DemoGraphic

Identifying different sources of school enrolment change in the Australian Capital Territory

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Introduction

To provide more accurate enrolment projections for local schools and to facilitate long-term education infrastructure planning, practitioners and researchers require detailed enrolment data to analyse school enrolment changes (GLA Demography 2015; National Center for Education Statistics 2016; Pajankar & Srivastava 2019; Raymer, Biddle & Guan 2017). We adopt the multiregional cohort component project model developed for regional population projections (Rogers 1995) to analyse and project school enrolments in the Australian Capital Territory (ACT). This approach allows users to track the sources of school enrolment change over time. In this data visualisation, we present the application of a multiregional cohort component model to identify sources of school enrolment change in the ACT.

Data and methods

The ACT Public school system consists of preschools, primary schools containing Kindergarten to Year 6 students, high schools containing Year 7 to Year 10 students, and colleges containing Year 11 and Year 12 students. We have developed a school enrolment projection model, known as the School Transition Estimation and Projection (STEP) model, based on a multiregional demographic accounting framework. The STEP model uses linked administrative school enrolment data to track student movements across academic levels and between all schools in the school system, including those in the Catholic and Independent sectors. The specification of the STEP model is as follows:

$$\mathbf{E}^{\mathbf{t+1}} = \mathbf{G}\mathbf{E}^{\mathbf{t}} + \mathbf{P} + \mathbf{I} \quad (1)$$

where $\mathbf{E}^{\mathbf{t}}$ and $\mathbf{E}^{\mathbf{t+1}}$ are two vectors of student enrolment at times t and t+1, respectively. $\mathbf{P}$ is a vector of preschool enrolments at t+1. $\mathbf{I}$ is a vector of new students who have migrated to the school system at time t+1. $\mathbf{G}$ contains transition probabilities between all schools and academic levels from time t to time t+1, taking into account graduates and students who left the school system prior to Year 12 (i.e., students who have out-migrated).

As a basis for annual projections for the next ten years, the most recent five years of observed enrolment data are used. Observed enrolment data and transition information were provided by the ACT Education Directorate, containing administrative data on all individual students in the ACT from 2011 to 2021. Future preschool enrolments are based on assumptions regarding the relationship with observed or projected suburb-level fertility four years prior to the projection year. The fertility projections are provided by the ACT Chief Minister, Treasury and Economic Development Directorate. Both the student enrolment data and fertility projection data are not publicly available and were provided directly for the purposes of this analysis.

The STEP model framework allows one to decompose year-to-year school enrolment growth by different sources of enrolment change. Year-to-year school enrolment change is the difference between $\mathbf{E}^{t+1}$ and $\mathbf{E}^{t}$. For the whole ACT school system, there are four components contributing to school enrolment changes:

(i) New Preschool entries (**P**);
(ii) Graduates from Year 12 (embedded in **G**);
(iii) Student in-migration to Kindergarten to Year 12 (**I**); and
(iv) Student out-migration from Preschool to Year 11 (embedded in **G**).

When examining school enrolment changes amongst individual schools or between districts, there are two additional sources of enrolment change (both embedded in **G**):

(v) Transitions from the school / district of interest to other schools / districts; and
(vi) Transitions from other schools / districts to the school / district of interest.

The decomposition allows users to analyse and project each enrolment component separately.

Key features

In Figure 1, we present the 2011-12 to 2030-31 sources of school enrolment change for eight Statistical Area Level 3 (SA3) districts in the ACT. The time periods are separated into three segments depending on whether the data are considered background information, inputs or outputs of the STEP model. The distribution of SA3 boxes represents their relative geographic locations in the ACT, created using the geofacet R package.

North Canberra, South Canberra, Woden Valley, Weston Creek, and Tuggeranong are established districts with no new suburbs planned. They experienced relatively slow or minimum total enrolment changes (the diamonds) over the last ten years and are projected to experience very conservative total changes in the next ten years. With the multiregional cohort component model, we differentiate the dynamics of enrolment changes in these five districts. Though they have similar levels of total enrolment change, these are driven by different components.

The two central districts North Canberra and South Canberra both gain from net migration. North Canberra has more preschool entries contributing to its enrolment change (around 600 students each year), whereas South Canberra has around 400. Instead, South Canberra gains over 300 students each year from inter-district transfers. Woden Valley also gains from inter-district transfers projected for 2022-2031, as well as from net migration. Weston Creek does not have a Public college,

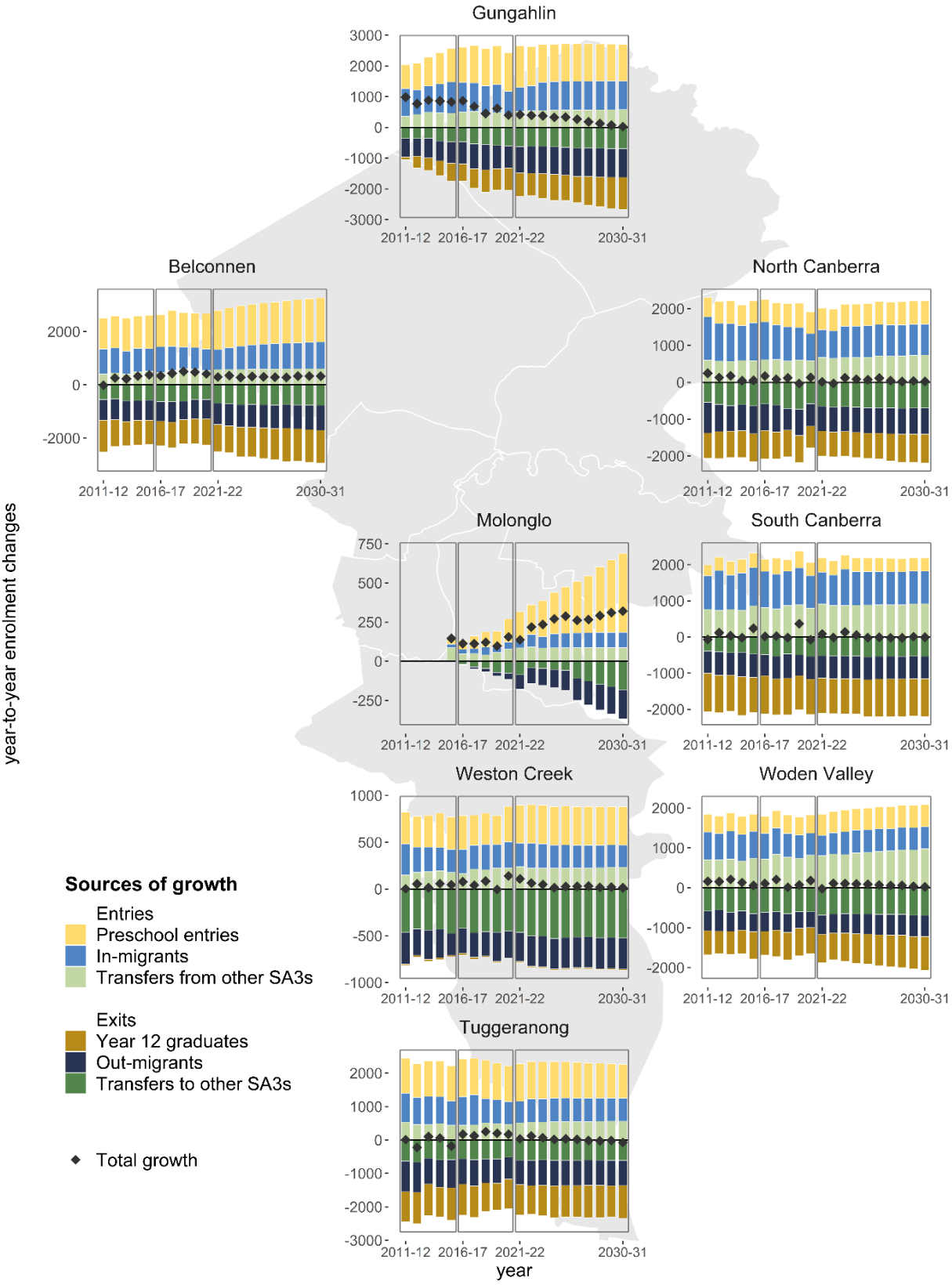

Figure 1: Year-to-year sources of school enrolment growth across ACT by SA3 district: 2011-12 to 2015-16 background data, 2016-17 to 2020-21 model input data, and 2021-22 to 2030-31 projected data

Source: STEP model (15 December 2021 version)

thus there are very few Year 12 graduates and very high transfers to other districts (around 500 students each year). Preschool entry is the largest booster to enrolment growth in Weston Creek, contributing to around 400 new students each year. Tuggeranong has high levels of preschool entries (over 1,000 each year), low levels of inter-district transfers, and high levels of student out-migration or graduation.

Gungahlin and Belconnen are two established districts with new suburbs built and planned. Both districts gain from preschool entries and migration, but lose students from inter-district transfers. Gungahlin exhibited the highest observed enrolment growth across all districts, including substantial growth in preschool entries. School enrolment growth in Gungahlin is expected to slow in the next ten years, driven by drops in preschool entries, increases in Year 12 graduates and losses from inter-district transfers. Preschool entry is the main contributor to Belconnen's school enrolment growth (over 1,200 students in observed data). With several new residential suburbs in the process of being developed, this component is expected to further increase to over 1,500 students after 2024 and to 1,600 students after 2029. The substantial growth in preschool entries is expected to drive enrolment change in Belconnen, counterbalancing increases in Year 12 graduates and net losses from inter-district transfers.

Finally, Molonglo is the newest district in the ACT with several more residential suburbs and new schools planned. School enrolment in Molonglo is projected to substantially increase in the next ten years, driven by preschool entries.

Multiregional demographic accounting frameworks applied to analyse and project school enrolments, like the STEP model, produce more accurate projections and make better use of available enrolment data (Raymer, Biddle & Guan 2017). Traditional school enrolment projection models on the other hand are more inefficient and prone to error as they focus on particular schools, independent of other schools.

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