

Abstract (English)

In this dissertation, we use epidemiologic-mathematical techniques to model the academic performance in Spain (paying special attention on the academic underachievement) to understand better the mechanisms behind this important issue as well as to predict how academic results will evolve in the Spanish *Bachillerato* over the next few years. The Spanish *Bachillerato* educational level is made up of the last courses before accessing to the university or to the work market and corresponds to students of 16 – 18 years old. This educational level is a milestone in the career training of students because it represents a period to make important decisions about academic and professional future.

In a first step, in the Chapter 2 we will present a deterministic model where academic performance is analyzed assuming the negative attitude of *Bachillerato* students may be due to their autonomous behavior and the influence of classmates with bad academic results. Then, in the Chapter 3, the model is improved based on the idea that not only the bad academic habits are socially transmitted but also the good study habits. Besides, we decompose the transmission academic habits into good and bad academic habits, in order to analyze with more detail which group of students are more susceptible to be influenced by good or bad academic students. The consideration of quantifying the abandon rates is also a new issue dealt with in it. The adopted approach allow to provide both punctual and confidence intervals predictions to the evolution of academic performance (including the abandon rates) in *Bachillerato* in Spain over the next few years. The adopted approach allows us to model academic performance in academic levels other than *Bachillerato* and/or beyond the Spanish academic system. This issue is assessed in Chapter 4, where the model is satisfactorily applied to the current academic system of the German region of North Rhine-Westphalia.

To conclude this dissertation, we provide an estimation of the cost related to the Spanish academic underachievement based on our predictions. This estimation represents the investment in the Spanish *Bachillerato* from the Spanish Government and families over the next few years, paying special attention on the groups of students who do not promote and abandon during their corresponding academic year.