Exploratory analysis of young adults' trajectories through the UK driving licence acquisition process

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Objective: The UK is one of many high-income countries to experience a decline in driving licence acquisition among young adults in the 2000s. This paper draws on newly available nationally representative microdata that captures the progress of individual drivers through the UK driving licence acquisition process, to establish socio-demographic correlates.

Methods: Using data from the 2016 and 2017 editions of England's National Travel Survey data, a series of binary logit models were employed to identify factors associated with progression through the various phases of the UK's driving licence acquisition process. Factors that are associated with (1) the frequency of taking the driving licence tests, (2) the number of times having failed the theory and driving tests are then identified.

Results: The socio-demographic explanators (i.e. age, gender, individual income, other household members' income, etc.) considered were each found to be associated with driving licence holding in intuitive ways that are broadly consistent with prior literature. However, relatively few factors are significantly associated with progress through the steps of the licence acquisition process, and the goodness-of-fit for progress through these intermediate phases are generally lower (three out of four relevant models have a goodness-of-fit less than 0.1, indicating that other unobservable idiosyncratic personal or contextual characteristics are dominant in these processes). A consistent theme is the strong relationship with labour market participation (positive and significant, at $p=0.06$ or lower, in six of the seven relevant models). Links between income and the intermediate phases, however, were generally weaker. Age is negatively associated with progress through the early phases when respondents are applying for provisional licence and taking theory test, but this relationship turns positive in later stages of the acquisition process ($p<0.01$ in all relevant models).

Conclusion: To the authors' knowledge, this study is the first opportunity to evaluate this novel data resource covering the UK's driving licence acquisition process. This is an important research direction to help policymakers understand young adults' delay in acquiring licences, particularly the extent to which there may be structural inequalities. The main finding is that socio-demographic factors appear to be relatively poor predictors of progress through the licence acquisition process, with employment status the strongest single correlate of the variables that were tested. This paper is concluded with suggestions for designers of household travel surveys in regions where youth licence-acquisition is of increasing focus, as well as a brief discussion of future research needs.

Keywords: driving licence, provisional licence, young adult, theory test, practical driving test

INTRODUCTION

Young adults are delaying or forgoing acquiring a driving licence in many high income countries, dating from the early 2000s (Kuhnimhof et al., 2012a, Delbosc and Currie, 2013). The research question is why this phenomenon is occurring, with hypotheses including changing lifestyles, changing attitudes towards cars, changing demographics, and changing socio-economic status of young adults compared with earlier generations. For example, members of the current cohort of young adults tend to spend longer in education and to postpone marriage and parenthood (Office for National Statistics 2019a, 2019b). An increasing proportion live with their parents (Blumenberg et al. 2016; Chatterjee et al. 2018; Circella et al. 2016). When compared with older generations, young adults nowadays are more likely to live in densely populated urban areas which are well served by public transport (Delbosc and Nakanishi 2017; Melia et al. 2018; Oakil et al. 2016), and these young adults are said to show a weak preference for cars but are open to any travel modes that are suitable (Delbosc and Nakanishi 2017). The slow rate of economic recovery since the Global Financial Crisis has also contributed to the decreasing automobile orientation (licensure, ownership, and use) among young adults (Polzin et al. 2014; Ralph 2015; Williams 2017).

In contrast to these social/economic phenomena, a different set of explanations focus on changes in the process of acquiring a driving licence. In England, the typical young adult in 2017 spends 1.5 years in the licence-acquisition process (calculated by the authors from the UK National Travel Survey data [NTS]), which is comparable to findings from earlier research, including the 1.7 years in Le Vine and Polak (2014) (data from year 2010 NTS) and the 13.2 months (excluding breaks of 6+ months) in the 'Cohort II' study (Wells et al. 2008) (survey data collected during years 2001-2005). Test pass rates have been stable since 2007 (the earliest available) for the "practical" (on-road) test (47% in 2007 vs 50% in 2019), however have trended downwards for the "theory" test (65% in 2007 vs 48% in 2019) (Department for Transport (DfT) 2019). Though the licence acquisition process varies across countries, a general observation in high income countries is a trend of increased stringency and complexity in the processes (see the Related Work section as well as linked discussion in this paper's Supplementary Material).

The current driving licence acquisition process in the UK is summarised in Figure 1. There are three main milestones: acquiring a provisional licence, passing the theory test, and then passing the driving test. With few exceptions, one can apply for a provisional licence at 15 years and 9 months of age, but can only start driving after age 17. Candidates can make arrangements to take the theory test at any time (subject to test centre availability), and can do the same for the driving test after they have passed the theory test. Passing the driving test leads immediately to acquisition of a full driving licence.

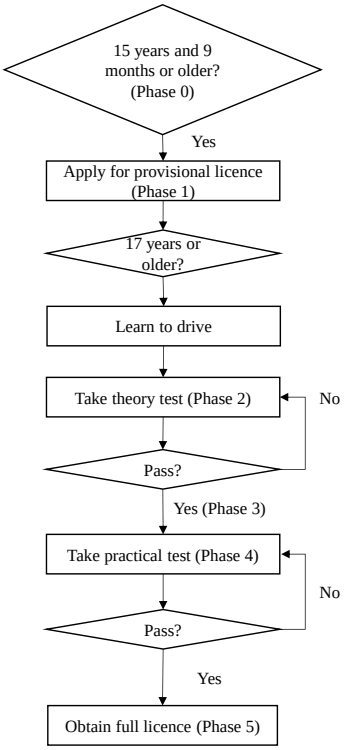


Figure 1 Driving licence acquisition process in the UK and phases

For driving licence acquisition, since its inception in 1965, the NTS only asked what type of licence the respondent holds (no licence, provisional licence or full licence). However, beginning in 2015 the NTS started to collect detailed driving licence acquisition data through additional questions. These data allow researchers to investigate factors that are associated with the driving licence acquisition process to greater depth than was previously possible. To the authors' knowledge, this is the first time that NTS collects driving licence acquisition data, and it is the first opportunity to evaluate the driving licence acquisition process. Given the imperative of decarbonising the transport sector, licence-acquisition is an important step at which policy may be targeted. Our objective through this paper is to contribute to better understanding current licence-acquisition behaviour, which is a pre-requisite to informing the design of policies to change the status quo.

The remainder of this paper is structured as follows. The rest of this section reviews the body of literature relevant to driving licence acquisition (further discussion about GDL processes in a variety of jurisdictions is contained in the Supplementary Material). The Methods section presents descriptive analysis of the data that are used in the Results section and the statistical regression models. The Results section presents results from models of driving licence acquisition, the number of times that a candidate fails the theory test, the number of times that a candidate fails the practical test, and the frequency of candidates' test-taking. The Discussion section concludes this paper with a brief summary of main findings and a set of future research needs.

Related work

Of studies that have investigated the decline in youth licence-holding, the main factors explored include socio-demographic features, the built environment, the possibility of changing attitudes of young adults to cars, and the introduction of graduated driving licence (GDL) systems. The relevant literature is mapped and organised by study objectives, geography, data sources, methodology, and factors investigated in Table SM1 in the Supplementary Material.

The literature focuses primarily on industrialised western countries, especially the US (i.e. McDonald and Trowbridge (2009), Brown and Handy (2015) and Thigpen and Handy (2018)) and Australia (i.e. Raimond and Milthorpe (2010); Delbosc and Currie (2014a, 2014b)). Several studies focus on European countries, including the UK (Le Vine and Polak, 2014; Melia et al., 2018), France (Licaj et al., 2012; Bayart et al., 2020), Sweden (Baradaran et al. 2016), and Norway (Hjorthol 2016). In part the under-representation of developing countries is related to the lack of statistically representative national travel surveys (see e.g. Le Vine et al. (2018)).

The number of studies of this phenomenon peaked in approximately 2012-2015, with the majority of the relevant studies published during these four years. The most frequently investigated factors relating to licence acquisition are socio-demographics and built environment characteristics. A general finding is that being employed and having high income increases the probability of holding a licence (Brown and Handy 2015; Delbosc and Currie 2014b, 2014c; Le Vine and Polak 2014), and Kuhnimhof et al. (2012b) report falling incomes of young adults as one correlate of declining automobile orientation. Living with parents and having good accessibility (from one's residence) to public transport services decreases the probability of holding a licence (Bayart et al. 2020; Hjorthol 2016; Rérat 2018; Le Vine and Polak 2014). Hence, the literature suggests that the delay in various milestones of adulthood (longer years of education and living with parents, delayed marriage, parenthood and home ownership), re-urbanisation (living in densely populated areas with good public transit service) and increasing financial pressure on young adults may be associated with the overall observation of delayed driving license acquisition.

In the US, white young people are more likely to hold a driving licence than their Black, Asian or Hispanic peers, even after controlling for household income (Brown and Handy 2015; Shults et al. 2016; Tefft et al. 2013; Williams 2011). Williams (2011) reported finding similar self-reported reasons for delaying licence acquisition across racial groups, and specifically noted that lack of an available car received the highest response from Hispanic teens (who are licenced at lower rates than non-Hispanic Whites, non-Hispanic Blacks and other non-Hispanic ethnicities). Williams concludes that lack of interest in driving is not the primary reason for minority race groups delaying licensure.

Other factors explored include attitudes and the influence of Information and Communication Technologies (ICT). With respect to attitudes, some studies argue that the young generation see car ownership as less of a status symbol than earlier generations did, and instead as an indicator of maturity and independence (Delbosc and Currie 2014a; Fylan and Caveney 2018). Thigpen and Handy (2018) investigated various attitudinal factors, and reported mixed findings regarding the effect of one's social network on the timing of licence-acquisition. The authors also found that reporting "enjoyment" from cycling or public transport was associated with delay. Multiple studies have found no evidence of heightened environmental concern being associated with delay in license acquisition (Delbosc and Currie 2014a; Schoettle and Sivak 2014; Le Vine, Jones, et

al. 2014). With respect to ICT, Thigpen and Handy (2018) found ICT delays driving licence acquisition, however other studies report that possessing a smartphone and/or using electronic communication *increase* the likelihood of young adults having a driving licence (Brown and Handy 2015; Le Vine, Latinopoulos, et al. 2014).

GDL has been introduced in many high-income countries, including Australia, Canada, New Zealand and the US [see reviews in Senserrick and Williams (2015) and Table SM2, as well as extended discussion in the Supplementary Material]. The influence of GDL restrictions has been considered by various authors, but the overall influence of GDL on licence acquisition is mixed. Overall, Raimond and Milthorpe (2010) and Tefft et al. (2014) did not find that GDL led to delayed licence acquisition, however Thigpen and Handy (2018) found that it did.

GDL and the UK's multi-stage driving licence acquisition system have similarities and differences (see detailed comparisons in Section SM1). Although the UK's Department for Transport has not yet elected to introduce it due to stated concerns that it would potentially restrict young people's education and employment (Department for Transport 2019a), there have been discussions on introducing GDL to the UK (Baughan and Simpson 2002; Department for Transport 2019b; Kinnear et al. 2014).

Wells et al. (2008) reported findings from a major longitudinal study of young and novice British drivers. Approx 43K learner drivers were observed in multiple waves between 2001 to 2005, with follow-up sampling at the 6, 12, 24 and 36 month timepoints after having passed the practical driving test. Wells and colleagues analysed factors affecting the pass rate of the theory and driving tests, notably factors relating to experiences both during the learning-to-drive phase and afterwards (i.e. crash involvement post-licence acquisition). Key findings include younger age groups having a higher rate of test-passing, and females having a higher rate of passing the theory test whereas males have a higher pass rate for the driving test. Also, Wells and colleagues report that the number of accidents tended to decrease as novice drivers gain experience, however the severity of accidents tends to increase. Finally, the authors reported that the introduction of the hazard perception component in the UK's theory test is associated with some reduction in subsequent crash rates.

The present study builds on the earlier Wells et al. (2008) work by introducing multivariate regression analysis of individual drivers' progress through the licence-acquisition regime, including a richer set of socio-demographic features than age and gender (which were analysed by Wells and colleagues). Whereas the Wells et al. study focused primarily (though not exclusively) on learner drivers' experiences post-licence acquisition, the present study is motivated to better understand learner-drivers' trajectories up to the point of licence acquisition. Results of this paper, which is based on a novel dataset, is also in contrast to many prior studies that have typically drawn on observations of the outcomes of these processes (licence acquisition or not, at a given age). It is hoped that documenting the correlates of progress through licence-acquisition processes can enrich understanding of the phenomenon of delayed acquisition in high-income countries.

METHODS

This section first introduces the data resource employed in this study, followed by the descriptive analysis of the data and then the statistical approach.

Data

The questions newly added in 2015 that are asked to only provisional licence holders, enquiring about their progress through the licence acquisition process (Department for Transport 2017), are as follows:

- Are you currently learning to drive?
- [If currently learning to drive] Have you taken the driving theory test?
- [If you have taken theory test] When did you first take the driving theory test (year and month)?
- [If you have taken theory test] Have you passed the driving theory test?
- [If you have passed theory test] How many times did you fail the theory test before passing?
- [If you have passed theory test] Have you taken the practical driving test?
- [If you have passed theory test] When do you plan to [next] take the practical test?
- [If you have taken practical test] When did you first take the practical test (year and month)?
- [If you have taken practical test more than once] When did you most recently take the practical test (year and month)?

Figure 2 illustrates the relationship between the driving licence acquisition process and the newly added process-related questions:

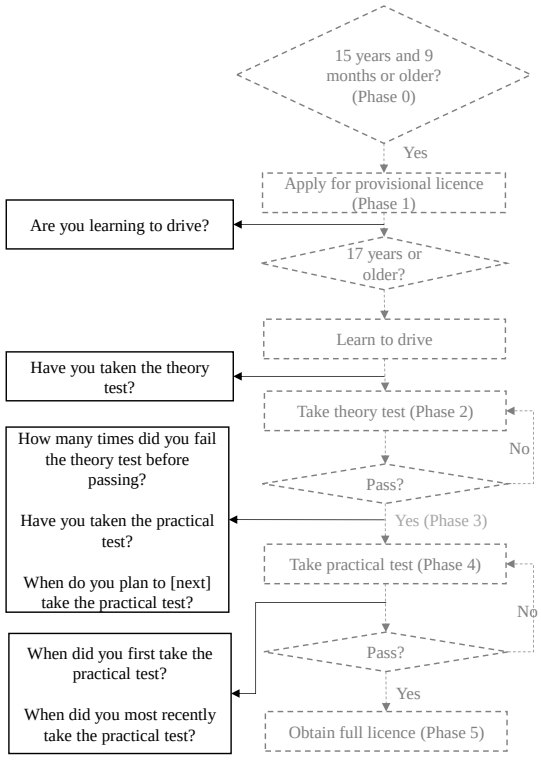


Figure 2 Relationship between steps of the driving licence acquisition process (right) and NTS survey questions (left)

Descriptive analysis of licence-acquisition-process data

The driving licence acquisition process was coded into its five phases (see Table 1). The number of times failing the theory test and the number of times failing the practical driving tests were summed up, and this quantity was divided by the duration between the first time the respondent took the theory test and the date of the respondent's NTS interview to calculate the frequency of taking licence-acquisition tests per year (shown in Table 1).

Table 2 contains a summary of the socio-economic profiles of young British adults in both years 2016/17 (the focus of this analysis) and comparison with 2002/03, as 2002 is first year when the NTS sample was increased to its present size (along with various other structural changes to the survey protocol). Due to the enforced interregnum period between age 15 years, 9 months (when a candidate can apply for a provisional licence) and when driving is allowed to commence at age 17 (see Figure 1), the analysis presented in this paper excludes all NTS respondents under age 17.

Full licence-holders are on average 3 years older than unlicenced and provisional licence-holders. A larger fraction of full licence-holders are female (52% in 2016/17 versus 54% in 2002/03), which is a continuation of longer-term trends in the UK and internationally (Kuhnimhof et al., 2012a; Chatterjee et al., 2018). However, males now represent a higher percentage of provisional licence holders (49% in 2016/17 versus 46% in 2002/03) and the unlicenced (48% in 2016/17 versus 45% in 2002/03).

For young adults of all driving licence statuses, mean individual income declined between 2002 and 2017 in inflation-adjusted terms. Mean individual income is highest for full licence holders, followed by provisional licence holders, and then the unlicenced, with the individual incomes of the latter two groups being much closer. On average, the majority of their household income is earned by other household members (rather than earned by themselves), with the difference in other household members' incomes between the different licence statuses much smaller than for individual incomes.

The average population density of the neighbourhoods (postcode sectors) of young adults' residences increased rapidly between 2002 and 2017, and the walking distance to public transport decreased, reflecting changes in the housing market during this period. Unlicenced young adults live in the highest-density neighbourhoods, and fully-licenced young adults live in the lowest-density neighbourhoods.

Being employed corelates closely with licence-holding status: For full driving licence holders, 84% were employed in 2016/17, whereas only 43% and 57% of the unlicenced and provisional-holders respectively were employed.

Compared to other ethnic groups, white young people are much more likely to own a licence (both provisional and full) in both 2002 and 2017. This trend is consistent in 2002 and 2017.

Another observed trend is that, across all licence-holding statuses, young adults became less likely to live with children a generation younger (i.e. an age difference of at least 16 years), and more likely to live with "parents" (i.e. an adult at least 16 years older).

Although the NTS is overall a large-sample survey (N=17,633 and 16,425 in 2016 and 2017, respectively), the relatively small proportion of the population that is actively in the process of acquiring a driving licence means that this subsample is much smaller. Hence, numerical analysis on the number of tests taken are based on a sample size of N=273 for the number of times having failed in the theory test and N=78 for the number of times having failed the practical driving tests.

Table 1 Descriptive analysis of 2016-2017 adults

Variable Name		Distribution or mean value
Phase	No licence (Phase=0)	19.6%
	Provisional licence, has not taken any tests (Phase=1)	5.6%
	Provisional licence, has taken but not passed the theory tests (Phase=2)	0.3%
	Provisional licence, has passed the theory tests (Phase=3)	0.7%
	Provisional licence, has taken but not passed the driving tests (Phase=4)	0.3%
	Full licence (Phase=5)	73.5%
Test-taking frequency per year		3.0 times (N=273)
Number of times having failed the theory tests		1.0 times (N=273)
Number of times having failed the practical driving tests		2.3 times (N=78)
Sample size		26,501

Statistical regression models

The statistical models employed in this study are binomial logit (BNL) and linear regression models. BNL was employed to analyse the correlates of socio-demographic features and (1) respondents having a full licence; (2) respondents' progress in the licence acquisition process, and (3) factors that are associated with multiple failings in the theory test and the practical driving test. Linear regression was used to analyse the associations of socio-demographic features and test taking frequency.

Table 2 Descriptive analysis of young adults (age 17-29) from 2002 to 2017

Variable Name	**Licence type**	**Distribution**	
		2002/03	2016/17
Mean age (years)	No licence	21.7	22.0
	Provisional	21.3	21.7
	Full	24.3	24.6
	Total	23.1	23.4
Proportion that is male	No licence	46%	49%
	Provisional	45%	48%
	Full	54%	52%
	Total	50%	50%
Mean individual income (2017 prices, CPI-adjusted)	No licence	£8,770	£7,617
	Provisional	£10,052	£9,350
	Full	£19,522	£17,839
	Total	£15,063	£13,769
Mean income earned by other household members (2017 prices, CPI-adjusted)	No licence	£24,841	£26,754
	Provisional	£30,064	£30,502
	Full	£29,654	£28,963
	Total	£28,547	£28,853
Mean population density (persons/hectare of postcode sector)	No licence	28.7 per hectare	52.0 per hectare
	Provisional	24.8 per hectare	40.0 per hectare
	Full	23.8 per hectare	34.3 per hectare
	Total	25.2 per hectare	39.3 per hectare
Mean walking time to the nearest public transit station (minutes)	No licence	3.7	3.1
	Provisional	3.7	3.2
	Full	4.0	3.3
	Total	3.8	3.3

Table 2 Descriptive analysis of young adults (age 17-29) from 2002 to 2017 (cont'd)

Variable Name	**Licence type**	**Distribution**	
		2002/03	2016/17
Proportion that is Employed	No licence	48%	43%
	Provisional	66%	57%
	Full	81%	84%
	Total	70%	70%
Proportion that is Full-time Employed	No licence	32%	28%
	Provisional	42%	36%
	Full	69%	71%
	Total	54%	54%
Proportion that as a Bachelor's degree or higher	No licence	N/A*	25%
	Provisional	N/A	19%
	Full	N/A	39%
	Total	N/A	32%
Proportion that lives with children a generation younger (16 years or greater difference in age)	No licence	22%	20%
	Provisional	20%	19%
	Full	20%	20%
	Total	20%	20%
Proportion that lives with adults a generation (16 years or greater difference in age)	No licence	55%	59%
	Provisional	61%	69%
	Full	38%	47%
	Total	47%	54%
Proportion that was born in the UK	No licence	N/A*	76%
	Provisional	N/A	89%
	Full	N/A	88%
	Total	N/A	86%

Table 2 Descriptive analysis of young adults (age 17-29) from 2002 to 2017 (cont'd)

Variable Name	Licence type		Distribution	
			2002/03	2016/17
Proportion of driving licence type, by ethnicity	No licence	White	22%	19%
	Provisional		19%	23%
	Full		58%	59%
	No licence	Non-white	38%	31%
	Provisional		19%	24%
	Full		43%	44%
Proportion of driving licence type, by household Area Type	No licence	London	22%	25%
	Provisional		15%	17%
	Full		15%	16%
	Total		17%	18%
	No licence	Other urban area	73%	69%
	Provisional		78%	75%
	Full		75%	72%
	Total		75%	72%
	No licence	Rural	5%	6%
	Provisional		7%	8%
	Full		10%	12%
	Total		8%	10%
Sample size	No licence		1657	1167
	Provisional		1286	1264
	Full		3782	3154
	Total		6725	5598

*Question not included in NTS questionnaire in 2002/03

RESULTS

Factors associated with young people's full driving licence possession was analysed first (Table 3). Other than gender and walking time to the nearest public transit station, all independent variables for the with/without full driving licence model are highly significant. The signs of each of these parameters is the same as prior analysis performed using year 2010 data, which is shown in Table 3 for comparison purposes (Le Vine and Polak 2014). Their ceteris paribus relationships with full driving licence holding are:

Table 3: Binary logit model for whether a young adult holds a full driving license

Variable	**Year 2016-17**		**Year 2010**	
	Parameter	**p-value**	**Parameter**	**p-value**
Intercept	-3.06	<0.01	-1.72	<0.01
Age	0.16	<0.01	0.11	<0.01
Individual income	2.17×10^{-5}	<0.01	2.41×10^{-5}	<0.01
Other household member income	1.16×10^{-5}	<0.01	1.91×10^{-5}	<0.01
Walking time to the nearest public transport station	0.02	0.21	0.02	0.06
Population density per hectare (natural log)	-0.01	<0.01	-0.01	<0.01
Gender (male)	0.05	0.47	0.18	0.05
Is employed	0.74	<0.01	0.64	<0.01
Is full-time employed	0.37	<0.01	0.47	<0.01
Has a degree	0.41	<0.01	0.83	<0.01
Live with children a generation (16+ years) younger	-0.38	<0.01	-0.03	0.82
Live with adults a generation (16+ years) older	-0.40	<0.01	-0.57	<0.01
Born in the UK	0.56	<0.01	0.78	<0.01
Household area type (London)	-0.72	<0.01	-0.54	0.02
Household area type (Other urban area)	-0.45	<0.01	-0.28	0.07
Household area type (rural area)	0 (fixed)		0 (fixed)	
Pseudo r^2	0.21		0.22	
Significance (p-value)	<0.01		<0.01	
Sample size	4716		2972	

- Age: positive association
- Income: positive for both individual and other household members' income, and the individual income has higher impact than other household members' income
- Employment status (and full-time employed): positive association
- Degree level: positive association
- Born in the UK: positive association
- Population density: negative association
- Living in London and other urban areas: negative association
- Living with adults a generation (16+ years) older: negative association
- Live with children a generation (16+ years) younger: negative association.

Notable changes from year 2010 include gender becoming insignificant (i.e. being male no longer having a significant positive relationship with licence-holding), and living with children 16 or more years younger becoming significant (and negative).

Table 4 presents the first of the results based on the acquisition-process data; four BNL models are shown that capture respondents' progress from no licence through to the practical driving test. The sample size decreases from left to right in Table 4, because in the model of each successive milestone of the licence-acquisition process, respondents who have not entered the phase are excluded. For instance, the model for whether a respondent has or has not taken the theory test (Phase 1 versus Phases 2-4) does not consider people that have not yet acquired a provisional licence (Phase 0).

The overall goodness-of-fit for the models presented in both Table 4 and Table 5 are relatively low. The general conclusion is therefore that standard socio-demographic characteristics provide relatively little explanatory power for progress through each of the phases of licence-acquisition. In Table 4, the higher goodness-of-fit for the first model indicates that the socio-demographic variables considered provide better explanation for which young adults have initiated the licence-acquisition process, in comparison to their progress in taking/passing the tests. Other explanators, which are unobservable in the NTS data, appear to be more salient.

Across the four models presented in Table 4, age and employment status tend to be the strongest predictors, each significant in three of the four models. Being employed is consistently a positive effect, however individual income and full-time employment status are weaker predictors.

The effect of age is negative at the early stages of the licence acquisition process, but it trends in a positive direction and becomes positive and significant in the final phase (having taken the driving test). Thus the overall positive ceteris paribus relationship between age and full-licence-holding status (see Table 3) is primarily due to older young adults progressing more rapidly through the later phases of the process (rather than the earlier phases). For the model of whether a candidate has taken the practical driving test (and failed, because they would become fully licenced by passing), the parameter for age is the only significant effect.

Having been born in the UK is significant in the models of the first two phases, but its influence is mixed: It has a positive impact on applying for a provisional licence, but a negative impact on starting to take theory test. In other words, international migrants to the UK tend, all else equal, to move more quickly to taking the theory test rather than remain in Phase 0 (holding a provisional licence but not having taken any tests).

Table 5 presents results from the frequency of test-taking (tests taken/year), the number of times having failed the theory test, and the number of times having failed the practical driving test.

Table 4 Driving licence acquisition process, by BNL models

Variable	With/Without provisional licence (Phase 0 versus Phases 1-4)		Has/Has not taken theory test (Phase 1 versus Phases 2-4)		Has/Has not passed theory test (Phase 2 versus Phases 3-4)		Has/Has not taken practical driving test (Phase 3 versus Phases 4)	
	Parameter	**p-value**	**Parameter**	**p-value**	**Parameter**	**p-value**	**Parameter**	**p-value**
Intercept	1.51	<0.01	-0.19	0.51	1.35	<0.01	-2.40	<0.01
Age	-0.05	<0.01	-0.04	<0.01	*		0.05	<0.01
Individual income	6.89×10^{-6}	0.02	*		*		*	
Other household member income	*		7.74×10^{-6}	<0.01	*		*	
Walking time to the nearest public transport station	*		*		*		*	
Population density per hectare (natural log)	-2.15×10^{-3}	0.03	*		*		*	
Gender (male)	-0.12	0.07	*		*		*	
Is employed	0.66	<0.01	0.29	0.02	0.74	0.06	*	
Is full-time employed	0.18	0.07	*		-1.08	<0.01	*	
Has a degree	-0.17	0.02	*		0.60	0.08	*	
Live with children a generation (16+ years) younger	0.41	<0.01			*		*	
Live with adults a generation (16+ years) older	*		*		*		*	
Born in the UK	0.23	<0.01	-0.84	<0.01	*		*	
Household area type (London)	0.27	0.08	-0.85	<0.01	*		*	
Household area type (Other urban area)	0.08	0.53	-0.47	0.03	*		*	
Household area type (rural area)	0 (fixed)		0 (fixed)		*		*	
Pseudo r^2	0.28		0.08		0.05		0.07	
Sample size	7,116		1,859		344		266	

Note: * indicates variables excluded due to p > 0.15

Table 5 Frequency/year of test-taking and number times of taking tests

Variable	Frequency of tests taken per year (linear regression)		Failed in the theory tests two or more times/less than two (BNL)		Failed in the driving tests two or more times/less than two (BNL)	
	Parameter	**p-value**	**Parameter**	**p-value**	**Parameter**	**p-value**
Intercept	1.21	0.08	-3.76	<0.01	-0.40	0.41
Age	*		*		*	
Individual income	*		*		*	
Other household member income	3.45×10^{-5}	0.01	*		*	
Walking time to the nearest public transport station	*		*		*	
Population density per hectare (natural log)	*		*		1.07×10^{-2}	0.07
Gender (male)	*		0.80	0.07	-0.99	0.10
Is employed	1.23	0.07	0.93	0.07	*	
Is full-time employed	*		*		0.84	0.11
Has a degree	*		*		*	
Live with children a generation (16+ years) younger	*		*		*	
Live with adults a generation (16+ years) older	*		*		*	
Born in the UK	*		-0.95	0.06	*	
Household area type (London)	*		*		*	
Household area type (Other urban area)	*		*		*	
Household area type (rural area)	*		*		*	
r^2 / pseudo r^2	0.03		0.09		0.15	
Sample size	273		273		78	

Note: * are factors with p-value>0.15

A model of the relationship between the frequency of test-taking per year and the socio-demographic features is presented first. The logic is that licensure candidates that engage in test-taking at a high frequency are likely to be relatively highly motivated to obtain a driving licence and/or experiencing difficulty passing the tests (the NTS data does not allow us to distinguish between these competing explanations).

Consistent with the results previously presented from the models of progress through the phases of licence acquisition, the results for this model of test-taking frequency show a positive and significant association between test frequency and employment status. Individual income is not

significant, whereas other household members' income (parental income in the caser of many young adults) has a positive association with the frequency of test-taking.

The other two models in Table 5 are binary logit models which analyse factors associated with experiencing multiple (two or more) test failures. Similar to the linear model, few significant relationships between the dependent variables and with socio-demographic factors were found. However, employment status again shows significant and positive association with multiple failings in both theory (is employed) and driving (is full-time employed) tests. The impact of gender on the two tests is opposite: being male is associated, net of confounding effects, with higher numbers of failures of the theory test, but vice versa for the driving test. Being born in the UK is associated with lower numbers of failures of the theory test, which may be because they are more familiar with the traffic rules in the UK. Candidates living in low-density locations are weakly significantly ($p=0.07$) less likely to have multiple failures of the driving test, though this effect was not found for the theory test.

DISCUSSION

This study contributes an initial exploratory analysis of young adults' progress through the elemental steps of the UK's driving licence acquisition process. Earlier work identified that the typical British young adult is (as of 2010) spending between one and two years in the process of acquiring a driving licence, which was found continues to be the case in 2016/17 (at 1.5 years).

While a body of literature has accreted over the past decade documenting the decline in rates of licence-holding among young adults in various high-income countries, there are competing hypotheses as to whether this is due to the increasing complexity of licence-acquisition regimes or changing preferences. To the best of the authors' knowledge, this is the first study to evaluate these changes using acquisition-process data of this level of granularity. However, while the National Travel Survey dataset that was employed is large-sample and nationally-representative of the English population in 2016/17, an important limitation of this study is the small sample size of the number of individuals observed in each phase of the licence-acquisition process.

The analysis focuses on two main questions: (1) which factors are associated with progress through the phases from being unlicenced to holding a full driving licence; and (2) which factors contribute to experiencing multiple failed tests and high rates of test-taking (with the latter measured as frequency of test-taking/year).

Many standard socio-demographic explanators were not found significantly to correlate with progress through the process of acquiring a driving licence, though they are better able to predict which young adults hold a full driving licence (i.e. which have successfully completed all steps in the process). Goodness-of-fit is generally low, indicating that other unobservable idiosyncratic personal or contextual characteristics are dominant in these processes. A consistent theme through many of the models of progress through the individual phases is the structural importance of labour market participation, with much weaker patterns for other socio-demographic indicators. Employment status was also found to correlate, ceteris paribus, with test-taking frequency. A mixed and generally weaker patterns for income is found, though in several models income of other household members (which will include parental income of candidates living with parents) is positively related to progress through the licence-acquisition regime as well as frequency of test-taking.

Beyond the small-sample limitations noted previously, this line of research highlights the complexity of gathering data of progress through the licence-acquisition-process in a large-scale household travel survey. In future surveys, it would be very useful to collect process-related data from people that have recently completed the process, which is not observable using the English NTS data resource and greatly limits researchers' ability to distinguish between the trajectories of the most successful learner-drivers and others. It would be useful to add several additional data points that are not present in the NTS data which would permit alternative statistical approaches (e.g. inclusion of additional detail about the timing of the transition between each phase would permit use of survival modelling approaches). It would also be desirable to include questions regarding the reasons for the amount of passage of time by each individual candidate in the licence acquisition process. Data that were employed in this study do not indicate whether the passage of time is voluntary on the part of the licence-seeker or externally imposed (perhaps because of demand for test-taking in excess of available test-taking slots). The limited saliency of socio-demographic explanators suggests that it may be useful to gather more information from respondents about their behaviour and decisions whilst learning to drive. Qualitative research methods could be very helpful to better understand which contextual or personal factors that are unobserved in this study are important in explaining successful navigation of the process. International comparisons from other locations that have experienced declines in youth licencing would help advance this line of research, as would further enquiry on the strong link between labour market participation and licence-acquisition, specifically on the dual transitions of young adults into both employment and into driving.

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SUPPLEMENTARY MATERIAL

Section SM1: Graduated Driving Licence (GDL) and its impacts

In the U.S., GDL restrictions became widespread in the 2000s (Blumenberg et al. 2016). GDL systems are designed to provide young or novice drivers with driving experience gradually over time, to lower their elevated risk of involvement in traffic casualties: For example, Zhu et al., (2009) reported that New York State's GDL system resulted in a 31% reduction in the driver injury rate among 16-year olds and a 21% reduction among 17-year olds; McCartt et al. (2010) demonstrate a 30% reduction in fatal crashes for "well restricted" versus "poorly restricted" GDL systems; Similarly, Begg and Stephenson (2003) report that the immediate impact on traffic injury rates from implementing GDL persists over time

Senserrick & Williams (2015) provide an extensive review of GDL literature published in the past two decades, covering Australasia, North America and parts of Europe. Senserrick & Williams (2015) identified clear limitations in the literature, such as not all specific elements of GDL regimes being supported by rigorous research. Example components noted by Senserrick and Williams to lack formal evaluation include supervisory driver requirements and minimum provisional period (before a full unrestricted licence can be attained). They also note that much of the literature does not account for structural socioeconomic disadvantages; understanding such issues is important to support policymakers in avoiding further disadvantaging already disadvantaged youth when introducing or strengthening a GDL component.

Though motivated by the same fundamental challenges facing young and/or novice drivers, there are both similarities and differences between the UK's driving licence acquisition process and the GDL schemes that are used in other high-income countries. Similarities include learner drivers requiring an in-vehicle fully licenced adult of a minimum age, and in some instances with a minimum number of years holding a driving licence to ensure that the supervising passenger is not a novice driver (Senserrick et al. 2010). Notable differences include that GDL schemes typically (see Table SM2) have a larger number of intermediate stages and more restrictions on holders' driving, compared to the UK's licence acquisition regime (Senserrick and Williams 2015; Shope 2007). Also, many GDL schemes restrict the number of peer (i.e. "friend") passengers (Ouimet et al. 2010) and night-time driving (Williams 2003) whilst the UK's system contains no such limitation.

Table SM1: Summary of literature

	Dependent variable/objective	Geography and data	Methodology	Dependent variables					Cohort analysis?
				Socio-demographic features	Built environment	Values and attitudes	ICT	GDL?	
(McDonald and Trowbridge 2009)	Young people (16-19 years old)'s driver status (including all types of licence status)	US, 2001 National Household Transportation Survey	Logit model		Neighbourhood density (-)				
(Raimond and Milthorpe 2010)	Young people's driving licence holding trends (all types or provisional + full)	Australia, Roads and Traffic Authority Licence Statistics and Estimated Resident Population	Descriptive	Economic pressure (-)	Population density (-)			Yes	Yes
(Sivak and Schoettle 2011)	Changes in licensing of U.S. drivers (did not specify the type of licence)	Federal Highway Administration (1984, 2009)	Descriptive						Yes
(Williams 2011)	Reasons for teenagers not starting acquiring licence; Teenagers' opinion on licencing policies	US (survey, n=641, 2010)	Descriptive	Lack of car access (+); Cost (+); Lack of parents' availability (+)	Access to other modes (+)	Busy with other activities (+)			

Table SM1: Summary of literature (cont'd)

	Dependent variable/objective	Geography and data	Methodology	Dependent variables	Cohort analysis?			
				Socio-demographic features	Built environment	Values and attitudes	ICT	GDL?
(Licaj et al. 2012)	Whether young adults participate in the early driving scheme at age 16-17; Whether age 18-24 people hold a driving licence; Whether young licence holders actually drive a car	France (2005-2006 Lyon Household Travel Surveys)	Multilevel logistical regression	Lack of car access (-) Income (-)	Living in urban area (+)			
(Kuhnimhof, Armoogum, et al. 2012)	Share of licence holders (not specify the type of licence); Car availability; Modal split; Multimodality; Car mileage and total mileage	NTS data of France (1982, 1993-1994, 2007-2008), Germany (1972, 1982, 1989, 2010), Japan (1987, 1994, 1999, 2005), Norway (1983, 2004, 2009), UK (1975-1976, 1985-1986, 1995-2006), US (1983, 2004, 2009)	Descriptive	Gender (Man decreased driving licence possession and car mileage more than female)				
(Sivak and Schoettle 2012)	% of people with driving licence (did not specify the type of licence)	Canada, Finland, Germany, UK, Israel, Japan, Latvia, Netherlands Norway, Poland, South Korea, Spain, Sweden, Switzerland, US	Descriptive; Linear regression	Gross national income purchasing power parity (GNI PPP) per capita (+); Vehicles per 1000 people; Passenger cars per 1000 people; Vehicles per kilometre of road; Percentage of unemployed Median age of the population (+); Mean years of schooling	Percentage of population in megacities (+)		Cell phone subscriptions per 100 people; Internet users per 100 people (-)	

Table SM1: Summary of literature (cont'd)

	Dependent variable/objective	Geography and data	Methodology	Dependent variables					Cohort analysis?
				Socio-demographic features	Built environment	Values and attitudes	ICT	GDL?	
(Delbosc and Currie 2013)	Review causal factors that contributed to licensing reductions	N/A	Descriptive						
(Delbosc and Currie 2014a)	The influence of attitudinal factors on driving licence acquisition	Australia; Discussion (33 people)	Descriptive	No	No	Social status of car; Environmental awareness	Electronic communications		
(Delbosc and Currie 2014b)	Has driving licence (provisional or full)	Australia (household travel survey 1994, 1999, 2004, 2009)	Binary logistic regression	Age (+) Gender (Man +) Employed (+) Living with children (+) Access to private vehicles (+)					Yes
(Delbosc and Currie 2014c)	Rate of driving licence acquisition (no licence, learner's permit, provisional or full licence)	Australia (interview survey, n=216)	Descriptive	Age (+); Employed (+) Cost (-) Living with roommates or a partner (+) Living in a household with a car (+)	Alternative modes (-)		Electronic communications (-)		
(Le Vine, Jones, et al. 2014)	Having a full licence	UK (2009-2010 NTS data)	Descriptive			Environmental concern			
(Le Vine, Latinopoulos, et al. 2014)	Having a full licence	UK (Scottish Household Survey and the Opinions and Lifestyle survey, 2005-2006)	Multivariate logistic regression	Income (+) Employed (+) Living with children (-) Living with parents (-) Education level (+)	Live in large urban areas (-)		Time spent online (+)		

Table SM1: Summary of literature (cont'd)

	Dependent variable/objective	Geography and data	Methodology	Dependent variables					Cohort analysis?
				Socio-demographic features	Built environment	Values and attitudes	ICT	GDL?	
(Le Vine and Polak 2014)	Having a full licence	UK (2010 NTS data)	Multivariate logistic regression	Gender (Man) (+) Employed (+) Education level (+) Living with parents (-) Born outside of UK (-) Individual income (+) Other household members' income (+)	Living in London (-) Population density (-) Walking time to nearest public transport stop (+)				
(Schoettle and Sivak 2014)	Reason for young people not having a driving licence (did not specify the type of driving licence)	Online survey (US, 618 respondents)	Descriptive	Lower income; Lower education level Disability/medical/vision problems	Have access to other modes	Not enough time; Prefer walk, bike or public transport; Environmental concern	Electronic communications		
(Tefft et al. 2014)	Whether young people are fully licenced (1) within 12 months of the state minimum age for licensure and (b) before age 18	Survey (US, n=1039, 2012)	Descriptive; Multivariable logistic regression	Ethnic group (white -); Household income (-)				Yes	
(Brown and Handy 2015)	Having a licence (learner permit and above); Age at which a licence was obtained	US (survey, n=3090, May 2013)	Binomial logit model; Multinomial logit model	Gender (Man) (+) Parent education level (+ for having licence) white (+) After-school activities (+ for having licence) Arrival before or after scheduled school start time (+ for having licence)	Distance from home to school (+) Access to bikes (+ for having licence) Bike use frequency (- for having licence)	Rushed to get ready in the morning (+) Lots of stuff to carry (+ for having licence) Liked being physically active (-)/bus (-) Can rely on parents to drive places (- for having licence)	Owning a smart phone (+)		

Table SM1: Summary of literature (cont'd)

	Dependent variable/objective	**Geography and data**	**Methodology**	**Dependent variables**					**Cohort analysis?**
				Socio-demographic features	**Built environment**	**Values and attitudes**	**ICT**	**GDL?**	
(Curry et al. 2015)	Crash rate at different phases	US (New Jerson Motor Vehicle Commission's licensing database and the New Jerson Department of Transportation's crash database)	Descriptive	Age (-) Driving experience (-) Transition from intermediate to full driving licensure (+)					
(Baradaran et al. 2016)	propensity of individuals in acquiring driving licence (did not specify the type of licence)	Sweden (annual tax declarations and annual vehicle inspections, 2003-2011)	complementary log-log proportional hazard model	Parent income (+) Parent vehicle ownership (+)	Living in large cities (-)				Yes
(Hjorthol 2016)	Have driving licence (not specify the type of licence); Have access to car whenever required	Norway; NTS data 1985-2009	Logistic regression; Logistic regression;	Gender (Man) (+) Employed (+); Education level (+); Married/cohabiting (+) Number of cars in household (+ for licence)	Household area in large cities (-); Access to public transport (-)				Yes
(Delbosc and Nakanishi 2017)	Whether young adults delayed or completely forgone driving licence acquisition (did not specify the type of licence)	Australia (interview, n=55, 2015)	Descriptive	Adult milestones (having children, moving to suburb areas, etc)					
(Fylan and Caveney 2018)	Motivations of young people to learn to drive (did not specify the type of licence)	UK (focus group, n=48)	Descriptive			Sign of independence (+); Personal space (+); Kudos (+); Expand their social world (+); Career opportunities (+)			

Table SM1: Summary of literature (cont'd)

	Dependent variable/objective	Geography and data	Methodology	Dependent variables					Cohort analysis?
				Socio-demographic features	**Built environment**	**Values and attitudes**	**ICT**	**GDL?**	
(Thigpen and Handy 2018)	Have driving licence (full licence); Licensing age	2014-15 UC Davis Campus Travel Survey	Binomial logistic model; Survival analysis and censored linear regression	Gender (Man) (+ for having licence and – for delay) Ethnicity (mixed for having driving licence and + for delay) Parent education level (+ for having licence and – for delay)	Household area in large cities (+); Access to walking (- for delay)/stake/bike (- for delay)/car/public transit Access to car before 16 (+ for having licence - for delay)	Wanted to get licence quick (+ for having licence and – for delay); Liked bicycling (+ for delay)/driving/taking public transit (+ for delay); Valued independence from parents (- for delay); Most friends driven to school Friends got their driving licence as soon as possible Driving was considered the coolest way to get to school Wide-spread public transit use in their community Parents' commute by car Parents allowed independent travel (+ for delay) Parents chauffeured to activities (+ for delay) Parent encouraged driving licence	Own cell phone (+ for delay)	Yes (-)	Yes

Table SM1: Summary of literature (cont'd)

	Dependent variable/objective	Geography and data	Methodology	Dependent variables					Cohort analysis?
				Socio-demographic features	**Built environment**	**Values and attitudes**	**ICT**	**GDL?**	
(Rérat 2018)	Have driving licence (probation and full licence)	Switzerland 2000 and 2015 Mobility and Transport Microcensuses	Logistic regression	Age (+); Gender (Man, +) Living with parents and siblings (-) Income (+) Have public transit pass (-) Have motorcycle driving licence (+)	Is urban (-)				
(Bayart et al. 2020)	Probability of a young person having a licence (did not specify the type of licence); Proportion of daily trips made as a driver	France (Lyon household travel survey, 1995, 2006, 2015)	Logistic regression; Zero-one-inflated beta regression	Age (+) Employed (+) Living with parent (- for having a licence and + for proportion of daily trips made by car)	Living in denser areas (-)				
(Vaca et al. 2020)	High school students'/young adults' delay in driving licensure	US NEXT Generation Health Study data, wave 1-7	Multinomial logistic regression	Male Race (+ for Latino compared to White) Education level of parents (+ for parents having lower than high school for long-term delay); Family structure (+ for single parent household for long-term delay) Family affluence	Living in urban and suburban area vs living in rural area (+ for long-term delay)				

Table SM2 GDL systems in different countries

Country/Region	Milestones of driving license	Transition condition	Restrictions
Australia/New South Wales	Stage 1: learner licence	Minimum age; Pass a knowledge test; Pass a vision test	Supervised driving by a full licence holder; Maximum speed of 90km/h; Zero blood alcohol content; Cannot tow a trailer; Put a black-on-yellow 'L' plate on the exterior of the driving
	Stage 2: P1 probationary licence	Held a learner license for 12+ months; 120 hours (20 hours night drive) of on-road driving experience; Pass a hazard perception test; Pass a driving test	Maximum speed of 90km/h; Zero blood alcohol content; Towing trailers of up to 250 kg; Put a red 'P' plate on the exterior of the driving; Limited demerit points; Teenager passenger restrictions during the night-time
	Stage 3: P2 probation licence	Held the P1 licence for 12+ months	Maximum speed of 100km/h; Zero blood alcohol content; Put a green 'P' plate on the exterior of the driving; Limited demerit points; No use of portable electronic communication and entertainment devices
	Stage 4: full licence	Held the P2 licence for 2+ years; Pass another computerised test	
Australia/Queensland	Stage 1: learner licence	Minimum age; Pass a knowledge test; Pass a vision test	Supervised driving by a full licence holder with 1+ year of driving experience; Zero blood alcohol content; Put a black-on-yellow 'L' plate on the exterior of the driving; Record 100 hours of supervised driving in the learner logbook, including 10 hours of night driving
	Stage 2: P1 probationary licence	Held a learner license for 12+ months for applicants under 21 years old, 6 months for applicants between 22-24 years old, and 3 months for applicants 25+ years old; 100 hours (10 hours night drive) of on-road driving experience; Pass a driving test	Zero blood alcohol content; Put a red 'P' plate on the exterior of the driving; Limited demerit points; Teenager passenger restrictions during the night-time; No use of portable electronic communication and entertainment devices
	Stage 3: P2 probation licence	Minimum age; Held a P1 licence for at least one year; Pass a hazard perception test	Zero blood alcohol content; Put a green 'P' plate on the exterior of the driving; Limited demerit points; Drive a high-powered vehicle; Drive under the influence of illegal or prescription drugs
	Stage 4: full licence	Minimum age; Held P2 licence for 2+ years for applicants under 25 years and 1+ year for applicants 25+ years old	
New Zealand	Stage 1: learner licence	Pass the minimum age; Pass theory test	Supervised driving by a full licenced person with 2+ years driving experience; Display the black-on-yellow learner plate
	Stage 2: restricted licence	Held learner licence for 6+ months; Meet eyesight and medical requirements; Pass the one-hour practical test	Night-time restriction if driving by own; Only allowed to carry passengers that are close family members
	Stage 3: full licence	Held restricted licence for 18+ months or 12 months+ if an approved defensive driving course has been completed (for 25+ years old, the period is 6+ months or 3+ months with an approved course having been completed)	

Table SM2 GDL systems in different countries (cont'd)

Country/Region	Milestones of driving license	Transition condition	Restrictions
Canada/Alberta	Stage 1: Class 7 (learner)	Minimum age; Pass a knowledge test; Pass a vision test	Supervised driving by a Class 5 or above adult; Zero blood alcohol content; Night-time restriction
	Stage 2: Class 5-GDL (probationary)	Held Class 7 licence for at least one year without suspension; Minimum age; Pass a vision test; Pass driving test	Fewer demerit points; Zero blood alcohol content
	Stage 3: Class 5 (full licence)	Minimum age; Held Class 5-GDL for at least two years; Has no suspensions during the last 12 months of the Class 5-GDL	
Canada/British Columbia	Stage 1: Class 7L (learner)	Minimum age; Pass a knowledge test	Supervised driving by a full licenced adult (25+ years old); Zero blood alcohol content; Night-time restriction; Teenager-passenger restrictions; Has a large 'L' decal on the back of the vehicle
	Stage 2: Class 7 (novice permit)	Minimum age; Pass driving test at the end of the Learner stage	Zero blood alcohol content; A limit of one passenger unless supervised by a full licenced adult (25+ years old) or the passengers are close family members; Has a large 'N' decal on the back of the vehicle
	Stage 3: Class 5 (full licence)	Pass the second driving test at the end of Class 7 stage	
Canada/Ontario	Stage 1: learner's permit (G1)	Minimum age; Pass the theory test; Pass the eye vision test	Supervised driving by a full licenced driver with four years of driving experience and a blood alcohol content less than 0.05; Night-time restriction; Zero blood alcohol content; Not allowed to drive on 400-series highways or other high-speed expressways unless accompanied by a licenced instructor
	Stage 2: Probationary licence (G2)	Held G1 licence for a year or 8 months if the driver has graduated from a ministry-approved driver education course; Pass a basic road test	Zero blood alcohol content; Restricted number of passengers
	Stage 3: Full licence (G2)	Held G2 licence for a year; Pass an additional road test	Zero bold alcohol for drivers aged under 21 and below 0.08 bold alcohol for drivers aged 22+
China/Hong Kong	Stage 1: learner permit	Minimum age	Supervised driving by a licenced driving instructor and in a car fitted with dual controls
	Stage 2: probationary driving licence	Pass theory test; Pass driving test	Place a white plate with read letter 'P' in front and rear of the vehicle; Speed limit is 70km/h; Not allowed to drive on the overtaking lane on highways; Not allowed to take passengers
	Stage 3: full license	Held the probationary driving licence for a year without traffic rule violations	

Table SM2 GDL systems in different countries (cont'd)

Country/Region	Milestones of driving license	Transition condition	Restrictions
Germany	Stage 1: Permission slip (for people aged 17)	Finish driving school; Pass the theory test; Pass the road test	Supervised driving
	Stage2: full licence (for people aged 18+)	Finish driving school; Pass the theory test; Pass the road test; Permission slip holders passed age 18	
UK	Stage 1: provisional license	Minimum age; Pass vision tests	Licenced adults (21+ years old) in the vehicle at all times; Have a L-plate on the back and front of the vehicle; Not allowed to drive on motorways unless accompanied by a driving instructor and in a car fitted with dual controls
	Stage 2: full license	Pass theory test; Pass driving test; Pass a probationary period	
US/California	Stage 1: Learner permit	Minimum age; Pass a vision exam; Pass the knowledge tests; complete driver education	Supervised driving by an adult who is 25+ and has a valid California driving licence
	Stage 2: Provisional licence	Hold learner permit for 6+ months; Minimum 50 hours of supervised learning (10 hours after sunset); Complete driver education and six hours of professional driver learning; Pass driving test	For the first 12 months, no passengers younger than 20 (expect for immediate family), no driving between 11pm to 5am, except for medical emergencies, school-related activities for which alternative transportation is not provided and job requirements
	Stage 3: Full licence	Minimum age; Holding provisional licence for 12 months	Zero Tolerance law on blood alcohol for under 21 years old drivers
US/Texas	Stage 1: Learner permit	Minimum age; Pass a vison exam; Pass the knowledge test; Complete driver education classroom instruction	Supervised by a licenced adult aged 21+; Restricted to use wireless communication devices
	Stage 2: Provisional licence	Hold learner permit for 6+ months; Complete behind-the-wheel portion of driver education, including 30 hours of supervised learning (10 hours after sunset); Complete the Impact Texas Teen Driver Program; Pass driving test	No more one passenger under 21 who is not a family member; not allowed to drive between midnight and 5am unless it is necessary for the driver to work, to attend or participate in a school-related activity, or due to a medical emergency; Restricted to use wireless communication device
	Stage 3: Full licence	Minimum age	If the driver is under 21, the driving licence shows 'under 21' on the driving licence
US/Florida	Stage 1: Learner's licence	Minimum age; Pass a vison and hearing exam; Pass the knowledge test; Complete a four-hour drug and alcohol course	Supervised by a licenced adult aged by 21+ ; Restricted to day light driving only in the first three months, and 6am to 10am driving only after the first three months;
	Stage 2: Operator's licence	Pass minimum age; Hold learner permit for at least 12 months; Complete 50 hours of supervised learning (with 10 of those hours night driving); Pass driving test	16-years-olds cannot drive from 11pm to 6am unless accompanied by a licenced adult aged 21+; 17-years-olds cannot drive 1am to 5am unless accompanied by a licenced adult aged 21+

Table SM2 GDL systems in different countries (cont'd)

Country/Region	Milestones of driving license	Transition condition	Restrictions
US/New York State	Stage 1: Learner permit	Minimum age; Pass a written test	Supervised by a licenced adult aged 21+; If supervising driver is not a parent/guardian (daytime only), only one passenger under 21 allowed, unless passengers are immediate family; The vehicle must have dual controls
	Stage 2: Junior licence	Hold learner permit for 6+ months; Minimum 50 hours of supervised learning (15 hours after sunset); Take pre-licensing course or driver education course; Pass driving test	Driving between 9pm and 5am is not allowed, except for school courses and work; Without supervising driver, only one passenger under 21 is allowed, unless passengers are immediate family; Driving in NYC is prohibited with a junior licence, and no driving on any street within a park in NYC, on any bridge or tunnel under the jurisdiction of the Tri-Borough Bridge and Tunnel Authority, on the Cross County, Hutchinson River, Saw Mill River, or Taconic State parkways
	Stage 3: Full licence	Pass minimum age	Electronic devices are prohibited for all drivers; blood alcohol less than 0.02 for drivers age under 21
US/Pennsylvania	Stage 1: Learner permit	Minimum age; Pass a written test; Passing a physical test and vision screening	Supervised by a licenced adult aged 21+; Not allowed to drive between 11pm to 5am, unless travel for employment and for volunteer or charitable service; Carry no more than one non-family member passenger under 18; Licence suspended for 90 days if he/she accumulates 6+ points or is convicted of a single high-speed violation
	Stage 2: Provisional licence	Hold learner permit for 6+ months; Minimum 65 hours of supervised learning (including 10 hours of night driving and 5 hours of driving under poor weather conditions); Passing driving test	Not allowed to drive between 11pm to 5am, unless travel for employment and volunteer or charitable service; Carry no more than one non-family member passenger under 18; Licence suspended for 90 days if he/she accumulates 6+ points or is convicted of a single high-speed violation
	Stage 3: Full licence	Pass minimum age, or the driver displays a crash- and conviction-free record for the 12 months period following the provisional licence issuance and has completed an approved drivers education course	The number of passengers must not exceed the number of seat belts in the vehicle; Licence suspended for 90 days if he/she accumulates 6+ points or is convicted of a single high-speed violation, if the driver is under age 18
South Africa	Stage 1: learner permit	Minimum age	Supervised driving by a full licenced driver
	Stage 2: full licence	Pass the driving test	
Sweden	Stage 1: learner permit	Minimum age; Provide medical status and pass optical exam	Supervised driving by licenced adults (24+ years old) in the vehicle at all times; Has a 'learner driver' sign on the back of the car
	Stage 2: full licence	Pass theory test; Pass driving test	