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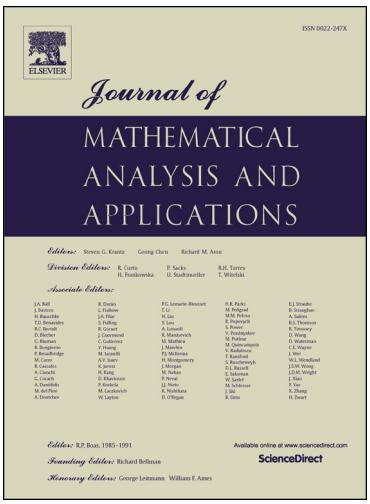

Smoothness of continuous state branching with immigration semigroups

M. Chazal, R. Loeffen, P. Patie

PII: S0022-247X(17)30984-8
DOI: https://doi.org/10.1016/j.jmaa.2017.10.071
Reference: YJMAA 21789

To appear in: *Journal of Mathematical Analysis and Applications*

Received date: 26 April 2016

Please cite this article in press as: M. Chazal et al., Smoothness of continuous state branching with immigration semigroups, *J. Math. Anal. Appl.* (2018), https://doi.org/10.1016/j.jmaa.2017.10.071

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SMOOTHNESS OF CONTINUOUS STATE BRANCHING WITH IMMIGRATION SEMIGROUPS

M. CHAZAL, R. LOEFFEN, AND P. PATIE

Abstract. In this work we develop an original and thorough analysis of the (non)-smoothness properties of the semigroups, and their heat kernels, associated to a large class of continuous state branching processes with immigration. Our approach is based on an in-depth analysis of the regularity of the absolutely continuous part of the invariant measure combined with a substantial refinement of Ogura's spectral expansion of the transition kernels. In particular, we find new representations for the eigenfunctions and eigenmeasures that allow us to derive delicate uniform bounds that are useful for establishing the uniform convergence of the spectral representation of the semigroup acting on linear spaces that we identify. We detail several examples which illustrate the variety of smoothness properties that CBI transition kernels may enjoy and also reveal that our results are sharp. Finally, our technique enables us to provide the (eventually) strong Feller property as well as the rate of convergence to equilibrium in the total variation norm.

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1. Introduction and main results

The objective of this paper is to develop an original approach to obtain detailed information regarding the representation and the regularity properties of the solution to the parabolic

Key words and phrases. Continuous state branching processes with immigration, Bernstein functions, non-self-adjoint integro-differential operators, Laguerre polynomials, Markov semigroups, spectral theory
2010 Mathematical Subject Classification: 41A60, 47G20, 33C45, 47D07, 37A30.

The authors are grateful to an anonymous referee for the careful reading of the manuscript and the insightful comments that helped improving the quality of the paper. This work was partially supported by the Actions de Recherche Concertées IAPAS, a fund of the Communautée francaise de Belgique.

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