The Decreasing Returns to Experience for Higher Education Graduates in France: an Occupational Analysis

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Abstract

This article evidences decreasing returns to experience between 1998 and 2010 for long higher education graduates on the French labor market. Returns remain stable for high school drop-outs, high school graduates, and short higher education graduates (below masters level). I decompose differences in average wage growth by occupation into an extensive and intensive margin. The extensive margin is driven by the composition effect from differences in shares of the 1998 and 2010 cohorts entering each occupation. The intensive margin rests on the change in annual wage growth by occupation. Occupations who display a negative intensive margin are also the ones who exhibit a large and positive extensive margin. This finding is consistent with decreasing returns to new graduates in each occupation. I then study two mechanisms behind the wage growth slow down: access to managerial positions and impact of initial match quality. I find access to managerial positions is more infrequent for recent cohorts. I also find that initial match quality has not worsened between the 1998 and 2010 cohorts, but its impact on future wages has become more enduring.

Keywords: Wage Return, Educational Changes, Higher Education
JEL Codes: J2, I2

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1 Introduction

The conditions of young people's professional integration have been the subject of a substantial economic literature since the recession that affected the world economy in the late 2000s and early 2010s. A subset of this literature, to which this article belongs, focuses on the impact of conditions encountered by a cohort, or generation, i.e. a set of individuals who entered the labour market at the same time, on wage growth of said cohort in the medium term. I use the French 'Generations' surveys made available by the CEREQ (Centre d'Etudes et de Recherche sur les Qualifications) to highlight the deteriorated growth of young higher education graduate's average salary in France for cohorts that entered the labour market in 2004 and 2010 versus in 1998.

Worsened entry conditions' impact on workers' career has been studied for a wide variety of worker profiles and countries: Oreopoulos et al. (2012) analyse the negative effect of the 2008 recession on the careers of college graduates in the US. Brunner and Kuhn (2014) differentiate the analysis by socio-professional category in Austria and show that the recession particularly affected blue-collar workers, as they are stuck in low-quality jobs longer than white-collar workers. Genda et al. (2010) compare the United States and Japan and find different effects depending on the country: low-educated men in Japan suffer persistent negative effects on their careers, while low-educated Americans face only temporary effects. The penalisation of medium- and long-term career progression by entering the labour market in a recession is referred to in the literature as the 'scarring effect'. In France, Gaini et al. (2013) study cohorts leaving the school system between 1982 and 2010 and conclude that entering the labour market during a crisis results in a lower short-term employment rate. More recently, Rothstein (2020) highlights a short- and medium-term decline in the wages of young university graduates in the United States that starts in 2005.

Over the period studied in this article, from the end of the 1990s to the second half of the 2010s, the French economy has undergone many changes, in addition to two recessions at the beginning and end of the 2000s: the high unemployment rate at the beginning of the period (above 10% for the total active population) fell sharply during the 2000s before rising again from 2008 onwards (without, however, reaching its previous level). GDP grew steadily throughout the period, except in 2008 and 2009. At the same time, the French education system evolved in the early 2000s, with the creation of professional licences and the LMD reform, which contributed to multiplying the number of university graduates entering the labour market.

Two mechanisms are at work over between 1998 and 2017: demand, reflected in job opportunities that vary according to the economic climate, and supply, since the share of each level of education in the population changes between 1998 and 2017, in favour of higher education. On the demand side, a wage depression can be expected in times of high unemployment. On the supply side, the impact of the increase in the number of graduates on wage levels can be thought of from various perspectives (Gaini et al. (2013); Dupray and Moullet (2010)). First, a degree could be a signal of individual quality which is unobserved by the analyst, but observed by the employer, who adjusts the wage accordingly. If we assume that the unobserved quality is distributed in the same way among each cohort, an increase in the number of graduates implies a decrease in their average unobserved quality, which can be reflected in a slower wage progression. A second approach considers the degree as a mean of acquiring human capital: in general, high human capital would imply high wages, because human capital makes workers more productive. If the level of human capital conferred by the degree does not change, wages should not change, regardless of the number of graduates. But the diversification of French higher education, by modifying degrees' content, may have negatively impacted the acquisition of human capital of young graduates. Finally, a third approach developed by Katz and Murphy (1992) and Card and Lemieux (2001) predicts a decline in the wages of young graduates if their number increases without any change in demand, even if neither the unobserved quality nor the content of the degree changes. This approach postulates that the wage of an employee depends mainly on his or her marginal product. If firms produce with decreasing returns to scale, an additional employee has a smaller marginal product than the employees that were hired before she was. In a context of a strong increase in the number of graduates on the labour market without a comparable increase in demand for the most highly educated, the diminishing marginal returns approach therefore anticipates lower wages for the latest arrivals, i.e. young graduates.

The three 'Generations' surveys by CEREQ cover the working lives of school leavers in 1998, 2004 and 2010 for seven years, and provides a comprehensive overview of the integration of young people into the French labour market [1]. The surveys show that the 2010 cohort (defined by individuals who left the education system in 2010, regardless of their age) has experienced a more difficult situation than its predecessors: three years after their entry into working life, their unemployment rate was 22%, compared to 11% for the 1998 generation in 2001 (Epiphane et al. (2019)). Median wage in the first year on the labour

[1] As described in Centre d'Études et de Recherche sur les Qualifications (2005), Centre d'Études et de Recherche sur les Qualifications (2011), Centre d'Études et de Recherche sur les Qualifications (2017)

market is higher for the 2010 cohort than for the 1998 cohort: 1265 versus 1090 in constant euros, base 2015. However, the 2010 cohort experiences a slower wage growth than the 1998 cohort: after seven years median wages are 1510 and 1500, respectively. Besides, median wage after seven years is higher for the 1998 than the 2010 cohort for higher education graduates, indicating a strong slowdown in salary progression for the highly educated.

This article sets out to empirically study the reasons for differentiated wage growth in France since the end of the 1990s. I first document early career wage progression in France between 1998 and 2017 and show that it changes differently depending on occupations. Indeed, occupations that know the most important slowdown in wage progression are also those which experience the greatest influx of graduates between 1998 and 2010. This is in line with a supply-demand interpretation of the wage growth slowdown, by which an over-supply of new graduates prevents them from attaining their predecessors' wage levels. This interpretation suggests exploring mechanisms through which an increase in graduates supply, along with a stagnation in demand, impact early-career wage dynamics. I explore two mechanisms: promotion to managerial positions and degree-occupation mismatch. I show that obtaining a managerial position is accompanied by an increase in salary in the medium term. Hence, a decrease in the probability of obtaining such a position worsens the overall wage progression. This is consistent with findings by Kwon et al. (2010). I then examine the argument of Liu et al. (2016), who show that in the US, college graduates during the Great Recession suffered from a degraded degree-industry match, which led to persistently lower wage levels than their older peers'. In France, I do not observe a worsening of mismatch (defined as the mean first-year wage level for a given degree major within a given occupation) between 1998 and 2010, but I find that its importance in determining next wages has increased between the 1998 and 2010 generations.

Section 2 describes the economic context in which the 1998, 2004 and 2010 cohorts entered, as well as the data from the Generations Surveys and the main variables of interest. I also introduce the empirical framework. Section 3 presents a decomposition of wage growth by socio-professional category. In section 4, I present two mechanisms of the slowdown in wage growth among the most highly educated. Finally, section 5 presents robustness tests and section 6 concludes.

2 Data and Empirical Strategy

2.1 The French labor market between 1998 and 2017

Wage changes examined in this article are part of general trends on the French labour market between 1998 and 2017. Table 1 uses INSEE census data to provide a general overview of changes in the composition of the educational levels and occupations of the working population between 1999 and 2011. On the supply side, the share of higher education graduates in 1999 was 24.6% of the working age population. In 2011, this share is 36.4%, a gain of almost 3 million individuals. The share of individuals with a high school degree has also increased, but to a lesser extent. The evolution of demand for each education levels is more difficult to assess, and I approximate it by the share of each occupation in the general population. The occupations whose numbers increased the most between 1998 and 2011 are managers and higher intellectual occupations (MHIO) and intermediate occupations (IO). Employees and craftsmen, shopkeepers and business owners saw their numbers stagnate, while they decreased for farmers and plant workers. In 1999, the MHIO positions were mainly occupied by higher education graduates (76.3%), and this share increased in 2011 (82%). However, the share of higher education graduates in intermediate occupations has also increased, from 43.7% to 55.1%. In absolute terms, this increase even surpasses that of the MHIOs: 1,026 thousand individuals compared to 920. The strong link between tertiary graduates and MHIOs in 1999 has thus been weakened in favour of IOs in 2011. Three mechanisms may jointly explain this evolution: firstly, the nature of the tasks required within the MHIOs and IOs may have changed. The literature on job polarisation in France (Albertini et al. 2017; Patel 2020) associates MHIOs with abstract tasks, and IOs with routine tasks, with higher education graduates being most suited to abstract tasks. If it is the case that task content required in IOs positions tends towards more abstraction, the demand for higher education graduates should increase within this occupation. Secondly, it may be that supply of higher education graduates in 2011 is above demand from MHIOs, pushing them towards intermediate occupations by default. Finally, either the content of higher education degrees, or the graduates themselves may have changed between 1999 and 2011, and higher education graduates who entered the labour market between 1999 and 2011 are more productive at performing routine than abstract tasks. Understanding how the type of tasks associated with different occupations has evolved over time is already a focus in the polarization literature, hence I choose to explore the last two mechanisms in this paper.

Table 1: Education Levels by Occupations within French active population in 1999 and 2011

	1999			2011			Difference	
Occupation	Nb (k)	% HS	% HE	Nb (k)	% HS	% HE	HS (k)	HE (k)
Farmers	532	16.1	7.5	344	28.3	18.4	12	23
Craftmen, retailers, business owners	1 407	15.0	14.9	1 367	21.4	23.9	82	116
Top managers, highly qualified professionals	2 802	10.6	76.3	3 726	9.2	82.0	47	920
Mid-level managers	5 100	21.8	43.7	5 905	21.1	55.1	134	1 026
Employees	6 587	16.7	10.5	6 522	24.8	20.5	516	646
Factory workers	5 827	6.2	2.7	5 162	15.1	6.8	418	193
Total	22 255	14.2	24.6	23 026	19.0	36.4	1 210	2 925

Nb (k): Number of individuals in thousands
HS: High School degree, HE: Higher Education degree

Lastly, changes in unemployment rate also reveals disparity between supply and demand. Public data from INSEE (Institut National de la Statistique et des Etudes Economiques) on unemployment rate by level of education show a systematically higher rate for high school graduates than for higher education graduates. Moreover, the unemployment rate increased between 1997 and 2017 for non-graduates, from 14% to around 17%, and high school graduates (around 12%), while it decreased for higher education graduates (from 7.5% to around 4.5%). This observation is consistent with an adjustment by unemployment among the less educated during a fall in demand, as the minimum wage prevents any adjustment of wages (Gaini, Leduc, and Vicard 2013). For higher education graduates, on the other hand, any friction between supply and demand is rather reflected in wage levels rather than in the unemployment rate.

2.2 The data

The Generations Surveys are presented in the form of a panel: each observation corresponds to the activity of an individual (employment or unemployment) over a given period, called a 'sequence' (or spell). CEREQ conducts its surveys on a given cohort every two or three years. For instance, the 2010 cohort is surveyed in 2013, 2015 and 2017. Only individuals who responded to all three surveys are considered here. The three surveys are unequal in terms of the number of individuals surveyed: there are twice as many individuals surveyed from 1998 versus the 2010 cohort. To account for these differences, and any selection effect that may arise from attrition, the Generation Surveys provide the analyst with a weighting per individual so that each survey is representative of the population of young French workers.

I adapt this weighting in two ways: first, I normalise it so that each of the generations 1998, 2004 and 2010 has the same weight. Second, since the data are presented as individual-spell observations, individuals who change spell frequently is greatly increased in the analysis (interim workers for instance). To avoid this giving them too much weight, I weigh spells of individuals who change status several times a year according to spell length. The entire analysis will be weighted by these modified weights.

Table 2: Number of individuals and spells by cohort

	Gen 1998	Gen 2004	Gen 2010
Number of individuals	13 673	9 633	7 500
Number of spells	63 965	45 343	34 730
Number of employment spells	27 618	21 576	15 533

The analysis focuses on employment spells and starting (or entry) wage obtained by young workers hired at the beginning of these spells, the changes in which is compared between the 1998, 2004 and 2010 cohort by level of education. Each individual first spell starts the month after graduation or after they left school if they did not graduate. The surveys also provide the last wage obtained at the end of each spell, but no intermediary wage. I choose to focus on entry wage, because this is invariant to the duration of the employment spell. Using the INSEE consumer price index series, I compute wages in constant prices in euro 2017.

I exclude from the analysis spells in which individuals are under 16 years old, as well as the employment spells for which the monthly starting wage is less than € 200 or more than € 20,000. The analysis focuses on job spell for which the location (at the 'department' level), firm sector and occupation are known. I consider only sequences in metropolitan France, between year 1 and year 8 of each cohort.

The main characteristics of the individuals are described in Table 3: there are no major differences between cohorts in terms of the average age just after leaving the education system, the gender distribution, or the average number of spells after seven years.

Table 3: Age, gender, and individual number of spells by cohorts

	Gen 1998	Gen 2004	Gen 2010
Average age at entry on labor market	21.6	21.2	21.3
% Men	0.51	0.53	0.51
Average number of spells	4.9	5.3	5.1
Average number of employment spells	2.1	2.4	2.2

I consider two main dimensions of individuals and their employment: educational attainment and occupation. I group individuals into four education levels: no degree (left the education system without finishing secondary school), secondary education (obtained either a general high school degree, or a vocational degree), short higher education (obtained a degree in less than four years, either a bachelor or a technical degree), and long higher education (obtained a degree in more than four years, either masters or PhD). Table 4 presents the composition of each cohort by level of education: the proportion of long higher education graduates (more than four years of higher education) is greater in the 2010 generation than in the 2004 and 1998 cohorts, while the proportions of short tertiary graduates (between one and three years of higher education) and secondary school graduates (CAP, BEP or Baccalauréat) are lower. The proportion of individuals without a diploma (having left school with a brevet level) is higher in the 2010 cohort. The Generations surveys therefore show a polarisation of educational provision between 1998 and 2010.

Table 4: Education level shares by cohort

Education level (%)	Gen 1998	Gen 2004	Gen 2010
No degree	8.9	7.9	17.2
High school degree	52.3	53	42.7
Short higher education degree	28.1	27.6	23.3
Long higher education degree	10.7	11.5	16.9
Total	100	100	100

Table 5 shows the decomposition of occupations for first job by cohort. The share of managers and upper occupations increased between the 1998 and 2010 cohorts. The share of intermediate occupations has also increased, at a faster pace. As in the general population, the share of blue-collar workers has decreased, and the share of white-collar workers has stagnated. Because farmers represent too small a share of the employment spell, these spells are excluded from the rest of the analysis.

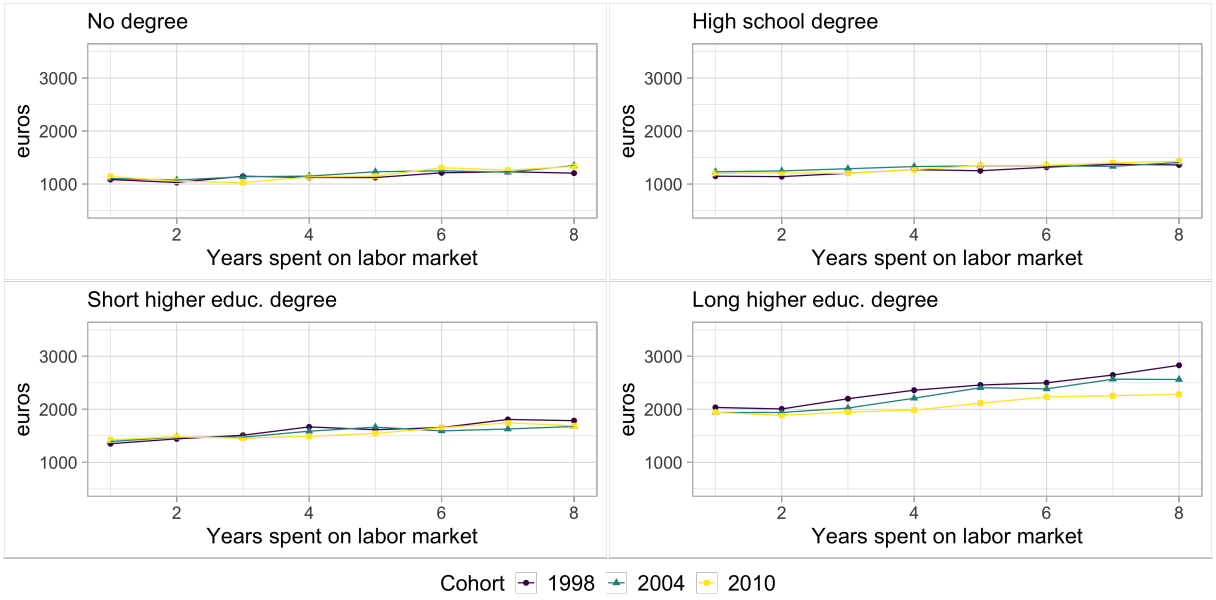
Table 5: Occupation shares by cohort

Occupation (%)	Gen 1998	Gen 2004	Gen 2010
Farmers	0.7	0.2	-
Craftmen, retailers, business owners	1.1	0.7	0.1
Top managers, highly qualified professionals	12.1	11.4	18.6
Mid-level managers	25.2	29.9	30.3
Employees	28.2	26.9	26.4
Factory workers	32.7	30.9	24.6
Total	100	100	100

2.3 Strategy

Figure 1 shows the evolution of average starting wage by cohort and education level reported by individuals on the Generation Surveys. Education levels are grouped into four categories: no degree (individuals who left school at brevet level), secondary degree, short tertiary diploma (graduates of a higher education degree in three years or less), and long tertiary degree (graduates of a higher education degree in four or more years). This graph shows no significant difference in how starting wages growth over time between cohorts for three out of four levels of education: non-graduates, secondary school graduates and short tertiary graduates. On the other hand, long-term tertiary graduates' entry wage growth differs between cohorts: the 2010 cohort experiences a slower growth than the 2004 and 1998 cohorts. This slowdown becomes more pronounced over time: the three cohorts begin their working lives with similar entry wage, and then diverge. While the 1998 cohort enjoys a significant average increase in starting wage from their second year on the labour market, the 2004 cohort's average starting wage only really increased after three years on the labour market, and that of the 2010 generation after four years. The result is that the 2010 generation is significantly behind its predecessors, a gap that persists beyond the 2010-2012 crisis period (years 1 to 3 for the 2010 generation), without any catching up taking place in the subsequent years available in the survey.

Figure 1: Average start of employment spell wage over time, by cohort and education level



To understand the reasons behind the divergence observed in Figure 1, I use the following framework: individual i enters employment contract $j = J(i,t)$ in year t. Each contract j is characterised by the characteristics of the firm, such as the industry or region, but also by features specific to the individual's role in the company, such as occupation. The individual also displays specific characteristics such as cohort or level of education. Entry monthly wage under contract j in year t is w_{jt}. The regression below allows to decompose the evolution of average entry wages by cohorts and level of education, considering possible differences in the characteristics of contracts or individuals:

$$\log w_{ijt} = \sum_{e} \mathbb{1}_{[educ_i = e]} \beta_{eg} \times a_t + g_i + r_j + s_j + \epsilon_{ijt} \tag{1}$$

Where $\log w_{jt}$ is the logarithm applied to entry wage, a_t is the number of years since leaving the education system (between 1 and 8), g_i a fixed effect for the individual gender, r_j is a fixed effect for region and s_j for industry within which the contract takes place.

The estimator β_{eg} Is computed by education level e and cohort g. It measures the average increase in entry wages per year, for each cohort and education level, controlling for variations in gender, industry, and region. Comparison of estimators between cohorts is based on the following identification assumption: the distribution of unobserved heterogeneity is the same for all generations. This assumption will be maintained for the rest of the analysis.

One way of approaching the variations of β_{eg} between cohorts in a context of changing supply and demand is to decompose average entry wage growth not only by cohort and level of education, but also by occupation. In fact, by highlighting the heterogeneity of wage growth by occupations, I can identified two margins of divergence: an extensive margin and an intensive margin. The extensive margin highlights the variations in the share of new hires in each occupation, keeping wage evolution constant. The intensive margin focuses on variations in wage levels, holding constant the share of each occupation in new hires. This margin decomposition proceeds in two steps: first, define w^0_{ijt}, average entry wage cleaned fixed effects in the previous regression:

$$\log w^0_{ijt} = \sum_g \mathbb{1}_{[coh_i=g]} \sum_e \mathbb{1}_{[educ_i=e]} \hat{\beta}_{eg} \times a_t + \epsilon_{ijt} \tag{2}$$

The second step is to project $\log w^0_{jt}$ onto the space of education and occupation by estimating the following regression by cohort:

$$\log w^0_{ijt} = \sum_e \mathbb{1}_{[educ_i=e]} \sum_g \mathbb{1}_{[occ_j=p]} \gamma_{egp} \times a_t + \epsilon_{ijt} \tag{3}$$

The following decomposition is then carried out, for a given level of education e :

$$\hat{\beta}_{e,2010} - \hat{\beta}_{e,1998} = \sum_p n_{e,2010,p} \times \hat{\gamma}_{e,2010,p} - \sum_p n_{e,1998,p} \times \hat{\gamma}_{e,1998,p} \tag{4}$$

Where $n_{e,1998,p}$ et $n_{e,2010,p}$ are the respective proportions of each occupation p within the education level e and the 1998 and 2010 generations. Introducing the cross term $\sum_p n_{e,2010,p} \times \hat{\gamma}_{e,1998,p}$ we obtain:

$$\begin{aligned} \hat{\beta}_{e,2010} - \hat{\beta}_{e,1998} = & \sum_p (n_{e,2010,p} - n_{e,1998,p}) \times \hat{\gamma}_{e,1998,p} \\ & - \sum_p n_{e,1998,p} \times (\hat{\gamma}_{e,2010,p} - \hat{\gamma}_{e,1998,p}) \end{aligned} \tag{5}$$

The first term $(n_{e,2010,p} - n_{e,1998,p}) \times \hat{\gamma}_{e,1998,p}$ corresponds to the extensive margin: the share of the change in the slope of entry wage growth due to changes in share of occupation p within new hires. The second term $n_{e,2010,p} \times (\hat{\gamma}_{e,2010,p} - \hat{\gamma}_{e,1998,p})$ is an intensive margin: the share of the change in the slope strictly due to the change in the slope for specific occupation p, holding constant the share of each occupation in new hires. This decomposition seeks to separate a pure demand or composition effect (changes in the occupation of new hires between cohorts, i.e. the extensive margin) from a supply and demand equilibrium effect (changes in the distribution of education levels within individuals, captured by the intensive

margin).

3 Results

Estimation results for equation (1) are presented in Table 6. Coefficients for entry-level wage growth are significant for all cohorts and levels of education. Hiring wages of individuals with no degree decrease slightly during the first seven years on the labour market for all generations (about 1% decrease per year), while hiring wages of high school graduates stagnate (less than 1% growth per year for all cohorts). Both short and long higher education graduates experience a more sustained growth in wage, but it is less pronounced for the 2004 and 2010 cohorts than the 1998 cohort (5.6% annual growth compared to 4% for short higher education graduates and 11.9% compared to 8.6% for long higher education graduates for 1998 and 2010 cohorts). Long higher education graduates suffer most from the slowdown in wage growth: the 2010 cohort's growth loses about a third compared to their 1998 predecessors. The rest of the analysis will therefore focus on long higher education graduates, although results are presented for all levels of education.

Table 6: Log entry wage regressed on number of years spent on the labor market by education level, with gender, location and industry fixed effects

	log entry wage		
	Gen 1998	Gen 2004	Gen 2010
Years × No degree	0.027***	0.037***	0.037***
	(0.003)	(0.003)	(0.003)
Years × High school degree	0.026***	0.019***	0.03***
	(0.001)	(0.001)	(0.002)
Years × Short higher educ. degree	0.037***	0.025***	0.023***
	(0.002)	(0.002)	(0.002)
Years × Long higher educ. degree	0.046***	0.045***	0.024***
	(0.003)	(0.003)	(0.003)
FE education	✓	✓	✓
FE gender	✓	✓	✓
FE location	✓	✓	✓
FE industry	✓	✓	✓
Observations	37 785	27 656	20 130
R^2	0.325	0.244	0.283

*p<0.1; **p<0.05; ***p<0.01

All occupations except Farmers

Estimation results for equation (3) are presented in Table 7 by cohort, for all levels of education and all occupations, except farmers, because their number is not large enough to obtain a robust estimate. Wage growth heterogeneity between the 1998 and 2010 cohorts by occupation is clearly apparent for higher education graduates. In particular, mid-level managers and top-level managers and highly qualified professionals are particularly affected by the slowdown in wage growth.

Table 7: Log entry wage regressed on number of years spent on the labor market by education level and occupation, with gender, location and sector fixed effects

	log entry wage cleaned of fixed effects		
	Gen 1998	Gen 2004	Gen 2010
Years × No degree × Craftmen,	0.075***	0.068***	
Shopkeepers, Business owners	(0.008)	(0.012)	()
Years × No degree × Top	0.064***	0.078***	0.08***
managers, Highly qualified prof.	(0.017)	(0.021)	(0.016)
Years × No degree × Employees	0.016***	0.032***	0.036***
	(0.002)	(0.003)	(0.002)
Years × No degree × Factory	0.03***	0.037***	0.037***
workers	(0.001)	(0.002)	(0.002)
Years × No degree × Mid-level	0.022***	0.043***	0.037***
managers	(0.005)	(0.005)	(0.003)
Years × HS deg. × Craftmen,	0.012***	0.056***	0.022
Shopkeepers, Business owners	(0.003)	(0.004)	(0.024)
Years × HS deg. × Top	0.074***	0.069***	0.068***
managers, Highly qualified prof.	(0.003)	(0.004)	(0.005)
Years × HS deg. × Employees	0.014***	0.006***	0.021***
	(0.001)	(0.001)	(0.001)
Years × HS deg. × Factory	0.025***	0.018***	0.026***
workers	(0.001)	(0.001)	(0.001)
Years × HS deg. × Mid-level	0.043***	0.031***	0.041***
managers	(0.001)	(0.001)	(0.002)
Years × SHE. deg. × Craftmen,	-0.001	0.041***	0.069
Shopkeepers, Business owners	(0.006)	(0.009)	(0.058)
Years × SHE. deg. × Top	0.082***	0.065***	0.065***
managers, Highly qualified prof.	(0.002)	(0.003)	(0.004)
Years × SHE. deg. × Employees	-0.001	-0.013***	-0.004

	(0.002)	(0.002)	(0.003)
Years × SHE. deg. × Factory	-0.013***	-0.003	-0.001
workers	(0.003)	(0.003)	(0.004)
Years × SHE. deg. × Mid-level	0.043***	0.034***	0.029***
managers	(0.001)	(0.001)	(0.002)
Years × LHE deg. × Craftmen,	0.057***	0.048**	0.079**
Shopkeepers, Business owners	(0.009)	(0.019)	(0.035)
Years × LHE deg. × Top	0.058***	0.067***	0.047***
managers, Highly qualified prof.	(0.002)	(0.002)	(0.002)
Years × LHE deg. × Employees	-0.062***	-0.038***	-0.038***
	(0.007)	(0.006)	(0.005)
Years × LHE deg. × Factory	-0.045*	-0.049***	-0.054***
workers	(0.023)	(0.014)	(0.009)
Years × LHE deg. × Mid-level	0.002	0.003	-0.011***
managers	(0.004)	(0.003)	(0.003)
Observations	37 785	27 656	20 130
R^2	0.182	0.139	0.155

*p<0.1; **p<0.05; ***p<0.01

Cells are empty where there were too few observations

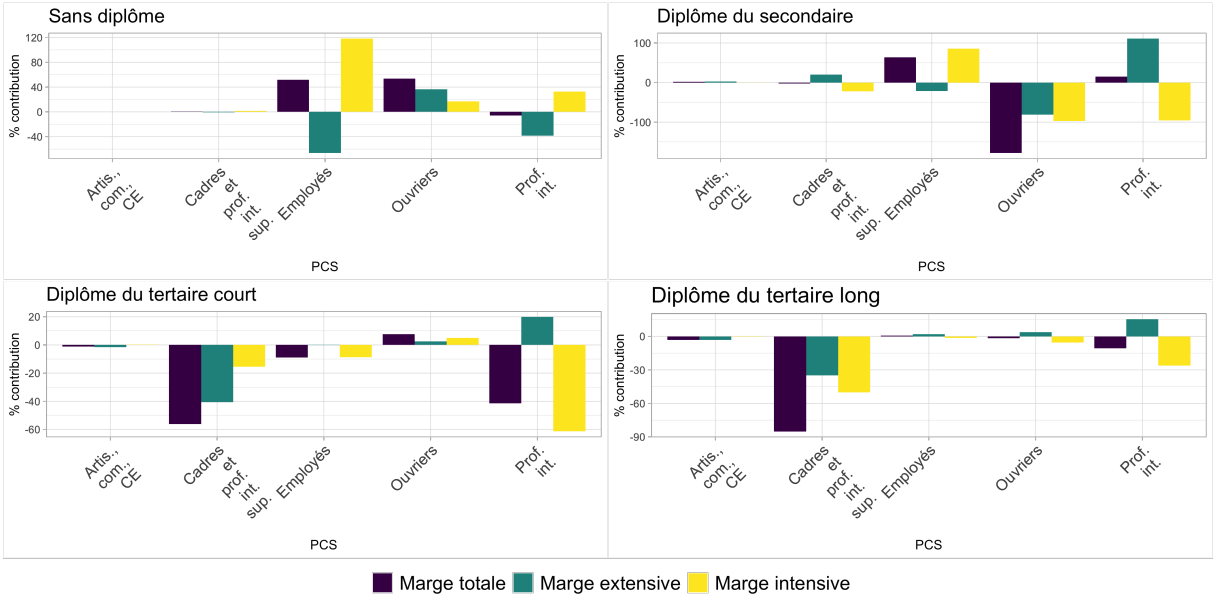
All occupations except Farmers

HS: High School, SHE: Short higher educ., LHE: Long higher educ.

Figure 2 presents the results of equation (5)'s decomposition by level of education. It shows that the slowdown in wage growth for higher education graduates between the 1998 and 2010 cohorts is mainly driven by mid-level managers and top-level managers and highly qualified professionals, who account for almost 100% of the total margin for both short and long higher education graduates. However, the extensive margin of mid-level managers behaves differently from that of top-level managers and highly qualified professionals: it is positive for the former, indicating an increase in the share of long higher education graduates among mid-level managers, and negative for the latter, signalling a decline in their share among top-level managers and highly qualified professionals. This suggests that the increase in the proportion of higher education graduates (especially long higher education) is unmatched by demand of top-level managers and highly qualified professionals. As a result, an increasing share of higher education graduates is absorbed by mid-level managers occupation. Intensive margins for mid-level managers and top-level managers and highly qualified

professionals are both negative, for higher education graduates. Because the intensive margin is particularly for short higher education graduates working in mid-level management, it may be that the 'absorption' by mid-level manager of long higher education graduates negatively impacts the growth of entry-level wages. This observation is consistent with a framework of diminishing marginal returns, where last entrants' wages decrease because of their lower productivity.

Figure 2: Average wage growth decomposition by education level and occupation



The previous analysis can be replicated at a finer level of occupation aggregation available in the data. The results of this second level of analysis are presented in Figure 3, for all higher education graduates and mid-level managers and top-level managers and highly qualified professionals only.

Figure 3: Average wage growth decomposition by education level and disaggregated occupation - Long higher education graduates

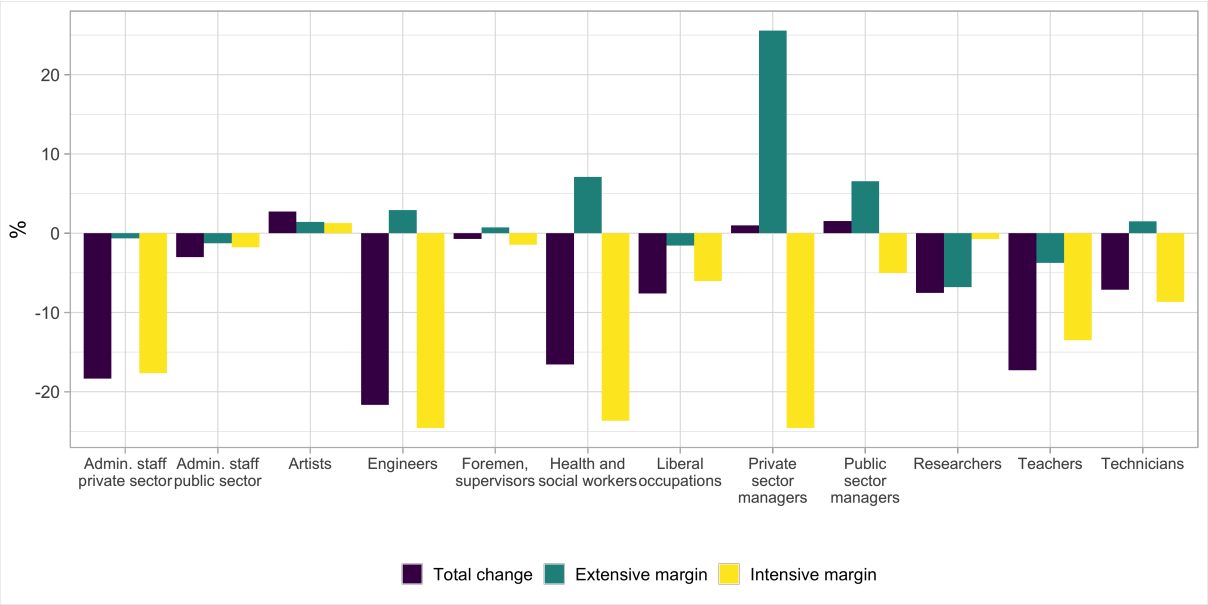


Figure 3 shows a significant heterogeneity in margins within the mid-level managers and top-level managers and highly qualified professionals. Sub-occupations can be classified into four categories according to their intensive and extensive margins: the first includes administrative staff in the private sector, teachers, and the liberal occupations. It contributes significantly to the slowdown in wage growth, is driven by both the intensive and extensive margins, although the intensive margin dominates in absolute terms. A second category is made up of engineers and health and social workers, whose contribution to the total slowdown in wage growth at the time of hiring is no less significant but is broken down differently from the first category. Their extensive margin is positive: the proportion of individuals starting contracts in these occupations increased between the 1998 and 2010 cohorts. However, their intensive margin outweighs their extensive margin, and the sum of the two is negative. The third category, which differs from the first two in that it has a positive total margin, comprises public and private sector managers: the contribution of these occupations to wage growth benefits the 2010 cohort compared with the 1998 cohort. This is due solely to a positive extensive margin, which is particularly high for private sector managers. Finally, the last category includes all other sub-occupation that have a small impact on changes in wage growth.

Except for two occupations (researchers and artists), all occupations suffer from a negative intensive margin, i.e. reduced wage growth at hiring, once composition effects (the

extensive margin) have been accounted for. Besides, occupations in categories two and three identified above whose intensive margin is largest in absolute value are also those whose extensive margin are most important and positive. This is consistent with a framework of diminishing returns: the influx of new employment contracts in these occupations, driven by an increase in the supply of higher education graduates, leads to a drop in marginal productivity of individuals who have recently entered the market, which translates into lower returns to experience.

In the next section, I explore two possible mechanisms involved in the intensive margin of the wage growth slowdown and how they translate differently into each occupation.

4 Mechanisms

I study two mechanisms that are likely to cause heterogeneity within the wage growth slowdown intensive margin: the first is promotion to managerial positions: it has been documented in the literature (Kwon et al. (2010)) that wage growth is affected if promotions become scarce for a given cohort. Such a mechanism could interact with the heterogeneity of the wage slowdown by level of education and occupations if the influx of graduates into some occupations, as evidenced by their large extensive margin, is correlated with a decline in the share of managerial positions at hiring, which leads to a lower increase in entry wages. In a theoretical perspective, the reasons for such a correlation are twofold: first, in a framework of decreasing returns an influx of graduates is not followed by demand for managers from firms, which mechanically reduces their proportion among new hires. Second, if the expansion of higher education graduates on the labour market is accompanied by a decline in their unobserved quality, it would lead to a decline in the share of managers within cohorts that experience the educational expansion. To check the validity of this mechanism, I establish two facts: first, lower access to managerial positions is linked to lower wages on hiring, and second, that hiring in those positions does fall for the 2010 cohort compared to the 1998 cohort. If it is particularly the case for occupations with the largest extensive margins , it suggests that the mechanism is rather based on the theory of decreasing returns, since occupations with the largest influx are most affected. If, on the other hand, I observe that the decline managerial positions is the same for all occupations, it would indicate that a decrease in unobserved quality drives the mechanism.

The second mechanism I evidence is the degree specialization (or major) and occupation match quality. In line with theories of human capital, Liu et al. (2016) show on US data that poor match quality in the early years on the labour market weighs on wage developments in

the medium to long term. Initial matching can be expected to have an impact on a cohort's medium-term wages in two ways: either initial match quality is the same across cohorts on average, but its impact on subsequent wages becomes stronger and more persistent, or initial match quality decreases across cohorts, and subsequent wage are negatively impacted. I show that the results obtained are consistent with the first explanation.

4.1 Promotion to managerial positions

To determine whether individuals are hired as managers, I use the question 'Do you manage a team?" in the Generations Surveys. This question provides is more accurate for my purpose than using mid-manager or top-manager occupations, as it is unclear whether individuals hired to these occupations do in fact manage some of their colleagues. Table 8 shows that the managerial hires increase with the level of education for all cohorts, but also that the share is higher for the long higher education graduates among the 1998 than the 2010 and 204 cohorts. Besides, for all cohorts and levels of education, the share of managerial hires is higher in the early years on the labour market. Particular attention should therefore be paid to recruitment opportunities in the first few years on the labour market.

Table 8: Share of managerial posisitions obtained by cohort, year 1-2 and year 7-8

	Gen 1998		Gen 2004		Gen 2010	
% Manager	Year 1-2	Year 7-8	Year 1-2	Year 7-8	Year 1-2	Year 7-8
Sans diplôme	19.2	13	11.8	2.2	8.5	12.1
Diplôme du secondaire	17.8	15.6	12.2	12.2	12.8	13.4
Diplôme du tertiaire court	19.8	18	16.4	14.1	18	17.2
Diplôme du tertiaire long	34.6	33.6	28.8	28.1	26	22.9

To understand the link between managerial positions and wage levels in the medium term, I estimate the following regression is made by cohort, only at years 7 and 8:

$$\log w_{ijt} = \sum_{e} \mathbb{1}_{[educ_i=e]} \sum_{p} \mathbb{1}_{[occ_j=p]} \zeta_{gep} \times M_{jt} + g_i + r_j + s_j + \epsilon_{ijt} \tag{6}$$

Where M_{jt} is a binary variable equal to 1 if the new job is a manager position, and 0 otherwise. The estimator ζ_{gep} indicates the average wage gain of a manager position compared to a non-manager position in the medium term, by cohort, level of education, and occupation. Long and short higher education graduates are grouped into the same category of higher education graduates.

Table 9 presents the three regressions (6) for the 1998, 2004 and 2010 cohorts. The impact of a managerial position on entry wages varies according to level of education: Significant coefficients are all positive for high school and higher education graduates (except craftsmen, shop keepers and business owners for 2010 high school graduates). On the other hand, the relationship is negative and significant for individuals with no degree working as employees and factory workers, indicating that a managerial position at this level of education does not offer the same benefits as to other levels. The relation between managerial position and entry wages is particularly strong for higher education graduates working as mid-level managers, and top managers and highly qualified professionals. However, the intensity of the relationship decreases between the 1998 and 2010 cohorts: among top managers and highly qualified professionals, a managerial position is associated with a salary 63% higher for the 1998 cohort and only 51% higher for the 2010 cohort. This decline could be the result of a drop in managerial productivity due to the particularly large influx of graduates into these occupations. However, the relationship remains significant and suggests examining the evolution of access to managerial positions between the 1998 and the 2010 cohorts.

Table 9: Log entry wage regressed on dummy for managerial position by education level and occupation, with gender, location and sector fixed effects

	log entry wage		
	Gen 1998	Gen 2004	Gen 2010
Manager × No degree× C/S/BO	0.226		
	(0.178)	()	()
Manager × No degree×	0.23		0.231
TM/HQP	(0.303)	()	(0.267)
Manager × No degree×	-0.199**		0.01
Employees	(0.086)	()	(0.084)
Manager × No degree× Factory	-0.103*	0.094	-0.143***
workers	(0.055)	(0.177)	(0.053)
Manager × No degree×	0.067	0.574**	0.111
Mid-level managers	(0.149)	(0.228)	(0.083)
Manager × HS deg.× C/S/BO	-0.043		
	(0.078)	()	()
Manager × HS deg.× TM/HQP	0.554***	0.374***	0.374***
	(0.086)	(0.086)	(0.078)
Manager × HS deg.× Employees	-0.048	-0.105**	-0.052
	(0.04)	(0.051)	(0.065)

Manager × HS deg.× Factory workers	0.045	0.073*	0.023
	(0.032)	(0.038)	(0.054)
Manager × HS deg.× Mid-level managers	0.199***	0.155***	0.181***
	(0.035)	(0.034)	(0.041)
Manager × HE. deg.× C/S/BO	0.575***		0.568
	(0.12)	()	(0.378)
Manager × HE. deg.× TM/HQP	0.634***	0.622***	0.508***
	(0.028)	(0.038)	(0.037)
Manager × HE. deg.× Employees	0.101	0.21**	0.148
	(0.107)	(0.103)	(0.117)
Manager × HE. deg.× Factory workers	0.013	0.222*	0.073
	(0.118)	(0.114)	(0.114)
Manager × HE. deg.× Mid-level managers	0.413***	0.248***	0.354***
	(0.043)	(0.043)	(0.048)
FE gender, location, industry	✓	✓	✓
Observations	4 730	3 433	2 792
R^2	0.332	0.277	0.291

*p<0.1; **p<0.05; ***p<0.01

Cells are empty where there were too few observations

Observations are the sequences between years 7 and 8

HS: High School, HE: Higher educ.

C/S/BO: Craftmen, Shopkeepers, Business owners

TM/HQP: Top managers, Highly qualified prof.

Probability to access a manager position by cohort and level of education within each occupation is assessed using the following logistic regression:

$$M_{jt} = \sum_{e} \mathbb{1}_{[educ_i=e]} \sum_{p} \mathbb{1}_{[occ_j=p]} \pi_{gep} \times a_t + g_i + r_j + s_j + \epsilon_{ijt} \tag{7}$$

Where M_{jt} is the binary variable equal to 1 if the individual is hired as a manager and 0 otherwise. Years since leaving the education system a_t range from 1 to 6 inclusive. The coefficient $\hat{p}_{gep} = 100 \times (\exp(\pi_{gep}) - 1)$ informs the probability increase each year in percentage terms.

Table 10 shows the change in $\hat{p}_{gep}$ between 1998 and 2010, by level of education. Among 1998 higher education graduates hired a top managers or highly qualified professional, chances of accessing a managerial position increase by about 5.1% per year. This percentage is lower for the 2010 cohort (3.6%). For middle-managers the increase in probability is much smaller for the 1998 cohort (1.2%), and not significant for the 2010 generation.

Table 10: Chances of obtaining a managerial postition by years spent on the labor market, by education level and occupation

	Managing position		
	Gen 1998	Gen 2004	Gen 2010
Year × No degree × C/S/BO	3.968*		
	(0.02)	()	()
Year × No degree × TM/HQP	17.697***	-3.971	-5.156
	(0.026)	(0.058)	(0.042)
Year × No degree × Employees	-1.464***	-1.212*	0.921*
	(0.006)	(0.007)	(0.005)
Year × No degree × Factory workers	-0.876*	-1.14*	0.519
	(0.005)	(0.006)	(0.005)
Year × No degree × Mid-level managers	0.751	-4.375***	1.142
	(0.009)	(0.009)	(0.008)
Year × HS deg. × C/S/BO	0.06	3.692	0.521
	(0.014)	(0.074)	(0.047)
Year × HS deg. × TM/HQP	3.281***	-1.185	-1.555*
	(0.007)	(0.008)	(0.009)
Year × HS deg. × Employees	-0.641**	-0.012	-1.054***
	(0.003)	(0.003)	(0.003)
Year × HS deg. × Factory workers	-0.305	0.309	-0.207
	(0.003)	(0.003)	(0.004)
Year × HS deg. × Mid-level managers	-0.126	-0.515	-0.571
	(0.004)	(0.004)	(0.004)
Year × HE. deg. × C/S/BO	2.43*	13.451**	2.604
	(0.014)	(0.05)	(0.065)
Year × HE. deg. × TM/HQP	1.208***	1.237***	-0.492
	(0.004)	(0.004)	(0.004)
Year × HE. deg. × Employees	-1.934***	-0.613	-0.995*
	(0.004)	(0.004)	(0.005)

Year × HE. deg. × Factory workers	-0.524 (0.007)	0.827 (0.006)	0.43 (0.007)
Year × HE. deg. × Mid-level managers	0.123 (0.003)	0.642* (0.003)	-1.137*** (0.004)
FE education, occupation	✓	✓	✓
FE gender, location, industry	✓	✓	✓
Observations	32 700	23 226	17 301
R^2	0.059	0.071	0.066

*p<0.1; **p<0.05; ***p<0.01

Cells are empty where there were too few observations

Observations are the sequences between years 1 and 6

HS: High School, HE: higher educ.

TM/HQP: Top managers, Highly qualified prof.

C/S/BO: Craftmen, Shopkeepers, Business owners

4.2 Major-Occupation match quality

Match quality between degree and employment plays an important role in the persistence of initial economic conditions' effect on medium term wage (Liu et al. (2016)). By defining match quality by wage level in first job for each degree specialization in each industry, the authors establish that the deterioration of initial match quality match due to poor economic conditions in the United States in the 2010s (including high unemployment) has a downward impact on wage levels in subsequent jobs. This mechanism is particularly salient for higher education graduates, who are more specialized than their less educated peers. In France, in addition to the recession of the early 2010s, there has been an increase and diversification of the educational supply (Dupray and Moullet (2010)) among the 2004 and 2010 cohorts, which may also have affected the quality of initial matching the first job for these two cohorts.

Table 11 shows the list of degree majors available to higher education students in France and their distribution among each cohort. Despite the diversification of educational provision, their distribution remains fairly stable between the 1998 and 2010 cohorts. There is however a decline in the 'Mechanics, Electricity' and 'Electronics' specialization and the rise of the 'Mathematics and Science' and 'Social work' specializations.

Table 11: Degree specialization shares by cohort

Share of graduates (%)	Gen 1998	Gen 2004	Gen 2010
Agriculture, fishing & woodland	4.4	4.4	3.8
Civil engineering & Construction	4.7	5.1	4.3
Communication & information	7	6.8	4.8
Community services	2.5	1.5	2
Flexible materials	1	0.9	0.5
General production	3.6	4.8	6
General service	0.2	0.5	3.3
General training	4.4		0.5
Humanities & law	10.8	8.3	9
Industrial transformations	5.6	5.9	4.9
Literature & arts	4.7	4.7	5.1
Mathematics & sciences	3.7	4.9	9.1
Mechanics, electricty & electronics	13.7	12.1	7.9
Personal services	15.7	18.9	19.7
Trade & management	17.9	21.3	19
Total	100	100	100

Thanks to the detailed level of data, I can analyse the specialization-occupation match quality. It is defined by the following regression, performed only on contracts starting in the year in which each cohort enters the labour market, by cohort and education level:

$$\log w_{ijt} = \sum_{s} \mathbb{1}_{[spec_i=s]} \sum_{p} \mathbb{1}_{[occ_j=p]} \delta_{geps} + \epsilon_{ijt} \tag{8}$$

Where $spec_i is$ the specialty chosen by individual i during their studies. The estimated coefficient δ_{geps} is an average of the logarithm of the first year's wage on the labour market, by cohort, education level, occupation, and degree specilization. To define a measure of matching, I look for the best matched specialization within a cohort, education level and occupation, i.e. the one for which average wage is highest:

$$\delta^*_{gep} = \max_{s} \delta_{geps} \tag{9}$$

Matching quality for a given degree specialization is defined by how far it stands with respect to the best matched specialization:

$$D_{geps} = -\left|\delta_{geps} - \delta^*_{geps}\right| \tag{10}$$

D_{geps} is always below or equal to zero, if s is the best matched specialization. The difference between δ_{geps} and $\delta_{geps'}$ for two specialisations s and s' is interpreted as the percentage

difference between the average hiring wage for s and for s'. The higher the absolute value of D_{geps}, the farther average salary for the specialization s is from best matched specialization. Matching quality is then be said to be poor. D_{geps} is a flexible measure of matching since one specialization may be mismatched with one occupation, but well matched for another. Matching quality is computed at cohort and education level, so that average earnings comparison between cohorts are irrelevant to computing D_{geps}.

Individuals who are not hired in their first year on the labour market are not included in regression (8). These individuals are excluded from the analysis, which therefore covers only a subset of each cohort. Another definition for the period during which initial matching quality is computed is explored in the robustness tests.

Table 12 shows the evolution of measure D_{geps} by cohort and education level in terms of median and interquartile deviation, weighted by individuals. Since individuals with no degree do not choose a specialization, they are excluded from the present analysis. Although median quality of matching deteriorates for high school graduates, it increases for higher education graduates, while the interquartile gap is the same for higher education graduates between 1998 and 2010 cohorts (and narrower for the 2004 cohort). Worsening of matching quality does not therefore appear to be a factor in wage growth slowdown for higher education graduates. It remains to be determined whether, despite the consistent quality of matching across the three cohorts, its effect on the persistence of wage levels changed between the 1998 and 2010 cohort.

Table 12: Match quality: median and interquartile range by cohort and education level

	Education level	Gen 1998	Gen 2004	Gen 2010
High school degree	p50	-0.2	-0.16	-0.22
	[p25-p75]	[-0.33,-0.09]	[-0.26,-0.09]	[-0.38,-0.12]
Short higher educ. degree	p50	-0.23	-0.16	-0.21
	[p25-p75]	[-0.32,-0.1]	[-0.31,-0.05]	[-0.31,-0.09]
Long higher educ. degree	p50	-0.38	-0.13	-0.23
	[p25-p75]	[-0.46,-0.16]	[-0.26,-0.07]	[-0.32,-0.13]

The impact of initial match quality on entry wages in subsequent years is assessed by the following regression, at cohort and education level:

$$\log w_{ijt} = \sum_a \mathbb{1}_{[year_t=a]} D_{geps} \lambda_{gea} + a_t + g_i + r_j + s_j + \epsilon_{ijt} \tag{11}$$

Unlike the previous regressions, the aim is to obtain an estimated coefficient $\hat{\lambda}_{geps}$ differentiated per year. Within a cohort and education level, all individuals face the same conditions every year, captured by a fixed effect, hence the only variation between individuals in this regression is due to the difference in initial matching quality.

The estimated coefficients $\hat{\lambda}_{geps}$ are presented in Table 13 for long higher education graduates only. Distinguishing between short and long higher education graduates matters in this analysis because degree specialization is closely linked to education level. Table 13 shows significant intergenerational differences among long higher education graduates: in the first years on the labour market, initial match quality's effect on entry wages is similar for all cohort. In year 1, a 1 percentage point increase in match quality, i.e. a .01 relative increase of $\hat{\delta}_{geps}$ over $\hat{\delta}^{*}_{geps}$, results in a wage increase of almost 1% for all generations (.72%, .83% and .67% respectively). However the effect of initial match quality diverge between cohorts around year 4, since they are no longer significant for the 1998 cohort, whereas they persist until year 7 for the 2004 cohort and until year 8 for the 2010 cohort.

Table 13: Log entry wage regressed on match quality by year and education level - Long higher education graduates

	log entry wage		
	Gen 1998	Gen 2004	Gen 2010
Year 1 × match quality	0.718***	0.828***	0.665***
	(0.057)	(0.052)	(0.034)
Year 2 × match quality	0.264***	0.223**	0.342***
	(0.099)	(0.092)	(0.058)
Year 3 × match quality	0.424***	0.481***	-0.012
	(0.126)	(0.096)	(0.066)
Year 4 × match quality	0.012	0.198**	0.272***
	(0.136)	(0.093)	(0.074)
Year 5 × match quality	-0.177	0.575***	0.363***
	(0.108)	(0.122)	(0.084)
Year 6 × match quality	0.087	0.343**	0.087
	(0.128)	(0.166)	(0.093)
Year 7 × match quality	-0.029	0.415***	0.297***
	(0.159)	(0.119)	(0.086)
Year 8 × match quality	0.285*	-0.123	0.195**
	(0.166)	(0.161)	(0.079)
FE gender, location, industry	✓	✓	✓
Observations	1 634	2 550	4 298
R^2	0.43	0.325	0.291

*p<0.1; **p<0.05; ***p<0.01

Only individuals who found a job in the first year after leaving school are included

Initial match quality plays a significant role in slowing down the salary progression of long higher education graduates between the 1998 and 2010 cohorts, not because the quality has deteriorated, but because its impact on subsequent salary levels has increased. This could be explained by mobility: if the 2010 cohort would change jobs less frequently than the 1998 cohort, the initial match quality may play a role in determining hiring wages for a longer time. However, average number of employment spells for long higher education graduates is 4.1, 4.5 and 4.4 for cohorts 1998, 2004 and 2010 respectively. The two last cohorts are changing jobs as much, if not more, than the 1998 cohort. To explore the mobility hypothesis in more detail, it is necessary to analyse the structure of transitions between occupations of each generation. If the 2004 and 2010 cohorts switch occupations less often than the 1998 cohort, initial matching quality's impact may increase as individuals remain stuck in occupations to which their degree is not adapted. However, this hypothesis is again contradicted by the

data: among the long tertiary graduates, those who never change occupation in the first seven years on the labour market account for 40%, 34% and 32% of the 1998, 2004 and 2010 cohorts, respectively. Individuals changing only once accounted for 31%, 29% and 30% of each cohort. This shows changes in occupations are more common among the 2004 and 2010 cohorts. Finally, the increased impact of initial match quality could be explained by the rise in the number of graduates in the labour market: mismatched individuals in the 2004 and 2010 cohorts may find it harder to access higher-paying jobs for their degree specialization as each year a new cohort enters the labour market, increasing competition for the best jobs. Because the supply of long higher education graduates is smaller in the late 1990s and early 2000s, the 1998 generation faces less competition and is able to make up for any low initial match quality.

5 Robustness tests

5.1 Sample representativity

The Generation surveys only provide information on wages when individuals transition from a job to another, or when they transition from and to unemployment. As such, they constitute an unbalanced panel: some individuals are not observed in some years. An individual that transitions often makes up more observations than an individual who stays in the same spell over the period, and thus have a greater weight in the data. It is therefore important to check that individuals that go through few transitions, such as those hired in their first year on the labour market who remain in their jobs for the next seven years, experience the same trend in wage growth between the generations 1998 and 2010. To do this, I perform two analyses: the first uses the wages observed during the last interview session of each generation. If the interviewee is employed during the last session, his or her current salary is reported as exit wage, even if his or her employment spell is not ending. This provides a cross-section of the entire population surveyed at the end of 2005, 2011 and 2017 respectively for each of the 1998, 2004 and 2010 cohorts. Comparing wages in this cross-section by education level and across cohort is a way of checking all graduates are affected by declining returns to experience. The second analysis looks at annual average exit wages over the seven years and examines whether entry wage growth slowdown is compensated for by pay raise during employment spells.

Table 14 shows the average observed wages in the 2005, 2011 and 2017 cross-sections (in constant euro base 2017) by education level and cohort. These cross-sectional wages have

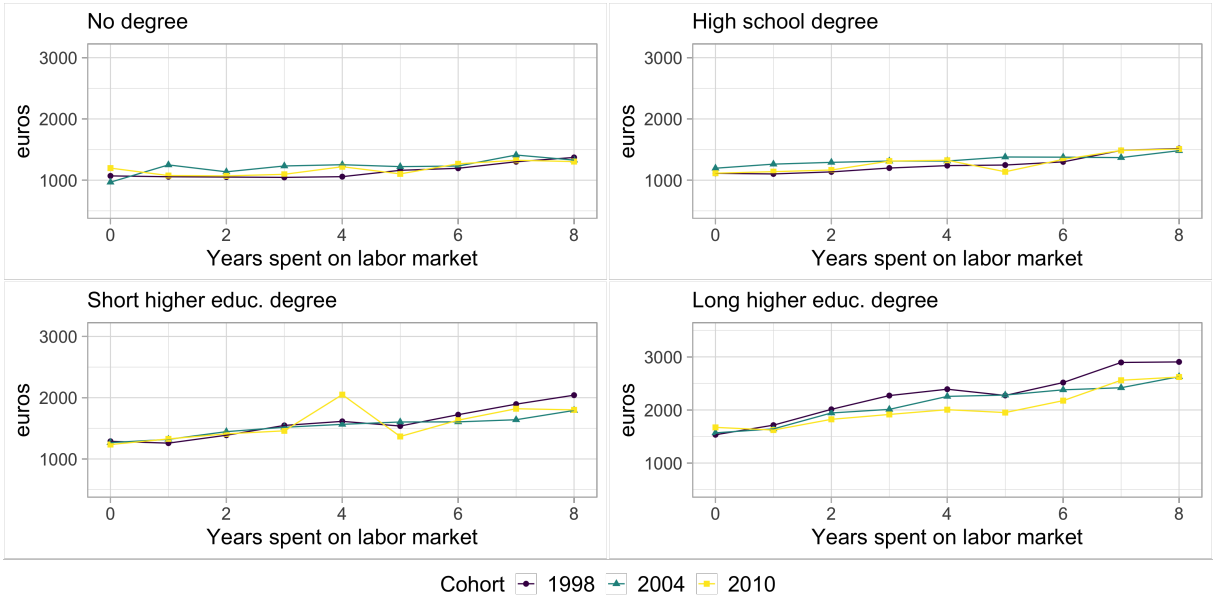
decreased on average between the 1998 and 2010 cohort for higher education graduates, which confirms that wage growth has slowed for all individuals in the cohort, including those in long-term employment.

Table 14: Average observed wage at end of survey, by cohort and education level

Niveau Education	Gen 1998	Gen 2004	Gen 2010
Sans diplôme	1325	1341	1357
Diplôme du secondaire	1499	1472	1508
Diplôme du tertiaire court	1918	1775	1826
Diplôme du tertiaire long	2902	2594	2567

Finally, Figure 4 shows changes in average exit wages (i.e. the last wage received in the job) over time by education level and cohorts. These wages are higher than hiring wages for all cohorts and education levels but exhibit the same slowdown trend for the higher education graduates between 1998 and 2010 as entry wages. I conclude that pay raises on the job do not compensate for decreasing returns to experience at hiring.

Figure 4: Average end of employment spell wage over time, by cohort and education level



5.2 Unobserved heterogeneity

The results presented above are based on the identification assumption that the distribution of unobserved quality is there within each cohort. I test this assumption by using a proxy for

unobserved quality, which is grade repetition before the start of secondary school. The Generation surveys provide individuals' age in 6th grade (the first grade in secondary school). Normal age is 6th grade is 11 years old, hence if an individual is older when entering 6th grade, I deduce they have repeated a grade in primary school. Repeating a grade before 6th grade indicates lower academic and learning abilities, which in turn affects the individual's wage levels in the labour market. I am agnostic as to the causes of these lower abilities. 23.0% of individuals in the 1998 cohort, 12.1% of individuals in the 2004 cohort and 12.8% of individuals in the 2010 cohort repeated a grade in primary school. The practise of grade repeating scaled back over the period, hence the high number of individuals who repeat grade in the 1998 generation is only partly indicative of a lower average unobserved quality.

To check the impact of unobserved quality on wage levels I introduce a dummy for class repetition in my baseline regression:

$$\log w_{ijt} = \sum_{e} \mathbb{1}_{[educ_i=e]} \times a_t + \alpha_i + g_i + r_j + s_j + \epsilon_{ijt} \tag{12}$$

Where α_i is equal to 1 if the individual has repeated a grade before entering secondary school and 0 otherwise. Since class repetition is only an imperfect measure of unobserved quality, and its practise has evolved between the 1998 and 2010 cohort, I do not compare its effect on log wages between cohorts. Instead, $\hat{\beta}_{eg}$ will be useful to understand if the effect observed in the baseline analysis is solely due to variation in unobserved quality.

Regression estimation is presented in Table 15. Grade repetition has a significant and negative effect on wage for all cohorts. It does not significantly change the previous results however: the slowdown in wage growth for long and short higher education graduates between 1998 and 2010 remains qualitatively the same. This suggests that this slowdown is not due to unobserved quality variations between the 1998 and 2010 cohorts.

Table 15: Log entry wage regressed on dummy for grade repeat and years spent on the labor market by education level

	log entry wage		
	Gen 1998	Gen 2004	Gen 2010
Grade repeat	-0.06***	-0.046***	-0.058***
	(0.004)	(0.006)	(0.007)
Years × Sans diplôme	-0.01***	-0.009***	-0.007***
	(0.001)	(0.002)	(0.002)
Years × High school degree	0.01***	0.007***	0.01***
	(0.001)	(0.001)	(0.001)
Years × Short higher educ. degree	0.054***	0.038***	0.04***
	(0.001)	(0.001)	(0.002)
Years × Long higher educ. degree	0.117***	0.099***	0.084***
	(0.002)	(0.002)	(0.002)
FE gender, location, industry	✓	✓	✓
Observations	37 785	27 599	19 992
R^2	0.29	0.218	0.229

*p<0.1; **p<0.05; ***p<0.01
Only individuals whose age is known in 6th grade are included

A second measure of unobserved quality, specific to long higher education graduates, is the type of school in which individuals obtained their degree, and whether they obtained a master's degree or PhD. There are disctinction in France between public university, where students can graduate both from a master and a PhD, and "Grandes Ecoles", specific schools specialized in engineering or business, that deliver specific degrees. Engineering and business schools graduates often obtain higher wages than university graduates. Since business and engineering schools have traditionally been more selective than universities, it can be expected that they will continue to be selective even if more young people apply. At university, on the other hand, there is no selection at entry since any student can enrol for a bachelor's degree (except in a few courses called where seats are scarce. It may then be that the 1998 cohort count proportionally more engineering and business school graduates, driving average wages upwards. Table 16 shows the distribution of types of degrees obtained among long higher education graduates by cohorts. PhD are not accounted for among the 1998 cohort and the type of degree is not unknown for 1.5% of graduates in the 2004 cohort. The share of university graduates (master's and doctoral degrees) indeed increased between cohorts 1998 and 2010.

Table 16: Degree type shares among long higher education graduates

Degree type (%)	Gen 1998	Gen 2004	Gen 2010
Business degree	10.1	11.1	9.2
Engineering degree	25.5	23.4	19.9
Masters degree	64.4	47.3	58.8
Doctorat		16.6	12.1
Inconnu		1.5	

To check that the wage growth slowdown is not due to a composition effect on the type of schools between the 1998 and 2010 cohorts, I perform the following regression, only for graduates of the long higher education sector:

$$\log w^0_{ijt} = \sum_d \mathbb{1}_{[degree_i=d]} \xi_{gd} \times a_t + + \epsilon_{ijt} \tag{13}$$

Where $\log w^0_{it}$ is log wage cleaned of fixed effects for gender, region and industry that was computed in section 2 equation (2). Estimate $\hat{\xi}_{gd}$ capture wage growth by degree type. It is presented in Table 17. For Individuals who graduated from business and engineering schools, where the selection should have remained stronger than at university, wage growth slowed as much as at university (-42, -33, -33 percentage points for business, engineering, and master's graduates, respectively, between generations 1998 and 2010). The type of degree does not capture unobserved quality that could be driving the wage growth slowdown observed between cohorts.

Table 17: Log entry wage regressed on years spent on the labor market by type of degree

	log entry wage		
	Gen 1998	Gen 2004	Gen 2010
Years × Business degree	0.081***	0.073***	0.038***
	(0.005)	(0.004)	(0.004)
Years × Engineering degree	0.065***	0.057***	0.042***
	(0.003)	(0.004)	(0.003)
Years × Masters degree	0.032***	0.026***	0.011***
	(0.002)	(0.002)	(0.002)
Years × Doctorat		0.071***	0.063***
	()	(0.004)	(0.004)
FE gender, location, industry	✓	✓	✓
Observations	2 787	3 835	5 891
R^2	0.105	0.091	0.053

*p<0.1; **p<0.05; ***p<0.01
Individuals whose degree type is unknown are excluded
PhDs are not accounted for in Gen 1998

5.3 Matching quality

Finally, I test for a different period over which initial matching quality is computed. In the baseline, the period considered is the first year on the labour market, i.e. the first observation year of the entire cohort (i.e. 1998, 2004 and 2010 respectively). However, this definition is restrictive in that it does not always leave a full year to everyone. For example, if an individual graduates in June, it leaves only 6 months, between June and December, to observe a first hire. The benefit of the baseline definition is to ensure that individuals face the same conditions in the labour market over a limited period, but it may neglect first hires for individuals finding their first job early in the year after the entire cohort leaves the education system. The alternative period definition considers the first year on the labour market at individual rather than cohort level: for instance, if an individual graduates in June 2010, their first year on the labour market runs from July 2010 to June 2011. I then carry out the same analysis to study the impact of initial matching quality on wage growth.

The results of the analysis using modified matching quality are presented in Table **??**. These results are qualitatively similar to the baseline: the 2010 cohort experiences a longer impact of initial matching quality on wage levels than the 1998 generation. However, the effect is shorter for cohorts 2004 and 2010, since it is no longer significant from years 4 and

6 (compared to 7 and 8 in the baseline analysis). R^2 are higher in the reference regression for the 1998 and 2004 cohorts, and almost equal for the 2010 cohort despite the increase in the number of observations between the reference regression and this one. Hence the shorter effect may be due to a loss in precision due to the new definition of initial period, that doesn't hold initial job market conditions constant.

Table 18: Log entry wage regressed on alternative match quality by year and education level - Long higher education graduates

	log entry wage		
	Gen 1998	Gen 2004	Gen 2010
Year 1 × match quality	0.944***	0.864***	0.62***
	(0.048)	(0.044)	(0.025)
Year 2 × match quality	0.529***	0.486***	0.315***
	(0.061)	(0.058)	(0.033)
Year 3 × match quality	0.488***	0.501***	0.222***
	(0.071)	(0.074)	(0.041)
Year 4 × match quality	0.09	-0.003	0.236***
	(0.092)	(0.07)	(0.046)
Year 5 × match quality	-0.1	0.041	0.241***
	(0.093)	(0.086)	(0.056)
Year 6 × match quality	-0.029	0.042	0.089
	(0.099)	(0.11)	(0.059)
Year 7 × match quality	0.101	-0.249***	-0.022
	(0.102)	(0.096)	(0.055)
Year 8 × match quality	-0.019	-0.538***	0.018
	(0.109)	(0.111)	(0.054)
FE gender, location, industry	✓	✓	✓
Observations	5 559	4 721	5 116
R^2	0.188	0.202	0.3

*p<0.1; **p<0.05; ***p<0.01

Only individuals who found a job in the first year after leaving school are included

6 Conclusion

The Generations Surveys highlight a delay in wage growth that affect cohorts leaving the higher education system in 2004 and 2010 compared to the cohort who graduates in 1998. I decompose the wage growth slowdown by occupation in two margins: an extensive margin, which reflects changes in the distribution of occupations within each cohort, and an

intensive margin, that captures changes in hiring wages by occupation between cohorts. I perform the decomposition at a finer level of occupation and find a clear heterogeneity in the extensive margin between occupations in middle management, and top management and highly qualified professionals. Among these two categories, occupations which experience the largest influx of higher education graduates between the 1998 and 2010 cohorts are also those for which the intensive margin is largest. It suggests the influx of young graduates has not increased the productivity of companies as much as their senior counterparts, which has impacted their wage growth downward. I further explore possible mechanisms in line with this interpretation: access to manager positions and initial match quality. I find both mechanisms play a role in the young higher education graduates' wage growth slowdown.

References

Brunner, B. and A. Kuhn

2014. The impact of labor market entry conditions on initial job assignment and wages. *Journal of Population Economics*, 27(3):705–738.

Card, D. and T. Lemieux

2001. Can Falling Supply Explain the Rising Return to College for Younger Men? A Cohort-Based Analysis. *The Quarterly Journal of Economics*, 116(2):705–746.

Centre d'Études et de Recherche sur les Qualifications

2005. Génération 1998 - Interrogation à 7 ans - 2005.

Centre d'Études et de Recherche sur les Qualifications

2011. Génération 2004 - Interrogation à 7 ans - 2011.

Centre d'Études et de Recherche sur les Qualifications

2017. Génération 2010 - Interrogation à 7 ans - 2017.

Dupray, A. and S. Moullet

2010. Offre éducative, valorisation des diplômes et effets de composition : deux générations de sortants de l'université au tournant des années 2000. *Revue d'economie politique*, Vol. 120(5):845–880.

Epiphane, D., Z. Mazari, M. Olaria, and E. Sulzer

2019. Des débuts de carrière plus chaotiques pour une génération plus diplômée. CEREQ Bref 382.

Gaini, M., A. Leduc, and A. Vicard

2013. Peut on parler de générations sacrifiées ? Entrer sur le marché du travail dans une période de mauvaise conjoncture économique. *Économie et Statistique*, n 462-463.

Genda, Y., A. Kondo, and S. Ohta

2010. Long-Term Effects of a Recession at Labor Market Entry in Japan and the United States. *The Journal of Human Resources*, 45(1):157–196.

Katz, L. F. and K. M. Murphy

1992. Changes in Relative Wages, 1963-1987: Supply and Demand Factors. *The Quarterly Journal of Economics*, 107(1):35–78.

Kwon, I., E. M. Milgrom, and S. Hwang

2010. Cohort Effects in Promotions and Wages: Evidence from Sweden and the United States. *The Journal of Human Resources*, 45(3):772–808.

Liu, K., K. G. Salvanes, and E. O. Sørensen

2016. Good skills in bad times: Cyclical skill mismatch and the long-term effects of graduating in a recession. *European Economic Review*, 84:3–17.

Oreopoulos, P., T. von Wachter, and A. Heisz

2012. The Short- and Long-Term Career Effects of Graduating in a Recession. *American Economic Journal: Applied Economics*, 4(1):1–29.

Rothstein, J.

2020. The Lost Generation? Labor Market Outcomes for Post Great Recession Entrants. NBER Working Paper 27516.