

# The effect of children's homeschooling during the pandemic on parents' commuting time

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## Abstract

The gender gap in commuting time has been reported in many countries. The gender gap could be an indication of lower mobility experienced by women, as well as gender inequality in the labor market. Household responsibilities have been identified as the primary reason for women's shorter commuting time. With the outbreak of the COVID-19 pandemic, many parents were forced to take on additional responsibilities due to their children's homeschooling, which could affect their commuting time and exacerbate the gender gap in this regard. In this study we examine the causal effect of children's homeschooling during the pandemic on employed parents' commuting time. We explore 16 waves of the panel survey of Household and Income Labour Dynamics in Australia (HILDA). The Difference in differences (DID) method is used to compare the changes in commuting time of parents who had homeschooled children during the pandemic and parents who did not. The results indicate a significantly larger decrease in the commuting time of women who had homeschooled children during the pandemic but the decline among men was not significant.

**Keywords:** COVID-19, gender inequality, homeschooling

## 1. Background

Gender disparities in commuting time are well documented in previous studies (Le Barbanchon et al., 2021, O'Kelly et al., 2012), with men typically having longer commutes than women (Gimenez-Nadal and Molina, 2014, Lee and McDonald, 2003, McQuaid and Chen, 2012, O'Kelly et al., 2012, Sermons and Koppelman, 2001).

Commuting time is often perceived as burdensome, with long journeys to work leading to increased fatigue and stress (Gimenez-Nadal and Molina, 2019), disruptions in work-life balance (Emre and De Spiegeleare, 2021), and decreased subjective well-being (Stutzer and Frey, 2008). However, when considering the gender gap in commuting time, it is important to note that shorter commuting time can be problematic when it is imposed by constraints such as mobility or job distribution, rather than being a choice made by women (MacDonald, 1999). The gender gap in commuting time has been attributed to both employment and commuting constraints. Women may be less likely to undertake long work trips due to lower wages compared to men (Fanning Madden, 1981, Hecht, 1974, White, 1977), and household and familial responsibilities can also force women to take shorter work trips, seeking employment closer to their homes (Lee and McDonald, 2003). This can be explained by the household responsibility hypothesis (HRH) stating that women bear a greater share of household responsibilities than men (Johnston-Anumonwo, 1992, Gimenez-Nadal and Molina, 2016). Accordingly, women engage in employments closer to their home to maintain a balance between household and work responsibilities (Crane, 2007, Lee and McDonald, 2003).

The gender gap in commuting time could be accentuated due to the pandemic and increased household responsibilities. With the school closure as a response to prevent the virus spread, parents had to take on the responsibility of educating their children. Homeschooling could have affected parents' commuting habits and daily routines, resulting in changes to their travel time. On the one hand, parents were relieved of the responsibility of dropping off and picking up their children from school, which could have reduced the time and distance of their daily commutes during the pandemic, as many Australian parents drop off/pick up their children to/from school on their way to work (Zaccari and Dirkis, 2003). On the other hand, homeschooling requires parents to dedicate time and effort to their children's education from home. During the pandemic, women had a greater share of children homeschooling and household responsibilities than men, and employed women reported an increased burden of childcare tasks compared to before the pandemic (Dunatchik et al., 2021, Todorovic et al., 2021, Yaish et al., 2021). Thus, homeschooling, as an extra household responsibility, might have impacted employed parents' commuting time differently. This issue is not sufficiently explored and most of the previous studies on commuting behavior during COVID-19 are focused on the effects of remote working on individuals' health and productivity (Rubin et al., 2020, Deole et al., 2023, Kun et al., 2020, Hensher et al., 2022, Shamshiripour et al., 2020, Musselwhite et al., 2021).

In this study, we use 16 waves of the Income Labour Dynamics in Australia (HILDA) dataset, a nationally representative sample of Australian households, to examine the causal effect of children homeschooling during the pandemic on their parents' commuting time. We develop Difference in difference (DID) models to uncover whether employed parents' commuting time has been affected by their children's homeschooling, and whether this impact differs based on gender. This study is a valuable contribution to the existing pandemic literature by illuminating the impact of homeschooling as an additional household responsibility on the gender gap in commuting time. This finding holds significant relevance for policymakers aiming to promote gender equity, particularly due to the unequal distribution of child-related tasks among couples within households. Additionally, the issue of gender equity and the division of household responsibilities between men and women, both within the home and in other settings such as the workplace, significantly influence changes in work-related mobility (Hjorthol, 2008, Frändberg and Vilhelmson, 2011). Therefore, exploring the effects of homeschooling on parents' commuting behavior during the pandemic can offer valuable insights into commuting patterns, which are crucial for the development of policies in urban and transportation planning, considering commuting as a vital aspect of travel behavior (Liu et al., 2020; Yao et al., 2022).

## 2. Data

We use the panel survey of HILDA to obtain the dataset of this study. HILDA has been running annually since 2001 and collects the information of about 17000 Australian residents (Wilkins et al., 2015). We restricted our sample to waves 5 to 20, which are the only waves including all the variables of interest. In this study, the population of interest are employed parents who have at least one school-aged child. After cleaning the dataset, 15627 observations from 2891 Individuals are used for the modelling. Some males and females in our sample belong to the same household. However, we treat them as independent observations. The outcome variable, commuting time, is measured by asking individuals about hours spent travelling to/from work per week. A summary of descriptive statistics is shown in table 1.

**Table 1: Descriptive statistics**

Variable	Category	Percentage
Gender	Male	52%
	Female	48%
Age bands	Age≤30	5%
	30<Age≤40	37%
	Age>40	58%
Number of children (NoC)	NoC=1	14%
	NoC=2	52%
	NoC≥3	34%
Being fulltime	Yes	45%
	No	55%
Being self-employed	Yes	16%
	No	84%
Education level	Bachelor or higher	33%
	Other	67%
Residential location	Urban	66%
	Rural	34%
Marital status	Married*	85%
	Other	15%
Income (\$ weekly)	Income≤100	10%
	100<income≤500	63%
	Income>500	27%
Housing tenure	Owner	77%
	Renter	23%

### 3. Method

The DID method is applied to estimate the effect of children homeschooling during the pandemic on parents' commuting time. The DID method has been widely used to test the effect of policies or programs at a particular time (Ashenfelter and Card, 1984, Donald and Lang, 2007). In this technique the outcome variable is observed for a group which is exposed to a treatment (treatment group). The same outcome variable is examined for a second group which does not receive the treatment (control group). Finally, the change in the outcome variable is compared for the treatment group and control group to measure the treatment effect. The outcome variable in this study is commuting time, and the treatment is homeschooling due to the pandemic. The treatment group are parents whose children had to do homeschooling due to the pandemic during 2020 and the control group are those who did not experience the treatment.

$$y_i = \beta_0 + \beta_1 x_i + \beta_2 z_i + \beta_3 Year + \beta_4 time + \gamma m_i + \varepsilon_i \quad (1)$$

Equation (1) shows the relationship between homeschooling and commuting time. In this equation  $y_i$  represents the commuting time of individual  $i$ .  $x_i$  is a binary variable which equals 1 if the respondent is in the treatment group, and 0 otherwise.  $z_i$  is a binary variable taking the value of 1 if the respondent belongs to the treatment group during the treatment period. *Year* denotes the year fixed-effects. *time* is a binary variable taking the value of 1 if the observation belongs to the year 2020 and 0 otherwise.  $m_i$  is a vector of socio-demographic attributes for individual  $i$  and  $\gamma$  is a vector of parameters indicating the sensitivity towards attributes. Finally,  $\varepsilon_i$  is a normally distributed error term.  $\beta_2$  is the coefficient of interest in this study which indicates the effect of children's homeschooling during the pandemic on parents' commuting time.

## 4. Results

Table 2 shows the DID estimates for the effect of children homeschooling during the pandemic on parents commuting time. First, we developed a model for all observations and then two separate models for mothers and fathers.

**Table2: Effect on children's homeschooling during the pandemic on parents' commuting time**

Variable	Persons	Male	Female
Intercept	3.86***	5.39***	3.59***
Treatment effect	-0.49	-0.17	-0.76*
Treated	0.17	0.38*	-0.08
Time	-0.45	-1.04*	0.07
Year	0.04***	0.06***	0.02*
<b>Socio-demographic attributes</b>			
Age	0.10**	0.03	0.08*
Income	0.03	0.06	0.07*
Self-employed	-0.61***	-0.33**	-1.34***
Urban	0.97***	1.24***	0.72***
Fulltime	2.06***	0.72***	1.61***
Number of children	-0.08*	-0.07	-0.16***
Number of observations	15552	8087	7465

As table 2 shows, homeschooling during the pandemic has a significant negative effect only on women's commuting time. That is, all else equal, there are more pronounced changes in the commuting time of women in the treatment group (those who did experience children homeschooling during the pandemic) compared with the commuting time of women in the control group.

We also control for the effect of other relevant factors in the models. The treatment effect coefficient for women remains significant even after including demographic characteristics. Age has a positive effect on women's commuting time which can be attributed to the fact that older women are more likely to be employed in more specialized professions which require longer commutes (Punpuing, 1993, Dai et al., 2016). With increasing income, parents' commuting time increases. Previous studies indicate that longer commutes can increase the probability of getting higher-paid jobs (Manaugh et al., 2010, Wyly, 1996, Haley-Lock et al., 2013). Self-employed men and women have shorter commuting times compared to employees. This finding can be explained by the fact that self-employed workers can reduce their commute time by choosing their workplace location (Giménez-Nadal et al., 2022, Lee and McDonald, 2003, Van Ommeren and van der Straaten, 2008). Residing in urban areas and being a full-time worker also have positive effects on parents' commuting time which can be related to higher levels of traffic congestion in urban areas (Zhang et al., 2014, Zhu et al., 2019) and higher wages of full-time employees, respectively (McQuaid and Chen, 2012). Finally, the number of children is negatively associated with women's commuting time. This finding is consistent with previous studies showing that an increase in the number of children has an adverse effect on women's commuting time due to greater child-related responsibilities (Fagnani, 1987, Silveira Neto et al., 2015).

## 5. Discussion and Conclusions

This study examined the impact of homeschooling children during the pandemic on parents' commuting time, which is an important but relatively understudied research topic. Drawing on the existing literature on the effect of additional child-related responsibilities on parents during the pandemic, we expected that parents with homeschooled children during the pandemic experience a higher reduction in their commuting time compared with those who did not have

homeschooled children. Also, as the literature suggests that mothers took on a greater share of childcare responsibilities during the covid-19 pandemic, we expected the effect on commuting time to be more significant for mothers than fathers.

To test these hypotheses, we utilized the data from 16 waves of HILDA, a nationally representative panel survey in Australia. We developed three DID models to measure the causal impact of homeschooling on the commuting time of parents, mothers, and fathers. The results indicated that mothers with homeschooled children experienced a larger reduction in their commuting time compared to mothers in the control group. However, the changes in commuting time of fathers in the treatment group were not significantly different from those in the control group.

Analysis of commuting, as the most important worker's daily activity, and its evolution is a crucial area for future research. In this context, gender gap in commuting time and the factors which might exacerbate the existing gap is an important topic for policymakers and planners. Because the gender gap in commuting time has implications for gender equity in the labour market and mobility, and ultimately individuals' wellbeing. Household responsibilities, as the main reason for the gender gap, can constrain women's commuting time, limit their mobility, and negatively affect their subjective wellbeing. By highlighting the unequal burden of homeschooling responsibilities on mothers, this study suggests that the pandemic could have widened the gender gap in commuting time.

## 6. References

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