bottom students, in order to see whether the comparison between wage expectations and wage realizations differs according to educational performance. The analysis is performed pooling together the four cohorts of graduates because the sample size was not large enough to allow for the distinction between performance levels within each cohort separately. However, we include years since graduation into the regressions to control for experience.

Results obtained controlling for observable characteristics are presented in Table 9 for the gender gap measured immediately after graduation and in Table 10 for the yearly growth of this gap.

The first interesting fact emerging from these tables is that top students clearly underestimate the gender gap at the beginning of a career ( $t_0$ ), while the guess of intermediate and bottom students is more accurate. This result hints at the possibility that top performing students may start their working career under the presumption that the human capital acquired in school is going to be the main determinant of success in the labor market, while reality is instead different.

A second striking set of facts is offered by the comparison between graduates in the two tables. In the top performance group we see the largest gender gap at the beginning of the career (see Table 9). However, the growth of the gender gap along the working life is larger in the intermediate and bottom performance group (see Table 10).

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<sup>10</sup>Remember that the students' questionnaires were attached to the evaluation forms of some courses. Therefore, our students sample has been drawn from the population of students still attending courses at the end of the term.

These results suggest the possibility of different patterns of job assignment between males and females at different stages of a career and at different levels of the occupational hierarchy. For example, in the case of the top graduates, wage differences, possibly due to different job assignments, seem to emerge immediately after graduation and to persist more or less constantly along the career. A different pattern characterizes instead the worse graduates. Here the evidence suggests that not only wages differ already at the beginning of the career, but also that the difference increases along the working life. As a result, the gender wage gap increases with experience. Borrowing from the terminology suggested by Booth, Francesconi and Frank (2003), this evidence is consistent with the existence of “glass ceilings” for highly skilled female graduates who are excluded since the very beginning of their careers from the same wage prospects offered to males of similar ability. Since results do not change when restricting the attention to females without children, it seems plausible to interpret the different job assignment as an insurance against maternity leaves that the employers can freely access. At the same time, our evidence suggests that at the opposite end of the skill spectrum unskilled females experience “sticky floors” which prevent them from enjoying during their careers the same wage growth of their male counterparts.

## **5 Robustness and sample selection**

We have already explained that the reason for focusing on a very selected and homogeneous sample of workers is that in such a group of individuals differences in wage expectations and wage realizations should be less likely to emerge. Thus, it is precisely the nature of our sample that makes our results striking. There are, however, other important ways in which a non random selection of subjects in our sample may affect the results we obtain and their

interpretation. This section is devoted to a brief discussion of the robustness of our results with respect to these selection issues.

First, our analysis focuses on wages and therefore excludes subjects who are not employed at the moment of observation. If this exclusion affected females and males randomly it would not be a problem, but since labor market participation is typically higher for males than for females, the latter are more likely to be excluded because a wage is not observed for them at the moment of the interview. This is certainly generating a bias in the measurement of the gender gap with respect to the hypothetical situation in which subjects of both genders worked with the same probability. It is, however, a bias that reinforces our results, because non-participating females are likely to earn lower wages in the market. Hence, if they were included in our sample of graduates the observed gender gap would actually be larger than the one we estimate. In any case, Table 11 shows that, pooling all cohorts together, 94% of the subjects in our sample of Bocconi graduates are employed at the time of the interview (i.e. 2001). More importantly from the viewpoint of this paper, the fraction of females working in 2001 (33.31%) is basically identical to the fraction of females interviewed (33.35%), which shows that among Bocconi graduates females are as likely to work as males. These results are basically confirmed within each cohort taken separately.

Second, we have shown that the gender gap increases along the life cycle within each cohort of graduates but this increase is underestimated by students' expectations. It could be argued that the growing realized gap reflects a discontinuous labor market participation by females who are more likely than males to go through career breaks. If this were the case, students would underestimate the growth of the gap either because they underestimate the occurrence of career breaks or because they underestimate their consequences

in terms of wages.

As far as this problem is concerned it should first be noted that labor market attachment is precisely one of the characteristics on which females may invest less because of their expectations on the gender gap. So if this were the reason for the observed gap it would be perfectly in line with the theoretical arguments proposed by Breen and Penalosa (2002) and by Filippin (2003).

Nevertheless it is interesting to evaluate how much of the observed gap remains when we compare males and females with the most similar career patterns as far as labor market attachment is concerned. Given the available information in our dataset, the indicator that we can use to identify subjects for this more focused comparison is the presence of children. If family duties are one of the determinants of career breaks for females, the absence of children should reduce the likelihood of such breaks, thereby eliminating one of the determinants of the growing wage gap during the life cycle. In Table 12 we perform the same regressions of Table 5 for the sample of graduates but we restrict the analysis to males and females with no children. In the first column all cohorts are pooled together and a significant wage gap is estimated both immediately after graduation (13%) and in 2001 (21%). Although this second date corresponds to different moments in the lifecycles of each cohort, this result undoubtedly indicates that even in the absence of children the gender wage gap is significant and grows with the life cycle. The point estimates in the last four columns of Table 12 are very similar in terms of size and significance to the corresponding point estimates of the last four columns of Table 5, even if in some cases (e.g. the 1985 cohort) the sample size is reduced substantially.<sup>11</sup>

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<sup>11</sup>If we perform these estimates excluding only females with children but leaving in the

Thus, the evidence of a growing gender wage gap in the absence of children is compatible with the possibility that, independently of family duties, females suffer some form of discrimination. And, as we already noted, this result is particularly striking in a sample of very homogeneous and highly skilled workers as the one constituted by the graduates of Bocconi University.

## 6 Conclusions

The evidence presented in this paper points towards some interesting findings. We first show that even in a sample in which males and females are very similar in terms of human capital and personal characteristics, subjects expect on average a substantial gender wage gap of approximately 10%. While more males than females attribute these expectations to the existence of “actual differences between men and women”, a larger fraction of females points towards “employers’ discriminatory tastes” as one of the causes for the expected gap. The existence of such a combination of beliefs might induce females to invest less in what is needed to perform well in the labor market.

We also show that the gender gap implied by students’ expectations one year after graduation is consistent with the gender gap observed in the actual earnings of their older counterparts who already graduated. There is instead a misperception of the gender gap ten years after graduation because students expect the gender gap to be roughly constant while realizations point toward an increasing gap with tenure. The gender gap diminishes but does not disappear when several controls such as family background, place of birth, high school diploma, university program attended, performance at university, civil status and number of children are taken into account.

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sample males with children (i.e. assuming that for males having children or not does not make any difference), leads to results that are even more similar to those of Table 5.

A second set of intriguing results concerns the evidence on realized gender gaps independently of expectations. Here, in contrast with the recent literature for industrialized countries, we see no evidence of a diminishing gender gap between subsequent cohorts of Bocconi graduates at the beginning of a career. In particular, the gender gap immediately after graduation displays a puzzling upward trend and reaches particularly high and significant values in the most recent 1997 cohort. This result is likely to be a consequence of the elimination of the cost of living adjustment scheme called Scala Mobile which prevailed in Italy during the '80s and was abolished in 1992.

This collage of results is in line with the hypotheses proposed by Breen and Penalosa (2002) and by Filippin (2003) on the relevance of expectations as one of the determinants of gender wage gaps. Nevertheless other explanations, such as discriminatory tastes, statistical discrimination or anticipated maternity leaves, are also supported by our results. This is indicated by the fact that a gender wage gap is observed in our data even immediately after graduation, when males and females in our sample are basically “identical”, except for gender, and certainly more similar than at any other point in their careers.

Finally, while the gender wage gap for the best graduates is large already at the beginning of a career but remains more or less constant throughout the working life, for the worse graduates the gender gap starts slightly lower but increases more significantly with experience. These results suggest that the careers of females are characterized by “glass ceilings” in particular at high skill levels, and by “sticky floors” at the opposite end of the skill spectrum. Unfortunately, our data do not allow to shed more light on the real nature and on the determinants of these differences in career developments.

The existence of gender differences of this kind, even in a very homo-

geneous group of high skilled workers like the one constituted by Bocconi graduates, is striking and clearly calls for more research and better data.

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Table 1: Classes of income in the questionnaires

	up to 1032.91
from 1032.91	up to 2065.83
from 2065.83	up to 3098.74
from 3098.74	up to 4131.66
from 4131.66	up to 5164.57
from 5164.57	

Note: Monthly income net of taxes and contributions at 2001 prices (in Euros).

Table 2: The expected gap

	1 year	10 years
Explicit expected gap (Males)	-7.6%	-7.2%
Explicit expected gap (Females)	-8.1%	-11.1%
Implicit expected gap	-9.7%	-13.9%

Note: percentage wage gap as explicitly reported by males (row 1) and females (row 2) or as computed implicitly starting from the expected wages (row 3)

Table 3: Reasons behind the gender gap

	Males	Females
Actual differences between men and women	18.3	10.9
Employers have discriminatory tastes	20.1	31.9
Employers expect different productivity	15.0	16.4
Different household duties	12.6	12.5

Note: fraction of students indicating that the row heading is a possible explanation of the expected gap, over the total of students who expect explicitly a gap (see question 7 of the questionnaire in the appendix).

Table 4: Percentage gender wage gap - uncontrolled

Cohort:	Students	grad85	grad89	grad93	grad97
N. obs:	887	234	469	637	765
$t_0$	-0.097*** (0.027)	-0.024 (0.053)	-0.030 (0.032)	-0.063** (0.029)	-0.096*** (0.026)
$t_1$	-0.139*** (0.026)	-0.569*** (0.068)	-0.423*** (0.048)	-0.263*** (0.037)	-0.158*** (0.030)

Note: standard errors in parentheses with  $p < 0.1 = *$ ,  $p < 0.05 = **$ ,  $p < 0.01 = ***$ .  
The column labels “grad\*\*\*” indicate the 19\*\* cohort of graduates.  
 $t_0$  = students’ expected wage 1 year after graduation; 1st wage earned by graduates  
 $t_1$  = students’ expected wage 10 years after graduation; graduates’ current wage  
Percentage gap computed on real wages (2001 prices).

Table 5: Percentage gender wage gap - controlled

Cohort:	Students	grad85	grad89	grad93	grad97
N. obs:	887	234	469	637	765
$t_0$	-0.082*** (0.027)	-0.014 (0.121)	-0.023 (0.064)	-0.069 (0.044)	-0.125*** (0.029)
$t_1$	-0.102*** (0.026)	-0.438** (0.157)	-0.150* (0.094)	-0.184*** (0.056)	-0.164*** (0.033)

Note: standard errors in parentheses with  $p < 0.1 = *$ ,  $p < 0.05 = **$ ,  $p < 0.01 = ***$ .  
Controls: high school diploma, family background, household business, degree program, place of birth, performance at university, civil status and number of children. For graduates, also part-time work is used as control.  
The column labels “grad\*\*\*” indicate the 19\*\* cohort of graduates.  
 $t_0$  = students’ expected wage 1 year after graduation; 1st wage earned by graduates  
 $t_1$  = students’ expected wage 10 years after graduation; graduates’ current wage  
Percentage gap computed on real wages (2001 prices).

Table 6: Annual growth of the gender wage gap

Cohort:	Students	grad85	grad89	grad93	grad97
N. obs:	887	234	469	637	765
uncontrolled	-0.017* (0.010)	-0.081*** (0.020)	-0.079*** (0.014)	-0.064*** (0.013)	-0.049*** (0.017)
controlled	-0.010 (0.010)	-0.067* (0.040)	-0.033 (0.027)	-0.038* (0.021)	-0.037* (0.020)

Note: standard errors in parentheses with  $p < 0.1 = *$ ,  $p < 0.05 = **$ ,  $p < 0.01 = ***$   
 Controls: family background, place of birth, high school diploma, university program attended, performance at university, civil status and number of children.  
 For graduates, also part-time work is used as control.  
 The column labels “grad\*\*\*” indicate the 19\*\* cohort of graduates.

Table 7: stratification by educational performance

percentile	10	25	50	75	90
students	22.03	38.93	53.02	60.36	64.14
grad 85	23.42	24.37	25.80	27.15	28.13
grad 89	23.29	24.45	25.67	27.12	28.31
grad 93	23.89	25.20	26.66	27.82	28.59
grad 97	24.59	25.72	26.87	27.89	28.62

Note: For students the performance indicator is a summary statistic of the grades obtained during the first year, weighted by the difficulty of each exam as measured by the number of credits assigned by Bocconi University. It has support  $[0, 100]$ .  
 For graduates the performance indicator is the average grade during the university career and has support:  $[18, 30]$ .

Table 8: Distribution of “top” and “bottom” subjects in each cohort according to performance

Group	% of “top”	% of “bottom”
Cohort 85	17.95	27.35
Cohort 89	21.11	24.31
Cohort 93	21.19	25.75
Cohort 97	23.01	24.71
2nd yr stud	34.22	12.86

Note: “top” (“bottom”) subjects are those whose indicator of performance is higher (lower) than the 75th (25th) percentile of the corresponding distribution of educational performance.

Table 9: Expected and realized gender gap one year after graduation, by educational performance and controlling for observable characteristics

	top Stud.	top Grad.	medium Stud.	medium Grad.	bottom Stud.	bottom Grad.
N. obs:	288	452	466	1122	133	531
Female	-0.038 (0.048)	-0.166*** (0.053)	-0.087** (0.037)	-0.118*** (0.029)	-0.134* (0.076)	-0.139*** (0.050)

Note: standard errors in parentheses with  $p < 0.1 = *$ ,  $p < 0.05 = **$ ,  $p < 0.01 = ***$ .

Dependent variable: log of real wage.

Controls: family background, place of birth, high school diploma, university program attended, civil status and number of children. For graduates, also time since graduation and part-time work are used as control.

Table 10: Expected and realized gender gap growth, by educational performance and controlling for observable characteristics

	top Stud.	top Grad.	medium Stud.	medium Grad.	bottom Stud.	bottom Grad.
N. obs:	288	452	466	1122	133	531
Female	-0.008 (0.005)	-0.012 (0.016)	-0.002 (0.004)	-0.017* (0.009)	0.005 (0.008)	-0.049*** (0.015)

Note: standard errors in parentheses with  $p < 0.1 = *$ ,  $p < 0.05 = **$ ,  $p < 0.01 = ***$ .

Dependent variable: real wage growth.

Controls: family background, place of birth, high school diploma, university program attended, civil status and number of children. For graduates, also time since graduation and part-time work are used as control.

Table 11: Fraction of females in the sample of Bocconi graduates

	Pooled	Grad85	Grad89	Grad93	Grad97
% of female graduates	33.35	22.41	26.78	35.61	40.04
N. of graduates	2802	348	631	834	989
% of working females in 2001	33.31	21.36	26.63	35.08	40.17
N. of working graduates in 2001	2645	323	597	784	941

Table 12: Percentage gender wage gap - controlled and computed only for workers without children

	pooled	grad85	grad89	grad93	grad97
N. obs:	1430	63	187	440	740
$t_0$	-0.131*** (0.024)	-0.032 (0.153)	-0.091 (0.072)	-0.058 (0.046)	-0.124*** (0.029)
$t_1$	-0.215*** (0.029)	-0.531*** (0.180)	-0.143 (0.108)	-0.162*** (0.058)	-0.164*** (0.033)

Note: standard errors in parentheses with  $p < 0.1 = *$ ,  $p < 0.05 = **$ ,  $p < 0.01 = ***$ .  
 Controls: high school diploma, family background, household business, degree program, place of birth, performance at university, civil status and number of children. For graduates, also part-time work is used as control.

The column labels “grad\*\*” indicate the 19\*\* cohort of graduates.

$t_0$  = students’ expected wage 1 year after graduation; 1st wage earned by graduates

$t_1$  = students’ expected wage 10 years after graduation; graduates’ current wage

Percentage gap computed on real wages (2001 prices).

# Occupation and income expectations of Bocconi students

Dear Student, we kindly ask you to fill this questionnaire concerning entrance in the labor market. Please consider that data are collected for the sole purpose of scientific research and that results will be circulated referring to aggregate statistics only.

1. After graduation do you expect to work in a household business?  YES  NO

2. Your occupation will more likely be:  
**Paid Employment**

	1 year after graduation (one choice)	10 years after graduation (one choice)
White collar.....	<input type="checkbox"/>	<input type="checkbox"/>
Middle manager.....	<input type="checkbox"/>	<input type="checkbox"/>
General manager.....	<input type="checkbox"/>	<input type="checkbox"/>
Secondary school teacher.....	<input type="checkbox"/>	<input type="checkbox"/>
University teacher.....	<input type="checkbox"/>	<input type="checkbox"/>
Other paid employment (GIVE DETAILS).....	_____	_____

**Self Employment**

Business consultant.....	<input type="checkbox"/>	<input type="checkbox"/>
Professional (non business consultant).....	<input type="checkbox"/>	<input type="checkbox"/>
Entrepreneur.....	<input type="checkbox"/>	<input type="checkbox"/>
Other self employment (GIVE DETAILS).....	_____	_____

3. In which sector? (one choice)

manufacturing  finance  public  trade  other (GIVE DETAILS) \_\_\_\_\_

4. How much do you think your monthly labour income net of taxes and contributions will be (at constant prices)

	1 year after graduation	10 years after graduation
Less than L. 2.000.000.....	<input type="checkbox"/>	<input type="checkbox"/>
L.2.001.000 - L.4.000.000.....	<input type="checkbox"/>	<input type="checkbox"/>
L.4.001.000 - L.6.000.000.....	<input type="checkbox"/>	<input type="checkbox"/>
L.6.001.000 - L.8.000.000.....	<input type="checkbox"/>	<input type="checkbox"/>
L.8.001.000 - L.10.000.000.....	<input type="checkbox"/>	<input type="checkbox"/>
More than L. 10.000.000.....	<input type="checkbox"/>	<input type="checkbox"/>

5. Setting to 100 your wage 1 year after graduation, how much do you think would be earned by a student with the same characteristics as yours but of the other gender?

50  60  70  80  90  100  110  120  130  140  150

6. Setting to 100 your wage 10 year after graduation, how much do you think would be earned by a student with the same characteristics as yours but of the other gender?

50  60  70  80  90  100  110  120  130  140  150

7. If your answer in 5 and/or 6 was different from 100: why? (multiple choices allowed)

- Characteristics and aptitudes actually differ between males and females
- Different distribution of household duties
- Employers expect different characteristics between males and females
- Employers' tastes given equal characteristics and household duties

8. Year

2^  3^  4^  F.C.

9. Degree Program

CLE  CLEA  CLAPI  CLELI  CLG  CLEFIN  CLEACC

10. Province of birth

\_\_\_\_\_

11. Gender

Male  Female

12. Date of birth

\_\_\_\_ \ \_\_\_\_ \ \_\_\_\_

13. Nr. of passed exams

\_\_\_\_\_

14. Average grade

\_\_\_\_\_

15. Education of the father

PRIMARY  SECONDARY  COLLEGE  UNIVERSITY

16. Education of the mother

PRIMARY  SECONDARY  COLLEGE  UNIVERSITY

17. Father's occupation

\_\_\_\_\_

18. Mother's occupation

\_\_\_\_\_

19. Tuition category

1^  2^  3^  4^  5^  6^

Thanks for your cooperation