The Effect of Vehicle Ownership Restrictions on Female Labor Supply

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Abstract

As the world's largest car market, China has grappled with problems of congestion and air pollution by using vehicle ownership restrictions. Using the quasi-experimental variation provided by the Beijing vehicle lottery, we examine the unintended consequences for labor supply of preventing people from buying cars. While the labor supply of men is largely unaffected, restricting vehicles reduces female employment rates and decreases household incomes. Our results highlight the important effect of transportation policy on labor markets.

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1 Introduction

Cars are a major contributor to some of the most important environmental issues today: air pollution, congestion, and climate change. China, as the world's largest market for cars, has notoriously struggled with these environmental problems. As a result, cities in China have imposed vehicle ownership restrictions, where a household wishing to add an automobile must first win an auction or lottery. Currently, eight large Chinese cities with a combined population of over 160 million people,[1] along with Singapore, restrict ownership, with many more cities considering some form of these restrictions.

Economic theory suggests that restricting vehicle ownership can affect labor markets by changing the costs and benefits of working. We discuss below why these effects might be different for men and women, and for people with and without children. Despite the growing prevalence of vehicle ownership restrictions and the importance of female labor supply, no work has yet studied the effects of car ownership on labor supply. The objective of our study is to characterize the labor supply effects of restricting transportation options by reducing vehicle ownership.

Closing the gap between male and female employment rates has large macroeconomic consequences, with both economic growth and income inequality at stake.[2] An increasing number of studies have emphasized female labor supply in developing countries because of its bearing on important social and economic outcomes. When women in India are exposed to labor market opportunities, they not only increase employment but also increase enrollment in educational programs and have better health outcomes (Jensen 2012). Higher female income in post-Mao China improves survival rates for girls and helps close the gender gap in birthrates (Qian 2008). A large number of policies have aimed at reducing the obstacles to female labor force participation, particularly those obstacles connected with the household labor that women

[1] We list these cities along with the year they began restricting vehicles here: Shanghai (1994), Beijing (2010), Guiyang (2011), Guangzhou (2012), Shijiazhuang (2013), Tianjin (2013), Hangzhou (2014), Shenzhen (2014).

[2] See recent literature reviews at IMF (2013), OECD-ILO-IMF-WBG (2014), and IZA (2014).

are more likely than men to provide.[3]

This paper makes three primary contributions to the literature on labor market effects of environmental and transportation policy. First, we provide evidence linking transportation policy and labor market outcomes, focusing on Beijing's vehicle ownership restrictions. Literature on vehicle driving restrictions has focused on the efficacy of those policies (e.g., Davis 2008), and Yang et al. (forthcoming) analyze the efficacy of Beijing's vehicle ownership restrictions at reducing car use. In contrast, we examine the potential unintended consequences of ownership restrictions on labor market outcomes. Although a vast literature has assessed the labor market effects of environmental regulations of firms (e.g., Walker 2014), we are not aware of research on labor market effects of environmentally-motivated transportation policy.

Second, using the city's license plate lottery, we provide causal evidence on the effects of car ownership on labor supply and income. Vehicle ownership restrictions affect the employment rate of women but not that of men; ownership restrictions also appear to have reduced household incomes of the lowest income groups. Third, although other papers have found women to respond more to job conditions and wages than men (e.g., Angrist and Evans 1998), we also report changes in household tasks that coincide with the labor market effects and that are consistent with the theoretical links among gender, home production, and labor market responses to car ownership.

The setting for our study is the city of Beijing. In an effort to curb serious problems of air pollution[4] and vehicle congestion,[5] Beijing's government imposes sharp restrictions on vehicle purchases. Before adding a car, a household must first win a license plate in a lottery. Lotteries are held monthly, and the lottery is heavily oversubscribed. The chance of winning a vehicle fell under 1 percent per month by the end of 2014, and the lottery reduced new car sales by at

[3]These include maternal leave policies, increased access to child care, and improved benefits and flexibility for part-time workers. United Nations (2009), Blau (1995), and Duflo (2012) review the literature of these topics.

[4]An air quality index (AQI) level below 100 is considered "satisfactory" by the US Environmental Protection Agency (EPA). However, four-fifths of all days in Beijing between 2008 and 2014 had AQI levels above this level. "Beijing's Bad-Air Days, Finally Counted," *The Wall Street Journal*, April 14, 2014.

[5]TomTom, a maker of GPS devices, compiles data on vehicle congestion. Beijing was the 14th most congested city in the world in 2015, with daily travel delays averaging 38 percent of travel time.

least two-thirds relative to prelottery levels.

We outline a model of gender and labor supply, which suggests that cars can play an important role in whether individuals enter the labor force. Theoretically, cars reduce the cost of commuting between home and the place of work; lower costs should positively affect the decision to work but have an ambiguous effect on hours worked (Cogan 1981). We then show how the presence of children can play an important mediating role in determining the effect of cars on work. If women have a comparative advantage in home production, cars won by women with children could increase the productivity of staying at home, increasing the opportunity cost of working and offsetting the lower cost of commuting. By contrast, the effects of cars on male labor supply would depend less on the presence of children. As a result of these offsetting factors, economic theory has ambiguous predictions on the effects of restricting vehicles on labor supply, but does highlight the potential importance of gender and the presence of children in determining the effects of car ownership restrictions on labor supply.

The empirical objective is to estimate the causal effect of vehicle ownership on labor supply. However, in most settings car ownership is endogenous to labor supply because preferences for working are likely to be correlated with preferences for cars, or because of reverse causality. Under the Beijing vehicle lottery, winning the lottery is randomly assigned conditional on entry, making lottery status a natural instrumental variable (IV) for the number of cars in a household. After examining the relevance and validity of this instrument, we estimate the effect of car ownership on female employment outcomes. Specifically, we regress whether a female lottery entrant worked on the number of household vehicles, using the lottery outcome to instrument for the number of vehicles. We find that, among all women, each car increases employment rates by 5.0 percentage points, or about 6 percent over the mean employment rate for lottery losers. We allow the effects of cars on labor supply to depend on whether the entrant has a child, accounting for the endogeneity of having a child, and we find that employment effects are concentrated among women without children; the labor supply of these women increases by 10.9 percentage points. The labor supply of women who have children is unaffected by

gaining a car.

Because the theoretical model predicts that cars affect home production as well as labor supply, we examine the number and types of tasks that women perform when they add cars to their households. Women with children use cars to increase the number of home production tasks, particularly picking up and dropping off others. Women with no children show no such increase in home production, but only an increase in trips to work. These changes in home production tasks and work trips are consistent with the intuition provided by the model.

Finally, we examine the welfare implications of these labor market effects by examining household incomes. Cars reduce the share of households that belong to the lowest income brackets, and increase the share of households in the next-to-lowest brackets. Cars do not affect incomes for those in higher income categories.

Contrasting with the effects of cars on women, male employment rates are essentially unaffected by cars. The inelasticity of male labor supply to policy has been found in other settings; for example, Triest (1990) found that income taxation substantially affected labor supply for women but not for men. In our study, children are an important mediating variable that determines the effect of cars on female labor supply, but not for men. While men with children increase their activities in picking up and dropping off others, the increase is about half the size of that for women. Finally, there is some evidence that cars increase the incomes of male winners.

Increasing female labor force participation by 5.0 percentage points is a large result and can be compared with some of the most important policy interventions that have been empirically demonstrated to affect female labor supply,[6] with the caveat that female employment of Beijing lottery entrants starts from a relatively high level.[7] Jensen (2012) experimentally assigns

[6]Duflo (2012) reviews the literature and points out some of the most important dimensions of gender inequality, from school enrollment rates to labor supply and time use. She notes the interconnection between development and gender inequality: increased development causes female empowerment, and empowering women may improve development.

[7]While households in Beijing are not as poor as those in Jensen (2012) or Dinkelman (2011), they are not rich. Over two-thirds of Beijing lottery entrants have a per capita income below $US 5,000 and almost 90% have a per

recruiters from an industry that employs high numbers of women to villages in India, finding that women aged 15 to 21 increase employment by 2.4 percentage points, or about 11 percent over the control group mean. Dinkelman (2011) shows how rural electrification in South Africa increased both employment and hours of work for women, attributing gains to lower household labor caused by electrification. Electrification increased female employment by 9 to 9.5 percentage points, 30-35 percent over baseline.

Although policy makers have long aimed to improve employment rates by increasing public transportation options and commute times, little empirical evidence has actually connected commuting costs to labor supply (Gibbons and Machin 2006). While some studies have assumed that higher commuting costs decrease labor supply (e.g. Parry and Bento 2001), Gutiérrez-i-Puigarnau and van Ommeren (2010) found that increasing commuting costs can raise the number of hours worked. Black et al. (2014) use a correlation across cities between commuting time and labor supply to suggest that commuting time might play a role in the work decisions of women but not men.

Our results relate to a growing body of literature on the effects of policies restricting vehicle use and ownership. Davis (2008), Wang et al (2013), and Viard and Fu (2014) examine the effects of usage restrictions, focusing on outcomes such as pollution, car mileage, and economic activity. The literature on ownership restrictions is more sparse than the literature on driving restrictions. Li (2016) compares the allocative cost of the Beijing vehicle lottery with Shanghai's license plate auction system. Yang et al. (forthcoming) find that the Beijing lottery sharply reduced car ownership and travel. Liu et al. (2018) show that restricting vehicle ownership reduced fertility rates in Beijing. Because of that result, in this paper we allow for the possibility that the number of children in a household is endogenous to the lottery outcome. This paper considers the labor market effects of vehicle ownership restrictions.

Policy makers are concerned with income inequality, and our results imply that vehicle restrictions increase the gap in employment rate between men and women from 16.9 percent-

capita income below $US 7,900.

age points to 17.1 percentage points. Moreover, restricting cars has lowered income for the poorest households, a consequence that could also be realized in any of the increasing number of cities that restrict vehicle ownership.[8] Our work has indirect relevance for localities trying to understand the broader labor market effects of reducing transportation costs. In cities implementing vehicle restriction policies, our results suggest that they should be combined with policies mitigating their unintended effects on those who want cars; one possibility might be the improvement of public transportation access to sectors and businesses that employ women without children. More generally, our results imply that transportation policy has a large and previously undocumented effect on labor markets.

2 Background and Data

Beijing began its license plate lottery in January 2011. Both women and men can enter the lottery, and all entrants do so at the individual rather than at the household level. Only qualified individuals can enter the lottery, where a qualified individual is defined as a Beijing *hukou* (residential permit) holder who has a driver's license; additionally, entrants cannot already have cars registered in their names. This means that individuals in households with cars may enter the lottery so long as the car is not registered in their name; for example, a woman without a car may enter the lottery even if she is married to a man with a car. Qualified individuals may enter the lottery without financial cost; the lottery application is a short online form approximately ten questions long.

Winners of the lottery receive electronic certificates that they can bring to new or used car dealers to purchase cars. While individuals who already had cars may retain their license plates and trade their existing vehicles for new ones, additional cars may not be purchased without first winning the lottery.

[8]Other Chinese cities restricting vehicle ownership employ an auction, where license plates are given to the highest bidders. In these types of systems, cars are likely to be prevented from going to the poorest households; this setting is also likely to incur the labor market effects we document here.

The license plate lottery sharply restricted car ownership. In 2010, 76,000 cars were sold each month in Beijing; the lottery has held new vehicle registrations to under 20,000 per month (Yang et al. 2014). When the first lottery was held, there were 10 times as many applicants as license plates. As more people have continued to apply to the license plate lottery, the number of new license plates has remained fixed. As a result, the probability of winning a car has fallen, and the chance of winning a new car at the end of 2014 was less than 1 percent per month.

Our data consist of a large randomized survey of Beijing's residents. This survey is conducted once every few years by the Beijing Transportation Research Commission (BTRC), a government agency that conducts research on how to improve Beijing's transportation systems.[9] The survey consists of about 40,000 households that are selected randomly and drawn in proportion to population from Beijing's 16 districts. It was conducted between September and November 2014.

The survey consists of three types of questions. First, it asks household level questions, such as the number of members in the household, the income of the household, and the number of vehicles it has. The relationship of each household member to the head of household is also reported.

Second, it asks individual level questions, such as the year of birth and gender of each respondent. At our request, the BTRC incorporated questions about the Beijing vehicle lottery. Individuals report whether they entered the Beijing vehicle lottery, whether they won, and when they won.[10] About 20 percent of households in the BTRC sample had at least one member participate in the lottery.

Importantly, we observe each household member's employment status, which is a primary outcome variable for our study. All household members report whether they work, whether

[9] Liu (2018) used these data to study the effect of vehicle ownership restrictions on fertility.

[10] There is no incentive to mis-report one's lottery outcome. The survey is administered by employees of a private agency on behalf of the BTRC, not by government officials. Additionally, there is no penalty for owning a car; the only punishment for losers of the lottery is a fine given for driving a car without a Beijing license plate on city roads during rush hours.

they go to school, whether they are retired, or whether they have another primary activity. We count those individuals who report working as employed.

The third section of the survey is comprised of detailed travel diaries. Travel diaries consist of 24-hour reports of where individuals went, when they went there, and what transportation modes they took. For example, a person might start the day at home, wait for the bus at 8:00 a.m., take the bus to work between 8:05 a.m. and 8:25 a.m., and then go home using the bus at 5:25 p.m.

Each element of a person's daily travel is reported, including the destination location and the purpose for the trip. We use the travel diaries to measure the number of trips people take, the purposes of the trips, and how long they spend at their destination. We calculate labor supply as the time elapsed between arriving at and departing from work.

This estimate of labor supply is imperfect in that people may work from home or do other activities when they are at their workplace. However, this method may be more likely to yield an accurate result than asking people to report how many hours they worked in a day; respondents may be unable to recall exactly how many hours they worked and are more likely to report round number estimates (for example, "I worked 8 hours today") when asked about their work hours directly.

A travel diary is likely to capture a daily activity when the individual travels for the purposes of the activity, but a diary may be poor at capturing an activity if multiple activities occur at a single location. For example, a visit to the mall may be not only a trip to purchase goods but also a form of child care.

3 Methodology

3.1 Theory of Vehicles and Labor Supply

In this subsection, we examine how restrictions on vehicle ownership fit into a model of labor supply that separately considers men and women. We adapt a stylized framework from the labor economics literature,[11] considering both the extensive margin (whether an individual has a job) and the intensive margin (how many hours the individual works per week, conditional on having a job). While female labor supply can be sensitive to policy (Eissa and Liebman 1996), studies such as Triest (1990) have found that male labor supply is invariant, even to variables such as the wage. The prior literature has found that commuting time is negatively correlated with female labor force participation rates, suggesting that women are more likely than men to withdraw from the labor force as a result of longer commutes (Black et al. 2014).

Our framework relies primarily on Cogan (1981) and is summarized in figure 1. Suppose that each individual has a time endowment H, an income endowment Y, and two types of costs of entering the labor market: time τ, and non time M. The time cost could include the time spent commuting to work. Non time costs are broader and could include both direct monetary costs such as bus fare and indirect costs such as the disutility of commuting.[12] At the reservation wage w_R, the individual is indifferent between working at leisure l^* and not working at leisure H.[13] The hours of work supplied is $H - \tau - l^*$. The market wage is the wage the individual earns upon entering the labor market, and the individual chooses to work only if the market wage is greater than or equal to the reservation wage.

A car can affect market wages by reducing the cost of traveling to a high wage job. An

[11] Killingsworth and Heckman (1986) and Blundell and MaCurdy (1999) present reviews of the labor supply literature, including differences in labor supply between men and women.

[12] Home production tasks that would not be completed if the individual works are treated as a non time opportunity costs of working.

[13] One possible explanation for the invariance of male labor supply is that there are two types of males: ones with low reservation wages and ones with high reservation wages. As a result, changes in the cost of working or in the market wage do not cause these men to either begin working or leave the labor force.

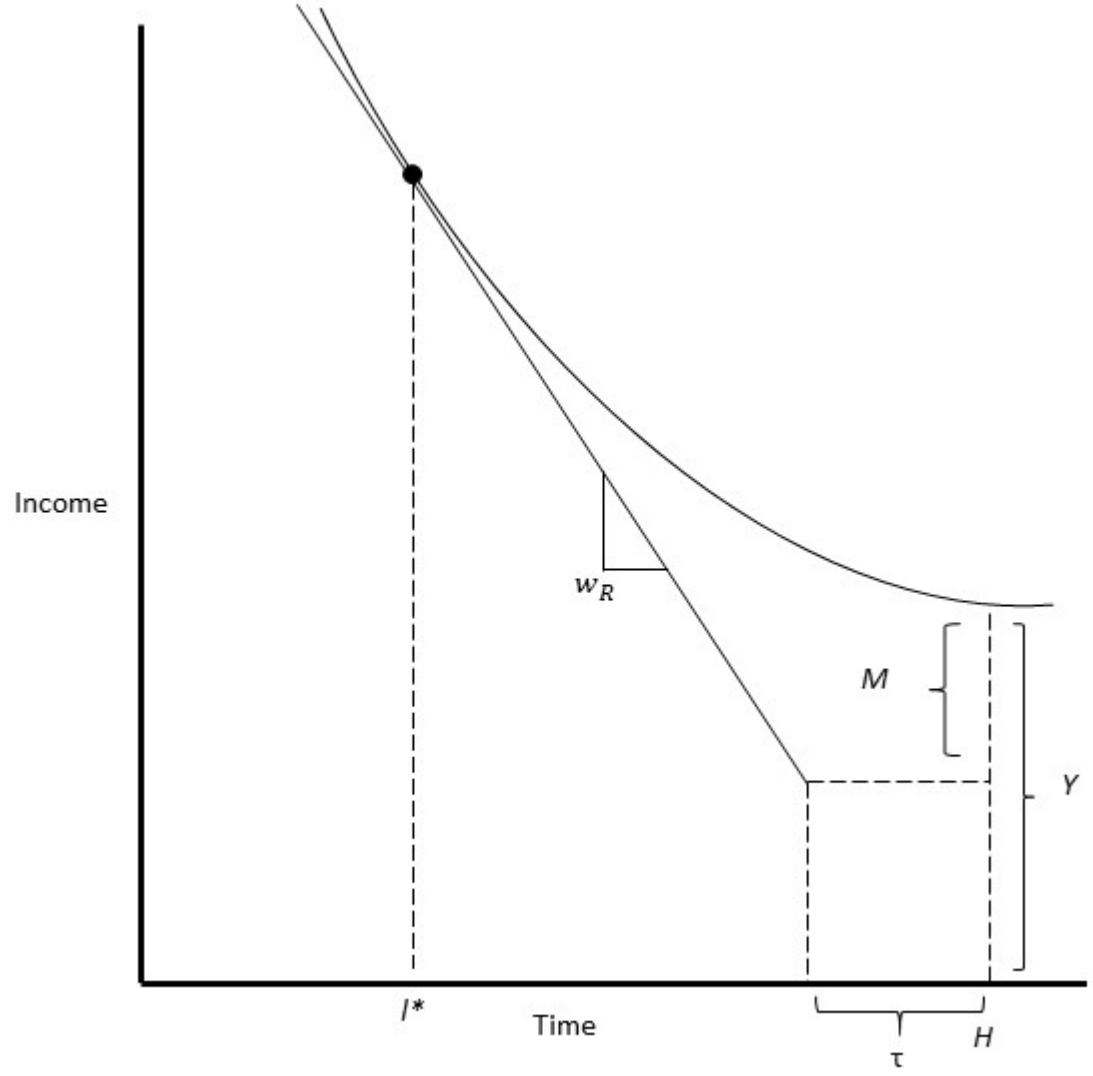

Figure 1: Diagram analyzing time and income decision in the presence of entry costs for labor. Diagram from Cogan (1981).

increase in the market wage rotates the solid budget line clockwise in figure 1, pushing the market wage above the reservation wage for some individuals and causing them to choose to work. However, the effect on hours worked is ambiguous and depends on the relative strengths of the income and substitution effects induced by the wage change (not shown).

Obtaining a car can also affect each of the two costs of entering the labor market, particularly if the car affects commuting costs.[14] The option to drive can reduce commuting time, directly decreasing τ.[15] In addition, a car may reduce M by reducing the disutility associated with commuting for individuals that prefer driving a car to using crowded public transportation.[16] If either τ or M decreases, the reservation wage unambiguously decreases, and the employment rate increases as a result.

One possibly moderating influence on the effect of cars is the presence of a child. Cars can increase the productivity of home production tasks such as child care by reducing the costs of taking children to lessons or to recreational activities outside the home. If we assume that women have a comparative advantage over men in child care (e.g. Black et al. 2014), then higher productivity in home production can *increase* the opportunity cost of the choice to work for women with children.

In summary, cars can affect labor supply not only by changing the market wage but also affecting commuting costs M and τ. Cars can decrease these costs for all women, increasing labor force participation with an ambiguous effect on hours worked. However, cars may increase M in households with children through the opportunity cost of improved child care.[17]

[14]Besides commuting costs, cars also can affect the cost of alternatives to working, such as leisure travel. Cars could also affect the cost of home production by facilitating tasks such as shopping. If either of these is the case, cars would raise M.

[15]Reductions in commute time also increase hours worked conditional on commuting because they increase the amount of time available for both work and leisure.

[16]Yang et al. (forthcoming) find that residents of Beijing obtaining a car choose to commute by car over other travel modes even if using the car does not substantially reduce total travel time. This suggests that typical Beijing commuters prefer commuting by car over other modes, in which case obtaining a car would decrease the disutility of commuting and reduce the reservation wage.

Importantly, driving a car may reduce possible safety concerns associated with a commute for some women, which Borker (2018) analyzes in India.

[17]One final consideration is that for two-adult households, car ownership and employment decisions of one

This labor supply model suggests two empirically testable hypotheses. First, the presence of a car could increase the labor supply of women but not men. Second, the presence of a child may offset these effects. The magnitude of each effect is unknown, so we turn next to empirical analysis of this question.

3.2 Empirical Strategy

The objective is to estimate the effect of household car ownership on labor market outcomes such as employment and income. We are interested in the average effect of car ownership on employment across the sample of lottery participants. Motivated by theory from the previous subsection, we also examine the effects of car ownership by gender and how it differs with the presence of children in the household.

Ordinary least squares (OLS) estimation of these effects is likely to be biased, because of unobservable confounding factors. For example, individuals with strong unobserved job opportunities may have more reason to acquire a car. Because individuals who work have more income, reverse causality is also likely to be a concern.

As a result, we rely on the quasi-experimental variation provided by the Beijing vehicle lottery. Specifically, we use the lottery outcome to instrument for the number of cars in the household of the lottery entrant. We estimate the following equations using an instrumental variables (IV) strategy:

$$Y_i = \alpha_1 + \alpha_2 \widehat{Cars}_i + \eta_t(i) + X_i\alpha_3 + \varepsilon_i \tag{1}$$

$$Cars_i = \beta_1 + \beta_2 W_i + \eta_t(i) + X_i\beta_3 + \mu_i \tag{2}$$

adult can affect the reservation wage and employment decisions of the other adult. For example, if a two-adult household obtains a car and one adult uses the car to commute to work, this adult could increase hours worked and total household income. The resulting income effect could raise the reservation wage of the other adult, reducing employment on the extensive or intensive margins. This effect would thus mitigate the employment effects discussed above.

In these equations, Y_i is the outcome of interest for individual i, such as her employment status or labor supply. $Cars_i$ represents the number of cars in the household of individual i; we insert the fitted value of $Cars_i$ from equation 2 into equation 1 and adjust the standard errors to account for the fact that we use the predicted rather than observed values.[18] W_i represents the lottery status of the individual: a dummy variable indicating whether the individual reports winning the Beijing vehicle lottery.[19]

Importantly, we include $\eta_t(i)$, a set of fixed effects for each entrant's lottery entry date. Earlier entrants have more chances to win the lottery and may have stronger unobservable demand for cars. The presence of this covariate implies that we compare lottery winners and losers who entered at the same time, controlling for possible unobserved factors correlated with entry date.

X_i represents a set of covariates that are not affected by vehicle ownership. Specifically, we include age and the square of age in our regressions, because middle-aged people are likely to supply more labor than the young or the old.[20] We include fixed effects for the day of the week of the interview, because work schedules may vary by weekday, particularly on Fridays and weekends. We also include fixed effects for the education level of the lottery entrant, because job hours may vary with education level.

Our theory suggests that both the gender of the lottery participant and having a child could

[18]Importantly, the lottery instrument is defined at the individual level rather than at the household level. This is because the randomization of the lottery occurs at the individual level; larger households with multiple entrants do not hinder our identification strategy so long as household size does not influence the probability that any given individual wins the lottery.

[19]In Beijing, the vehicle lottery rules evolved so that applications were removed if the applicants did not periodically submit a renewal, consisting of a simple online form. Specifically, if an applicant entered the lottery in 2011 and did not win during a given month, that entrant would remain in the pool of applicants for each drawing in the remainder of the year. In January 2012, Beijing changed the rules of the lottery so that applicants had to renew their applications every three months. In January 2014, the lottery began to be held every two months rather than monthly; starting at this time, lottery entrants participate for six months before renewal is required.

As a robustness check, appendix table A1 shows the estimation results if we define the instrument to include winning the lottery without renewal.

[20]Appendix table A2 reports tests of the sensitivity of our primary results to controlling for age. Adding age covariates significantly improves the goodness-of-fit of these regressions, reducing the standard errors of our main explanatory variables of interest. The magnitude of the coefficient of the effect of the number of cars on female employment is largely robust to the specification of age covariates.

be moderating variables in the effects of cars on labor supply. To test whether gender moderates the relationship between car ownership and labor market outcomes, we add to the estimating equation the interaction of the number of cars with the lottery participant's gender. To investigate the role of having a child, we include the triple interaction of the number of cars, gender, and the presence of a child.

While gender is exogenous, Liu et. al (2018) showed that lottery winners have more babies than lottery losers. As a result, we instrument for the presence of a child in the home using the presence of a prelottery child. Because lottery outcomes could not affect this variable, we treat it as exogenous in a fully expanded IV specification:[21]

$$Y_i = \gamma_1 + \gamma_2\widehat{Cars_i} + \gamma_3\widehat{C_i} + \gamma_4 G_i + \gamma_5\widehat{Cars_i * C_i} + \gamma_6\widehat{Cars_i * G_i} + \gamma_7\widehat{C_i * G_i} + \gamma_8\widehat{Cars_i * C_i * G_i} + \eta_t(i) + X_i\gamma_5 + \varepsilon_i \quad (3)$$

$$I_i = \delta_1 + \delta_2 W_i + \delta_3 P_i + \delta_4 G_i + \delta_5 W_i * P_i + \delta_6 W_i * G_i + \delta_7 P_i * G_i + \delta_8 W_i * P_i * G_i + \eta_t(i) + X_i\delta_8 + \mu_i \quad (4)$$

In addition to those variables defined above, we define several new variables in these equations: C_i is a dummy variable indicating whether individual i has a child aged 18 and under, G_i as a dummy variable indicating whether the lottery entrant is female, and P_i is a dummy indicating whether a child is present who was born before 2011, the first year of the lottery. These equations, which include all first and second-order terms in the triple interaction of car ownership, gender, and having children, allow us to directly calculate the effect of cars on the

[21] Since we are interested in studying the effect of cars for women overall, and the effect of cars for those with children, some tables report less expanded specifications where we include only cars interacted with gender or cars interacted with the presence of a child.

labor supply men and women separately, and for each gender when they do and do not have children. Specifically, we can obtain the effect of cars on labor supply for men without children (γ_2), for men with children ($\gamma_2 + \gamma_5$), for women without children ($\gamma_2 + \gamma_6$), and for women with children ($\gamma_2 + \gamma_5 + \gamma_6 + \gamma_8$).

I_i represents each of the variables instrumented in equation 3: the number of cars ($Cars_i$), the presence of a child in the household (C_i), the number of cars interacted with the gender of the entrant ($Cars_i * G_i$), the interaction of the number of cars with the presence of a child ($Cars_i * C_i$), the gender interacted with the presence of a child ($G_i * C_i$), and the interaction of all three variables ($Cars_i * G_i * C_i$). We employ the three prelottery variables (W_i), (P_i), (G_i), and their interactions as instruments.

The low entry costs of the lottery imply that any individual who wants to purchase a car would enter the lottery. Therefore, compliers (individuals who win the lottery and obtain a vehicle but would not have done so otherwise) include all individuals who would purchase a car given the opportunity to do so. Since cars are expensive and China is an industrializing country, lottery entrants and non-entrants are observably different; for example, lottery entrants belong to households reporting higher incomes than non-entrants.[22] However, this fact does not bias our IV estimates. Conditional on entering the lottery, the lottery's outcome is still randomly assigned; we interpret the IV estimates as pertaining to applicants.

3.3 The Comparability of Winners and Losers

In natural experiments such as the Beijing lottery, the control group (lottery losers) represents a valid counterfactual for the treatment group (lottery winners). In expectation, both observed and unobserved characteristics that are unaffected by winning the lottery should be identical for these groups.

[22] We compare the characteristics of lottery entrants with other people surveyed in appendix table A3. Lottery entrants are sharply different than non-entrants: they are younger, more educated, more likely to be male, and typically belong to households with higher reported incomes.

We examine first all lottery entrants, and then women separately, because we are interested in both collective outcomes and gender-specific outcomes. Table 1 reports tests of the comparability of observable characteristics that should be unaffected by the lottery. In column 2 we test for the equality of the unconditional means across winners and losers, and in column 3 we test for equality after conditioning on lottery entry date and survey day. Each of these characteristics is statistically indistiguishable, both for the full sample and for women.[23] In table 2, we split our sample of women by whether a prelottery child is present; we also find no statistically significant differences between winners and losers. In summary, we find no evidence of ineffective randomization for any characteristic examined.

To provide context for our IV estimation results, we also provide means of some of our important outcome variables for women in tables 3 and 4.[24] For all groups of women, lottery winners have more cars. We note that the difference is larger for women with no children than for women who have children. Households who have children have more cars than households without children; lottery losers who have prelottery children may have purchased a car before vehicle restrictions were enacted. Additionally, lottery losers with children may exert more effort in obtaining vehicles through other means. For example, there is some evidence of a black market for license plates in Beijing; some residents also rent license plates illegally from automobile dealers (Yang et al. 2014). Such behavior (i.e., the presence of always takers) would not bias our IV estimates because the randomization of the lottery assures us that these behaviors should be equally distributed between winners and losers.

Among women who have children, employment is statistically indistinguishable across lottery winners and losers. However, for women who have no children, lottery winners are more likely to be employed, and this difference is statistically significant at the 5 or 10 percent level. Among lottery winners who have no children, the largest change in tasks is an increase in the

[23] It is not unusual for statistically significant differences in means to appear in tests of balance. For every 20 characteristics, even random variables centered around the same mean will have one characteristic appear different at the 5 percent level of statistical significance.

[24] We report the results for men in appendix tables A4 and A5.

Table 1: Comparability of Lottery Entrants Winning and Not Winning the Lottery for Variables Unaffected by the Lottery

	All Lottery Entrants		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Is Female	0.407 (0.491)	-0.020 (0.019)	-0.005 (0.019)
Birth Year	1975.8 (11.3)	0.033 (0.426)	0.468 (0.432)
Has Finished High School	0.859 (0.348)	-0.013 (0.013)	-0.011 (0.013)
Has Finished College	0.624 (0.484)	0.004 (0.018)	0.008 (0.018)
Is Head of Household (HoH)	0.419 (0.493)	0.004 (0.019)	-0.001 (0.019)
Is Spouse of HoH	0.278 (0.448)	-0.013 (0.017)	-0.014 (0.017)
N	8,057	8,057	8,057
	Women Only		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Birth Year	1977.9 (9.9)	0.251 (0.6)	0.675 (0.608)
Has Finished High School	0.915 (0.279)	-0.004 (0.017)	-0.009 (0.017)
Has Finished College	0.715 (0.451)	0.015 (0.027)	0.016 (0.028)
Is Head of Household (HoH)	0.395 (0.489)	-0.014 (0.029)	-0.010 (0.030)
Is Wife of HoH	0.283 (0.451)	-0.003 (0.027)	-0.008 (0.028)
N	3,282	3,282	3,282

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows summary statistics and shows that there are no significant differences in fixed characteristics between lottery winners and those who lost the lottery. In column (1), we report means of variables, with standard deviations in parentheses. In column (2), we use OLS to regress the fixed characteristic on a dummy for whether the entrant won the lottery, and report the lottery coefficient and standard error from this regression. In column (3), we again use OLS to regress the fixed characteristic on the lottery win dummy, as well as fixed effects for the lottery entry date and the day of week that the survey was taken.

Table 2: Comparability of Female Lottery Entrants Winning and Not Winning the Lottery for Variables Unaffected by the Lottery

	Women with Prelottery Children		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Birth Year	1976.5 (6.002)	-0.401 (0.637)	0.702 (0.665)
Has Finished High School	0.881 (0.324)	0.010 (0.034)	-0.009 (0.036)
Has Finished College	0.654 (0.476)	0.017 (0.050)	-0.006 (0.053)
Is Head of Household (HoH)	0.438 (0.496)	0.036 (0.053)	0.040 (0.055)
Is Spouse of HoH	0.391 (0.488)	-0.035 (0.0.052)	-0.033 (0.055)
N	906	906	906
	Women with No Prelottery Children		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Birth Year	1978.5 (12.0)	0.739 (0.804)	1.224 (0.821)
Has Finished High School	0.928 (0.259)	-0.007 (0.019)	-0.107 (0.019)
Has Finished College	0.739 (0.439)	0.021 (0.32)	0.023 (0.033)
Is Head of Household (HoH)	0.379 (0.485)	-0.043 (0.036)	-0.037 (0.037)
Is Spouse of HoH	0.242 (0.429)	-0.001 (0.031)	-0.006 (0.032)
N	2,376	2,376	2,376

This table shows summary statistics of key variables that cannot be affected by the lottery. In column (1), we report means of variables, with standard deviations in parentheses. In column (2), we use OLS to regress the fixed characteristic on a dummy forwhether the entrant won the lottery, and report the lottery coefficient and standard error from this regression. In column (3), we again use OLS to regress the fixed characteristic on the lottery win dummy, and this time condition the regression with fixed effects for the lottery entry date and the day of week that the survey was taken.

Table 3: Comparability of Female Lottery Entrants Winning and Not Winning the Lottery for Key Outcomes

	All Women		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Number of Cars	0.724 (0.631)	0.595 (0.037)***	0.572 (0.037)***
Is Employed	0.786 (0.410)	0.039 (0.025)	0.034 (0.025)
Number of Total Tasks	1.289 (0.923)	0.095 (0.056)*	0.084 (0.058)
Number of Business Tasks	0.843 (0.635)	0.004 (0.039)	0.001 (0.040)
Number of Housework Tasks	0.316 (0.714)	0.105 (0.044)**	0.103 (0.045)**
- Pickup and Dropoff	0.157 (0.555)	0.116 (0.034)***	0.112 (0.035)***
Number of Recreation Tasks	0.130 (0.390)	-0.016 (0.024)	-0.021 (0.024)
N	3,176	3,176	3,176

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows summary statistics of key variables that can be affected by the lottery. In column (1), we report means of variables, with standard deviations in parentheses. In column (2), we use OLS to regress the fixed characteristic on a dummy forwhether the entrant won the lottery, and report the lottery coefficients and standard error from this regression. In column (3), we again use OLS to regress the fixed characteristic on the lottery win dummy, as well as fixed effects for the lottery entry date and the day of week that the survey was taken.

number of business tasks. Winners who have children do significantly more housework tasks than losers. These tables preview the results of IV estimation reported in the next section.

Because we are also interested in the effects of cars on income, we demonstrate the difference in household income brackets in figures 2 through 4, which compare income for winners and losers. For all three categories of women, winners are less likely to be in households with the lowest income bracket (which includes households with incomes below 50,000 RMB, or about 6,500 US dollars). Winners are more likely to be in higher income brackets; these differences appear to be larger for the next lowest income brackets. The income differences in the raw data are consistent with the empirical results in the next section.

Table 4: Comparability of Female Lottery Entrants Winning and Not Winning the Lottery for Key Outcomes

	Women with Prelottery Children		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Number of Cars	0.828 (0.590)	0.508 (0.060)***	0.503 (0.063)***
Is Employed	0.838 (0.369)	-0.031 (0.039)	-0.046 (0.041)
Number of Tasks	1.615 (1.102)	0.073 (0.117)	0.034 (0.124)
Number of Business Tasks	0.915 (0.629)	-0.107 (0.067)	-0.111 (0.070)
Number of Housework Tasks	0.615 (1.014)	0.220 (0.107)**	0.189 (0.113)*
- Pickup and Dropoff	0.465 (0.886)	0.230 (0.094)**	0.195 (0.099)**
Number of Recreation Tasks	0.088 (0.295)	-0.043 (0.031)	-0.048 (0.033)
N	906	906	906

	Women with No Prelottery Children		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Number of Cars	0.684 (0.642)	0.626 (0.045)***	0.607 (0.046)***
Is Employed	0.766 (0.423)	0.067 (0.031)**	0.056 (0.031)*
Number of Tasks	1.160 (0.807)	0.062 (0.061)	0.060 (0.062)
Number of Business Tasks	0.814 (0.636)	0.051 (0.048)	0.044 (0.049)
Number of Housework Tasks	0.199 (0.508)	0.008 (0.038)	0.012 (0.039)
- Pickup and Dropoff	0.036 (0.262)	0.018 (0.020)	0.020 (0.020)
Number of Recreation Tasks	0.146 (0.421)	0.003 (0.032)	0.004 (0.032)
N	2,376	2,376	2,376

This table shows summary statistics of key variables that can be affected by the lottery. In column (1), we report means of variables, with standard deviations in parentheses. In column (2), we use OLS to regress the fixed characteristic on a dummy forwhether the entrant won the lottery, and report the lottery coefficient and standard error from this regression. In column (3), we again use OLS to regress the fixed characteristic on the lottery win dummy, and this time condition the regression with fixed effects for the lottery entry date and the day of week that the survey was taken.

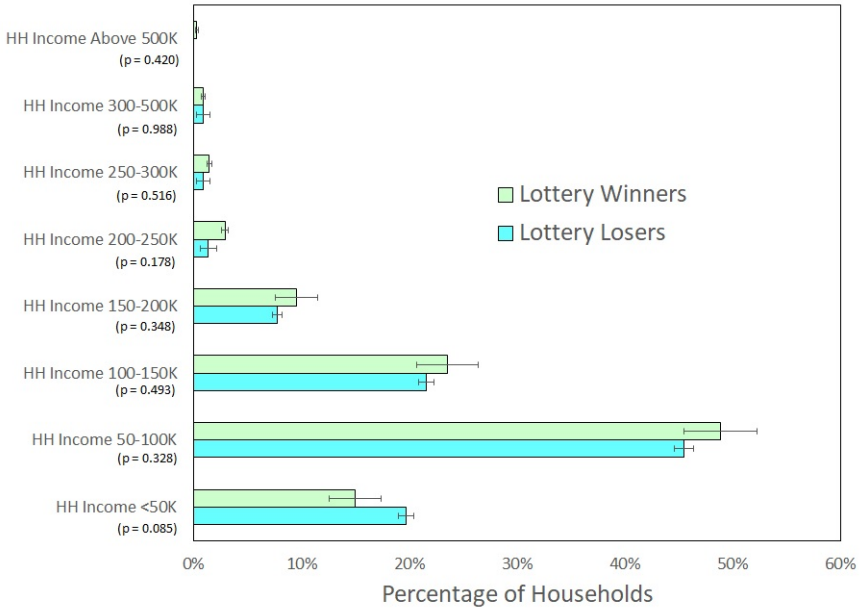

Figure 2: The Household Incomes of Lottery Winners and Losers - Women

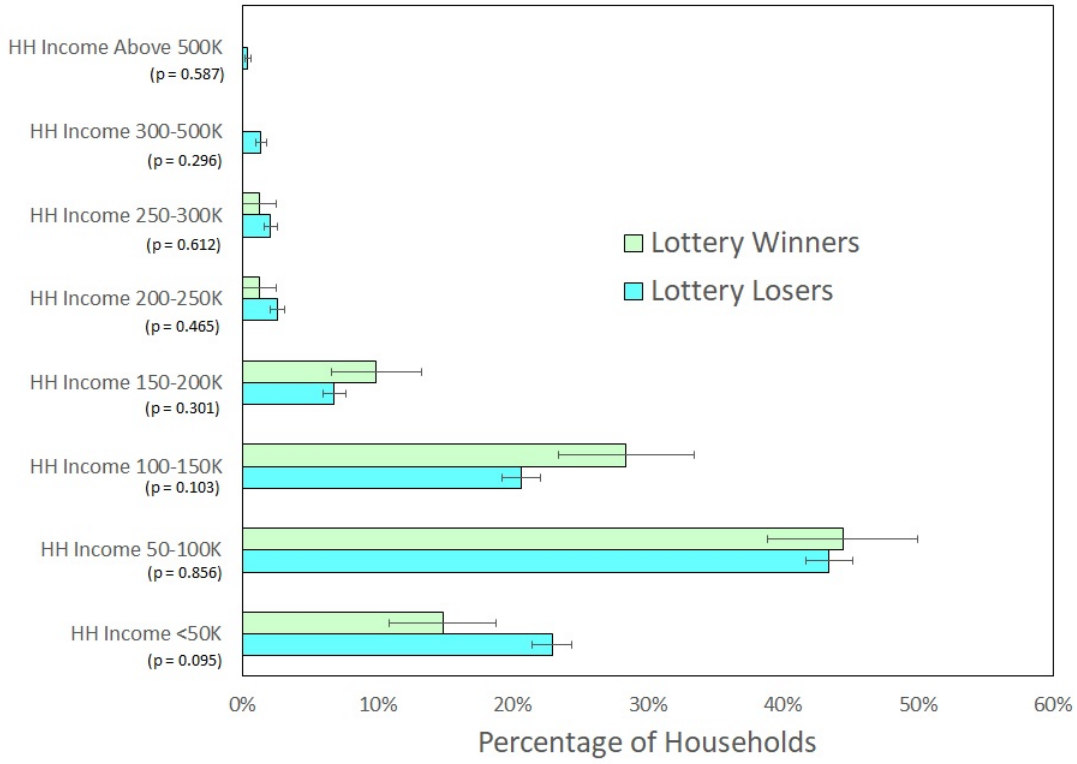

Figure 3: The Household Incomes of Lottery Winners and Losers - Women with Prelottery Children

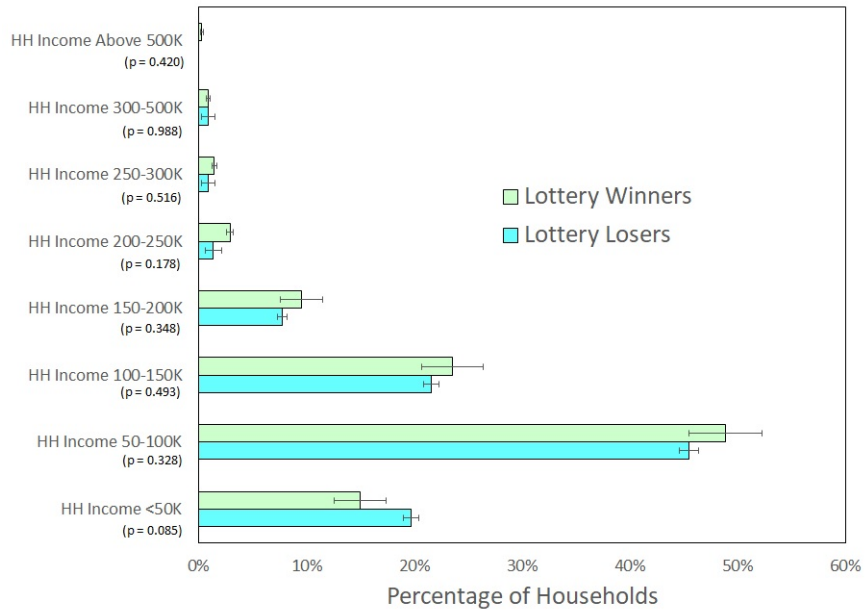

Figure 4: The Household Incomes of Lottery Winners and Losers - Women without Prelottery Children

3.4 The effect of winning the lottery on the number of cars

Table 5 shows the number of cars in the households of lottery winners and losers. Focusing on the top panel, we can see that lottery losers are more likely to have zero cars, while lottery winners are more likely to have 1, 2, or 3 cars.

The second and third panels of this table show an important difference between female lottery entrants and male lottery entrants. The majority of male lottery entrants who do not win the lottery have zero household cars, while the majority of female entrants who do not win the lottery already have one household car. This suggests that females enter the lottery more often to obtain a second household car, while men enter the lottery more often to obtain a first household car.

Appendix tables A6 through A9 show the first stages of the IV regressions. We exclude these from the main text of the paper because equation 3 has a large number of instrumented variables. In all specifications tested, winning the lottery has a large and statistically significant effect on the number of cars in households of both female and male entrants.

Table 5: Number of Household Cars for Lottery Winners and Losers

	Losers	Winners	Difference: Winners - Losers
		All Lottery Entrants	
0 Cars	0.505	0.069	0.435***
1 Car	0.437	0.668	0.231***
2 Cars	0.056	0.248	0.192***
3 Cars	0.003	0.015	0.013***
		Women	
0 Cars	0.404	0.056	0.348***
1 Car	0.525	0.640	0.115***
2 Cars	0.069	0.287	0.218***
3 Cars	0.002	0.017	0.014***
		Men	
0 Cars	0.574	0.078	0.497***
1 Car	0.375	0.685	0.309***
2 Cars	0.047	0.223	0.176***
3 Cars	0.003	0.015	0.011***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows the mean number of cars for Beijing lottery entrants, separated by whether they won or lost the lottery.

4 The Effect of Cars on Labor Supply, the Distribution of Household Activities, and Income

4.1 Effects on Employment

We report the effects of the number of household cars on employment status in table 6. In these regressions, the dependent variable is whether lottery entrants report that they are working.[25]

Column (1) reports results for equation 1. Columns (2) and (3) report expanded versions of this specification, where we instrument for the number of cars interacted with gender in column (2), and for whether the household has a child and the number of cars interacted with whether the household has a child in column (3). Column (4) reports the expanded regression from equation 3. Since combinations of coefficients in this column apply to different populations, we report the effect of car ownership on particular populations in the bottom 4 rows of the table.

For the overall population, Column (1) shows that winning a car has a statistically insignificant effect on whether the lottery entrant is employed. However, Column (2) shows that obtaining a car increases the chance that a woman works by a statistically significant 5 percentage points. Since winning the lottery increases the number of cars by 0.636 (appendix table A6), female employment would be (5.0 * 0.636 =) 3.2 percentage points higher in the absence of lottery restrictions, an increase of 4.1% over the 78.6 percent employment rate of female lottery losers.

Our theoretical model suggests that the presence of children could be a moderating variable. Column (3) shows that obtaining a car does not differentially affect labor supply of lottery entrants who have a child, compared to entrants who do not have a child. However, the bottom of column (4) shows that obtaining a car has a large effect on the labor supply of women without

[25]Survey respondents identify their current status, with options including 'full-time work,' 'part-time work,' 'student,' and 'retired.' If their status is either 'full-time work' or 'part-time work,' we identify them as working. Identifying oneself as working is an important determinant of time spent working in our travel diaries: those identifying themselves as working report a mean time spent working of 7.9 hours, while those not working report a mean time spent working of 9 minutes.

Table 6: IV Regressions on Employment

	(1)	(2)	(3)	(4)
Number of Cars	0.016	-0.002	0.023	-0.021
	(0.021)	(0.025)	(0.032)	(0.043)
Has Child			0.030	-0.023
			(0.043)	(0.043)
Is Female	-0.120***	-0.153***	-0.120***	-0.209***
	(0.027)	(0.036)	(0.027)	(0.061)
(Number of Cars)*(Has Child)			-0.022	0.052
			(0.040)	(0.063)
(Number of Cars)*(Is Female)		0.050***		0.129***
		(0.019)		(0.047)
(Is Female) * (Has Child)				0.163*
				(0.085)
(Number of Cars)*(Is Female) *				-0.206**
(Has Child)				(0.100)
Age	0.049***	0.049***	0.048***	0.048***
	(0.011)	(0.011)	(0.013)	(0.012)
(Age*Age)	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Effect for Man - No Child				-0.021
(Row 1)				(0.043)
Effect for Man with Child				0.031
(Row 1 + Row 4)				(0.032)
Effect for Woman - No Child				0.109***
(Row 1 + Row 5)				(0.027)
Effect for Woman with Child				-0.046
(Row 1 + Row 4 + Row 5 + Row 7)				(0.049)
N	8,057	8,057	8,057	8,057

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

All regressions include fixed effects for lottery entry date, for day of week of interview, and for education level. Standard errors are robust and clustered at the level of age bracket interacted with education level.

children, increasing their employment by 10.9 percentage points (statistically significant at the 1 percent level). The effect of car ownership for women with children, presented in the bottom row, is small and statistically indistinguishable from zero. The combination of columns (2) and (4) suggests that obtaining a car raises labor supply for women overall, and that these effects are concentrated among women without children.

As noted above, Liu et. al (2018) also examine the Beijing vehicle lottery and find that winning the lottery increases birth rates. Since women with babies are employed less than women without babies, our labor supply effects might be even bigger if the fertility effects were not present. Women without prelottery children would also have babies if they won the lottery, decreasing employment relative to where it would be if they did not have children.

4.2 Effects on the Distribution of Tasks

Our theory suggests that cars affect other outcomes besides employment, such as home production and tasks that require travel. In this section we examine the daily tasks reported in travel diaries. These results help us understand the effects of cars for women with and without children, and are generally consistent with the labor market effects documented above.

We report the effects of an additional car on the number and types of daily activities of lottery entrants in table 7.[26] For these regressions, the dependent variable is the number of activities such that the purpose specified by the respondent falls into the category in the row titles.[27] We report results from the expanded specification of equation 3, with the bottom four columns in this table summarizing the effect of a car for each subpopulation of interest.

[26]We examine the effects of a car on the minutes spent in activities in section 4.4.1. Consistent with the results in this section, women without children spend more time on work tasks. However, women with children do not spend more time on picking up and dropping off others. We speculate that cars may allow women with children to perform these tasks with greater efficiency.

[27]The purposes "work," "business trip," and "attend school" are labeled "business tasks." The purposes "personal affair (such as seeing doctor)," "housework/take care of others," "shopping," "pick up/drop off passenger," and "pick up/drop off goods" are labeled "Housework Tasks." The purposes "sleep/rest," "meal," "recreation," "community/social," and "accompany other" are labeled "Recreation Tasks."

Table 7: IV Regressions by Type of Task

	All Tasks	Business Tasks	Housework Tasks	Pickup & Dropoff	Recreation Tasks
Number of Cars	0.037	-0.072	0.036	-0.038	0.072
	(0.089)	(0.071)	(0.038)	(0.025)	(0.078)
Has Child	0.091	-0.090	0.154*	0.195***	0.028
	(0.124)	(0.096)	(0.080)	(0.069)	(0.070)
Is Female	-0.106*	-0.245**	0.117**	0.007	0.021
	(0.061)	(0.102)	(0.054)	(0.034)	(0.038)
(Number of Cars)*	0.183	0.173	0.119	0.141	-0.110
(Has Child)	(0.170)	(0.142)	(0.114)	(0.097)	(0.122)
(Number of Cars)*(Is Female)	0.013	0.175	-0.132**	-0.058	-0.029
	(0.101)	(0.126)	(0.053)	(0.059)	(0.068)
(Is Female) * (Has Child)	0.334	0.398**	-0.064	-0.101	0.009
	(0.245)	(0.190)	(0.186)	(0.118)	(0.074)
(Number of Cars)*	-0.120	-0.481*	0.383*	0.387***	-0.030
(Is Female) * (Has Child)	(0.284)	(0.286)	(0.199)	(0.137)	(0.108)
Effect for Man - No Child	0.037	-0.072	0.036	-0.038	0.072
(Row 1)	(0.089)	(0.071)	(0.038)	(0.025)	(0.078)
Effect for Man with Child	0.220*	0.101	0.156	0.103	-0.038
(Row 1 + Row 4)	(0.134)	(0.089)	(0.111)	(0.080)	(0.052)
Effect for Woman - No Child	0.050	0.103	-0.096	-0.097*	0.043
(Row 1 + Row 5)	(0.119)	(0.082)	(0.048)	(0.053)	(0.055)
Effect for Woman with Child	0.112	-0.205	0.407**	0.432***	-0.098*
(Row 1 + Row 4 + Row 5 + Row 7)	(0.267)	(0.156)	(0.184)	(0.136)	(0.054)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results of coefficients γ_2 through γ_8 from equation 3. All regressions include fixed effects for lottery entry date, for day of week of interview, and for education level. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Cars cause different patterns of changes in tasks for women with no children and women with children. Women without children who gain cars appear to shift activities away from housework and toward tasks like work and recreation, although these estimates are not statistically significant.

By contrast, cars cause women with children to increase the number of housework tasks. The last row of table 7 shows that cars increase the average number of housework tasks by 0.407, an increase of 66 percent over the mean for this group that is statistically significant at the 5 percent level. This increase is partially offset by a decrease in recreation tasks among those women.

Column (4) distinguishes the housework task of picking up and dropping off others from all other housework tasks. This task accounts for the entire increase in the change in housework tasks by women with children, implying that the largest effect of gaining cars on the activities for women with children is to allow them to pick up and drop off children. According to the bottom row of column (4), each car increases the number of pickup and dropoffs for women with children by 0.432, a statistically significant and large increase compared to the average of 0.157 pickups and dropoffs across all women.

For men, cars have no statistically significant effect on the number of business tasks for men either with or without prelottery children. Like women, men with children increase the number of pickup and dropoff tasks, but this number changes less than than of women, and these changes are not statistically significant.

To summarize the estimation results for tasks, women without children increase their business tasks, although not to a statistically significant degree. Women with children use cars to pick up and drop off others rather than for work. Tasks done by men are largely unaffected by cars. All of these changes are consistent with our previous findings on labor supply.

4.3 Effects on Household Income

Because cars affect employment, they may also affect income. Although the Beijing government survey we use does not ask respondents to report their individual incomes, it does ask them to identify their household income from a set of eight ranges printed on a card.[28]

We use the data to examine the effects of winning a car on the probability that a lottery entrant's household reports its income in a given range. We estimate equation 3 with the dependent variables dummies indicating whether the lottery entrant's household income falls in the range reported in the column headings in table 8. To focus on the main results, this table includes only the four lowest income brackets . Appendix table A10 reports results for all income brackets, but it turns out that cars have no statistically effect in any of the four highest income brackets.

We examine each category in the bottom four rows of table 8 separately. For men with no children, only the bracket with an income between 100-150K shows a change at the statistical significance level of 10%. There is an equal and opposite change for the 0-50K income bracket, although this change is not statistically significant. For men with children, there is a decrease at the 50-100K income bracket, and a statistically insignificant increase at the 150-200K income bracket.

Compared to the results for men, the income changes for women are larger in magnitude and more precisely estimated. For women without children, there is a strongly statistically significant decrease at the lowest 0-50K income bracket and a large and statistically significant increase at the next to lowest income bracket. This is consistent with our previous finding these these women gain employment as a result of obtaining a car. Finally, for women with children, there is a decrease at the lowest income bracket, and a moderate but statistically insignificant increases at the 100-150K and 150-200K income brackets.

[28]The card's ranges are: "<50,000 RMB," "Between 50 and 100,000 RMB," "Between 100 and 150,000 RMB," "Between 150 and 200,000 RMB," "Between 200 and 250,000 RMB," "Between 250 and 300,000 RMB," "Between 300 and 500,000 RMB," and "Above 500,000 RMB."

Table 8: IV Regressions on HH Income Brackets

	<50K	50-100K	100-150K	150-200K
Number of Cars	-0.037	0.008	0.037*	-0.007
	(0.025)	(0.025)	(0.019)	(0.014)
Has Child	-0.015	0.070	0.010	-0.038
	(0.031)	(0.048)	(0.056)	(0.032)
Is Female	-0.020	-0.018	0.027	0.009
	(0.017)	(0.029)	(0.020)	(0.021)
(Number of Cars)*(Has Child)	0.033	-0.112	-0.038	0.073
	(0.042)	(0.069)	(0.081)	(0.057)
(Number of Cars)*(Is Female)	-0.023	0.075**	-0.050*	0.001
	(0.022)	(0.030)	(0.028)	(0.021)
(Is Female) * (Has Child)	0.075	-0.056	-0.046	-0.025
	(0.048)	(0.060)	(0.061)	(0.046)
(Number of Cars)*(Is Female) *	-0.063	0.042	0.087	-0.006
(Has Child)	(0.060)	(0.082)	(0.102)	(0.053)
Effect for Man	-0.037	0.008	0.037*	-0.007
(Row 1)	(0.025)	(0.025)	(0.019)	(0.014)
Effect for Man with Child	-0.004	-0.105*	-0.001	0.066
(Row 1 + Row 4)	(0.034)	(0.057)	(0.070)	(0.050)
Effect for Woman	-0.060**	0.083***	-0.013	-0.006
(Row 1 + Row 5)	(0.028)	(0.030)	(0.026)	(0.020)
Effect for Woman with Child	-0.090*	0.012	0.035	0.060
(Row 1 + Row 4 + Row 5 + Row 7)	(0.053)	(0.048)	(0.041)	(0.051)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results of coefficients γ_2 through γ_8 from equation 3. All regressions include fixed effects for lottery entry date, for day of week of interview, and for education level. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Collectively, these results suggest that cars can increase household incomes, and that they do so primarily for households in the lowest income brackets. Cars appear to affect income for both women and men regardless of whether a child is present in the household.

While we are unable to observe the type of job of survey respondents, our finding that cars can increase the income bracket for all groups is consistent with the results in the previous subsection that only some groups increase employment. For example, if a person works at a low-paying job because it is close to her home, obtaining a car may enable her to find and be able to work at a higher-paying job.

As mentioned earlier, we find in the appendix table that households in higher income brackets are unaffected by cars. While we are unable to examine the reasons for this, it seems logical that transportation policy would have a greater impact on low-skilled and lesser-paying professions than on high-skilled and higher-paying professions.

4.4 Additional Outcomes

4.4.1 Effects on Time Spent on Activities

While we previously used travel diaries to examine how cars affect the number of tasks done by lottery entrants, we can also use the times reported in the travel diaries to examine the effect on time spent on these tasks. We employ the same specification as that described in table 7, except that the dependent variables are the time spent on various tasks rather than the number of tasks. We note that we are only able to observe tasks when they involve travel of some kind.

We report these results in appendix table A11. For all tasks, cars do not change the amount of time dedicated to each task for any given group. Women without children do have a large positive point estimate of 37 minutes spent on business activities, but the standard error is too large for us to discern whether this is statistically significant.

4.4.2 Effects on the Division of Household Activities

In this section, we examine how the division of daily household activities by men and women is affected by new cars. We look specifically at how the number of household tasks done by men in the household and done by women in the household is affected by winning a car in the lottery.

This investigation of the distribution of daily activities is related to the literature on intra-household bargaining (e.g. Chiappori and Mazzocco forthcoming). One relevant hypothesis from this literature is that a woman works more when she wins the lottery because she uses the car more than she would if a man in her household wins.

Before we examine this question, it is important to discuss how cars may change the composition of households. Liu et al. (2018) examine the effects of car ownership on household structure, finding that cars increase household size but do not affect the gender mix of adults. As a result, the total number of household tasks could increase for lottery winners, but the balance of men and women in each household who do tasks should be identical.[29]

We first examine household labor outcomes in table 9. We examine the total number of people in a household who work along with the household number of minutes worked when a man or woman wins the lottery. As we report at the bottom of the table, cars increase the total number of women working in a household, but only when a women without child wins the lottery. Cars decrease the number of women working when a woman with a child wins. One possible explanation for this result is that cars raise the opportunity cost for working, and either the lottery entrant herself or a female relative will be entrusted with home care.

Cars have no statistically significant effect on the number of people working when a man wins the lottery. Additionally, we estimate the effects of cars on total time spent working by men and women in a household, but these effects are not precisely estimated. The point

[29]Children under the age of 18 do not fill out travel diaries, and new babies do not affect the gender mix of the tasks.

Table 9: IV Regressions on Number of Workers and Minutes Working in a Household

	Number of People Working	Number of Men Working	Number of Women Working	Worktime for All	Worktime by Men	Worktime by Women
Number of Cars	-0.098	-0.016	-0.082	-29.237	1.106	-29.578
	(0.107)	(0.060)	(0.058)	(42.511)	(24.796)	(28.440)
Has Child	-0.017	-0.157***	0.140**	51.477	-50.437	102.266***
	(0.064)	(0.045)	(0.060)	(42.789)	(33.739)	(38.497)
Is Female	-0.110	-0.336***	0.226***	-48.195	-145.895***	98.418*
	(0.089)	(0.061)	(0.084)	(52.688)	(31.596)	(52.277)
(Number of Cars)*(Has Child)	0.091	0.031	0.060	4.354	0.157	4.005
	(0.130)	(0.074)	(0.103)	(67.477)	(49.274)	(52.292)
(Number of Cars)*(Is Female)	0.153	-0.038	0.191***	76.285	-24.395	100.089**
	(0.142)	(0.098)	(0.071)	(77.709)	(51.904)	(47.272)
(Is Female) * (Has Child)	0.148	0.234*	-0.086	14.064	56.104	-41.911
	(0.136)	(0.139)	(0.102)	(78.527)	(69.276)	(76.013)
(Number of Cars)*(Is Female)	-0.244	0.029	-0.273*	-65.917	60.500	-126.497
* (Has Child)	(0.232)	(0.174)	(0.139)	(110.968)	(79.605)	(81.791)
Effect for Man - No Child	-0.09	-0.016	-0.082	-29.237	1.106	-29.578
(Row 1)	(0.107)	(0.060)	(0.058)	(42.511)	(24.796)	(28.440)
Effect for Man with Child	-0.007	0.015	-0.022	-24.883	1.263	-25.573
(Row 1 + Row 4)	(0.058)	(0.061)	(0.066)	(37.784)	(39.188)	(30.538)
Effect for Woman - No Child	0.054	-0.054	0.108**	47.048	-23.289	70.511
(Row 1 + Row 5)	(0.066)	(0.062)	(0.045)	(56.258)	(41.536)	(43.552)
Effect for Woman with Child	-0.099	0.006	-0.105*	-14.515	37.367	-51.982
(Row 1 + Row 4 + Row 5 + Row 7)	(0.267)	(0.110)	(0.055)	(52.016)	(41.084)	(42.745)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

All regressions include fixed effects for lottery entry date, for day of week of interview, and for education level.

Standard errors are robust and clustered at the level of age bracket interacted with education level.

estimate for work time by women increases by a large 70.5 minutes when a woman without a child obtains a car; however, the standard errors are sufficiently large that we cannot distinguish this point estimate from zero.

Next, we examine the total number of household activities in table 10. In contrast to the regressions from table 7 in which the dependent variable was individual tasks performed, these regressions use as the dependent variable household tasks performed. The unit of observation is still at the lottery entrant level.[30]

The first column of this table suggests that cars increase the total number of household tasks when a woman wins the lottery and has no child, with the largest increase in recreation tasks for the household. For women with children, the number of household pickup and dropoff tasks show a statically significant increase. The changes for other tasks are not statistically significant. For men without children, winning the lottery slightly decreases the number of pickup and dropoff tasks.

Finally, we turn our attention to the issue of whether the gender of the winner affects the distribution of household tasks performed by men and women. Table 11 examines the total number of tasks in a household performed by women when someone in the household wins the lottery , and table 12 examines the number performed by a man after winning.

The number of tasks performed by women is affected only when a woman wins the lottery. Cars increase the number of recreation tasks taken by women when a woman without a child wins the lottery, and increase the number of pickup tasks when a woman with a child wins.

The number of tasks performed by men is affected primarily when a man wins the lottery. When a man without a child wins the lottery, the number of pickup and dropoff tasks decreases, although we note that this number is quantitatively small relative to other coefficients. When a man with a child wins the lottery, the number of tasks performed by men increases in several

[30]Because the lottery is randomized at the individual level but not at the household level, it is not appropriate to perform regressions with units of observation at the household level. As a result, the dependent variable takes on the same value for individuals in the same household.

Table 10: IV Regressions on Types of Number of Total Household Activities

	All Tasks	Business Tasks	Housework Tasks	Pickup & Dropoff	Recreation
Number of Cars	-0.072	-0.156	-0.068	-0.117***	0.151
	(0.245)	(0.172)	(0.101)	(0.045)	(0.135)
Has Child	1.713***	0.857***	0.790***	0.856***	0.071
	(0.197)	(0.173)	(0.114)	(0.116)	(0.136)
Is Female	-0.311	-0.174	0.067	0.031	-0.206
	(0.194)	(0.173)	(0.103)	(0.071)	(0.149)
(Number of Cars)*(Has Child)	0.393	0.317	0.282	0.357**	-0.210
	(0.253)	(0.280)	(0.188)	(0.175)	(0.205)
(Number of Cars)*(Is Female)	0.628**	0.304	-0.024	0.009	0.350
	(0.281)	(0.265)	(0.141)	(0.115)	(0.240)
(Is Female) * (Has Child)	0.575	0.595	-0.178	-0.124	0.168
	(0.491)	(0.376)	(0.246)	(0.194)	(0.252)
(Number of Cars)*(Is Female) * (Has Child)	-1.053*	-0.903*	0.179	0.094	-0.338
	(0.630)	(0.539)	(0.341)	(0.294)	(0.355)
Effect for Man	-0.072	-0.156	-0.068	-0.117	0.151
(Row 1)	(0.245)	(0.172)	(0.101)	(0.045)	(0.135)
Effect for Man with Child	0.321	0.161	0.214	0.240	-0.058
(Row 1 + Row 4)	(0.201)	(0.191)	(0.177)	(0.150)	(0.095)
Effect for Woman	0.556*	0.148	-0.092	-0.108	0.501***
(Row 1 + Row 5)	(0.294)	(0.194)	(0.172)	(0.102)	(0.144)
Effect for Woman with Child	-0.104	-0.438	0.369*	0.343**	-0.046
(Row 1 + Row 4 + Row 5 + Row 7)	(0.476)	(0.293)	(0.218)	(0.166)	(0.168)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Entries in this table are coefficients of interest γ_2 to γ_8 from equation 3. The dependent variable in each regression is the quantity of tasks. Regressions include only entrants. All regressions include covariates of the age and age-squared of the entrant, as well as fixed effects for the day of the week of the interview, for the education level of the entrant, and for the month of entering the lottery. Standard errors are robust and clustered at the level of age bracket interacted with education level.

categories.

Overall, we observe substantial differences between how the car is used when a woman wins and how the car is used when the man wins. These results could be explained by the fact that when the woman wins, the additional car is often a second (or even a third) car, in which case the additional car may be used by the woman for picking up and dropping off children. When a man wins, the car is more likely to be the household's first car, and the woman does not use the car for picking up and dropping off others. Alternatively, and as discussed above, intrahousehold bargaining may explain the relationship between travel behavior and the gender of the winner.

4.4.3 Effects on the Gender Gap

In this section, we estimate the effect of our findings on the overall gender labor force participation gap. We assume that the behavior of losers would have been the same if there were no vehicle restrictions; we also assume that women who did not enter the lottery would not have changed behavior.

Our first-stage estimates suggest that lottery losers would have increased the number of cars owned by 0.636 (Appendix table A6); our IV estimates suggest that car ownership raises female employment by 5.0 percentage points. This implies that the employment rate for lottery losers would have been (0.636*5.0) = 3.2 percentage points higher in the absence of vehicle restrictions. Since 2,979 women participated in the lottery but never won, this implies that 94.7 of these women do not work because of vehicle ownership restrictions.

In the larger BTRC survey, 20,296 out of 47,319 women age 18 and older report being employed, an employment rate of 42.9 percent. In a counterfactual world with no vehicle restrictions, an additional 94.7 of these women would have been employed, resulting in an employment rate of 43.1 percent. As a result, we can say that vehicle restrictions raised total female employment in the city of Beijing by 0.2 percentage points, or 0.4 percent.

Table 11: IV Regressions on Types of Number of Household Activities Done by a Woman

	All Tasks	Business Tasks	Housework Tasks	Pickup and Dropoff	Recreation
Number of Cars	-0.077	-0.111	-0.039	-0.046	0.072
	(0.164)	(0.096)	(0.074)	(0.034)	(0.076)
Has Child	1.254***	0.608***	0.634***	0.622***	0.013
	(0.172)	(0.165)	(0.057)	(0.083)	(0.052)
Is Female	0.277**	0.217	0.090	0.038	-0.033
	(0.129)	(0.160)	(0.069)	(0.029)	(0.077)
(Number of Cars)*(Has Child)	-0.006	0.131	-0.010	0.075	-0.128
	(0.256)	(0.202)	(0.131)	(0.141)	(0.086)
(Number of Cars)*(Is Female)	0.322*	0.234	-0.032	-0.025	0.123
	(0.195)	(0.199)	(0.097)	(0.058)	(0.121)
(Is Female) * (Has Child)	-0.332	0.044	-0.359**	-0.334***	-0.005
	(0.355)	(0.313)	(0.177)	(0.117)	(0.116)
(Number of Cars)*(Is Female) * (Has Child)	-0.102	-0.480	0.417*	0.388**	-0.049
	(0.513)	(0.437)	(0.222)	(0.171)	(0.166)
Effect for Man	-0.077	-0.111	-0.068	-0.046	0.072
(Row 1)	(0.164)	(0.096)	(0.074)	(0.034)	(0.076)
Effect for Man with Child	-0.082	0.020	-0.049	0.029	-0.055
(Row 1 + Row 6)	(0.199)	(0.154)	(0.096)	(0.118)	(0.045)
Effect for Woman	0.246*	0.122	-0.071	-0.071	0.196***
(Row 1 + Row 4)	(0.148)	(0.156)	(0.097)	(0.045)	(0.072)
Effect for Woman with Child	0.138	-0.227	0.336**	0.392***	0.019
(Row 1 + Row 4 + Row 6 + Row 7)	(0.370)	(0.251)	(0.167)	(0.122)	(0.092)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Entries in this table are coefficients of interest γ_2 to γ_8 from equation 3. The dependent variable in each regression is the quantity of tasks. Regressions include only entrants. All regressions include covariates of the age and age-squared of the entrant, as well as fixed effects for the day of the week of the interview, for the education level of the entrant, and for the month of entering the lottery. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table 12: IV Regressions on Types of Number of Household Activities Done by a Man

	All Tasks	Business Tasks	Housework Tasks	Pickup and Dropoff	Recreation
Number of Cars	0.007	-0.043	-0.029	-0.072**	0.079
	(0.117)	(0.097)	(0.048)	(0.028)	(0.077)
Has Child	0.459***	0.247***	0.157	0.234***	0.059
	(0.138)	(0.078)	(0.115)	(0.080)	(0.101)
Is Female	-0.585***	-0.390***	-0.021	-0.007	-0.172**
	(0.132)	(0.077)	(0.065)	(0.052)	(0.087)
(Number of Cars)*(Has Child)	0.399*	0.187	0.292*	0.282**	-0.082
	(0.223)	(0.162)	(0.171)	(0.125)	(0.137)
(Number of Cars)*(Is Female)	0.304*	0.069	0.008	0.034	0.227
	(0.170)	(0.134)	(0.085)	(0.068)	(0.143)
(Is Female) * (Has Child)	0.909***	0.553***	0.181	0.210	0.173
	(0.326)	(0.180)	(0.217)	(0.176)	(0.144)
(Number of Cars)*(Is Female) * (Has Child)	-0.953**	-0.424	-0.238	-0.294	-0.289
	(0.429)	(0.267)	(0.261)	(0.218)	(0.206)
Effect for Man	0.007	-0.043	-0.029	-0.072**	0.079
(Row 1)	(0.117)	(0.097)	(0.048)	(0.028)	(0.077)
Effect for Man with Child	0.406***	0.144	0.263	0.211**	-0.003
(Row 1 + Row 4)	(0.157)	(0.096)	(0.152)	(0.105)	(0.085)
Effect for Woman	0.311	0.026	-0.021	-0.037	0.305***
(Row 1 + Row 5)	(0.192)	(0.110)	(0.103)	(0.070)	(0.095)
Effect for Woman with Child	0.242	-0.212	0.033	-0.049	-0.066
(Row 1 + Row 4 + Row 5 + Row 7)	(0.314)	(0.190)	(0.169)	(0.133)	(0.105)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Entries in this table are coefficients of interest γ_2 to γ_8 from equation 3. The dependent variable in each regression is the quantity of tasks. Regressions include only entrants. All regressions include covariates of the age and age-squared of the entrant, as well as fixed effects for the day of the week of the interview, for the education level of the entrant, and for the month of entering the lottery. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Among men surveyed, 26,201 out of 43,679 men age 18 and older enter the lottery, an employment rate of 60.0 percent. The initial gender gap in employment is 17.1 percent. If the lottery did not exist, the gap would have been 16.9 percent, a decrease in this gap of 0.2 percentage points.

This calculation suggests that, even though cars have large effects on female labor supply, the gender labor gap is so large that lifting vehicle ownership restrictions would only close a small portion of it.

4.5 Other Robustness Checks

Since many female lottery entrants try to win a second car for their household while comparatively more male entrants try to win a first car for their household, we examine whether the labor supply effects we observe are different if the household wins a first car or whether they win an additional car. We report the results in appendix table A14. Surprisingly, we find that many of the same qualitative patterns hold for both the first car and for additional cars: cars increase the rate of employment for women without children and increase the incomes of low-income households. We do find that second cars are more often used for housework tasks, but only in households for women with children.

Since most women with children in China are married, we test in appendix table A16 whether our results stem from marriage rather than the presence of a child. We use the specification from equation 1, dividing each gender according to whether we observe them to be married at the time of the survey. We caution that marriage is potentially endogenous to the number of cars, so these results would not be suitable for a main specification. There are no employment effects of cars for women, suggesting that the labor market effects of car ownership stem from having a child, rather than marriage.

5 Conclusion

As policy makers consider restricting vehicle ownership or use, it is important to remember that the policies' primary purpose is to improve environmental quality and reduce traffic congestion. Yang et al. (forthcoming) show that in Beijing, the license plate lottery reduced car ownership by 20 percent, vehicle distance traveled by 15 percent, and travel during peak congestion hours by 15 percent. This policy undoubtedly has large social benefits from reducing congestion, pollution, and greenhouse gas emissions. In this paper, we demonstrate the unintended consequences of this policy on female labor in Beijing. Female lottery losers are employed significantly less than lottery winners.

Several Chinese cities have imitated Beijing by allocating all or part of their license plates via lottery. Other cities, such as Shanghai and Singapore, restrict vehicles through an auction. Although this alternative mechanism may be more economically efficient than a lottery (Li 2016), an auction may exacerbate the gender labor supply gap more than a lottery, because cars are allocated to the wealthy, and men are likely to have higher incomes than women.

We observe a female labor supply response in Beijing, a densely populated city with an extensive bus and subway network. In these types of cities, the time savings from cars are likely to be smallest,[31] suggesting that vehicles are valued enough to have a strong influence on behavior even when other transportation options are readily available. The effects of restricting car ownership on female labor market outcomes could be larger in cities with lower quality public transportation.

It is unclear whether these effects will persist in the long run and in general equilibrium. Beijing frequently changes its transportation policies, builds new roads, and opens new public transportation options (e.g., Yang et al. 2018). Improving transportation options, such as providing new public transit options or ride-sharing services, may diminish the labor market

[31] Yang et al. (forthcoming) document that car owners spend roughly the same amount of time and travel the same distances as those who take subways and buses.

consequences of vehicle restrictions. However, it is hard to see how these transportation options would eliminate the labor supply effects of car ownership restrictions because the other options are imperfect substitutes for car ownership.

The most important policy implication of this work is that the labor market effects of vehicle restrictions should be mitigated, most directly through policies targeted at the primary group affected: women without children. For example, expansions in public transportation could be directed at areas with businesses employing concentrations of these women. Alternatively, labor tax incentives could be deployed precisely targeting those women without cars or children.

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Table A1: Robustness of Employment Regressions to Definition of Instrument

	No Renewal	Renewed within 6 months	Renewed within 1 year	All winners
	(1)	(2)	(3)	(4)
Number of Cars	-0.082	-0.052	-0.024	-0.021
	(0.080)	(0.058)	(0.050)	(0.043)
Has Child	-0.064	-0.035	-0.012	-0.023
	(0.065)	(0.047)	(0.046)	(0.043)
Is Female	-0.292***	-0.208***	-0.208***	-0.209***
	(0.107)	(0.071)	(0.059)	(0.061)
(Is Female) * (Has Child)	0.299**	0.162*	0.157*	0.163*
	(0.133)	(0.093)	(0.091)	(0.085)
(Number of Cars)*(Has Child)	0.132	0.078	0.034	0.052
	(0.106)	(0.074)	(0.070)	(0.063)
(Number of Cars)*(Is Female)	0.269**	0.135*	0.128*	0.129***
	(0.132)	(0.076)	(0.066)	(0.047)
(Number of Cars)*(Is Female)	-0.415**	-0.209*	-0.193	-0.206**
* (Has Child)	(0.188)	(0.126)	(0.130)	(0.100)
N	8,057	8,057	8,057	8,057
Effect for Man - No Child	-0.082	-0.052	-0.024	-0.021
(Row 1)	(0.080)	(0.058)	(0.050)	(0.043)
Effect for Man with Child	0.050	0.026	0.010	0.031
(Row 1 + Row 4)	(0.045)	(0.033)	(0.034)	(0.032)
Effect for Woman - No Child	0.187**	0.083*	0.104***	0.109***
(Row 1 + Row 5)	(0.093)	(0.045)	(0.031)	(0.027)
Effect for Woman with Child	-0.097	-0.048	-0.055	-0.046
(Row 1 + Row 4 + Row 5 + Row 7)	(0.068)	(0.057)	(0.060)	(0.049)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions include only female lottery entrants. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A2: Robustness of Employment Regressions to Age Covariates

	(1)	(2)	(3)
Number of Cars	-0.021	-0.015	-0.008
	(0.053)	(0.040)	(0.042)
Has Child	0.077**	-0.097***	-0.021
	(0.038)	(0.033)	(0.032)
Is Female	-0.195***	-0.207***	-0.220***
	(0.069)	(0.060)	(0.063)
(Is Female) * (Has Child)	0.169	0.152*	0.178*
	(0.107)	(0.079)	(0.094)
(Number of Cars)*(Has Child)	0.031	0.063	0.033
	(0.073)	(0.059)	(0.056)
(Number of Cars)*(Is Female)	0.152**	0.114***	0.137***
	(0.067)	(0.043)	(0.049)
(Number of Cars)*(Is Female) * (Has Child)	-0.230*	-0.199**	-0.218**
	(0.138)	(0.091)	(0.108)
Age		0.169***	
		(0.013)	
(Age*Age)		-0.003***	
		(0.000)	
(Age*Age*Age)		0.000***	
		(0.000)	
Age 18 to 25			0.377***
			(0.040)
Age 26 to 35			0.548***
			(0.029)
Age 36 to 45			0.548***
			(0.029)
Age 46 to 55			0.468***
			(0.036)
Ages 56 and up			0.000
			(.)
Effect for Man - No Child	-0.021	-0.015	-0.008
(Row 1)	(0.053)	(0.040)	(0.042)
Effect for Man with Child	0.009	0.048	0.026
(Row 1 + Row 4)	(0.035)	(0.033)	(0.027)
Effect for Woman - No Child	0.131***	0.099***	0.129***
(Row 1 + Row 5)	(0.035)	(0.026)	(0.027)
Effect for Woman with Child	-0.069	-0.037	-0.056
(Row 1 + Row 4 + Row 5 + Row 7)	(0.063)	(0.046)	(0.056)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions include only female lottery entrants. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A3: Comparison of Lottery Entrants and Other People Surveyed

	Lottery Entrants	Other People Surveyed	Difference
	Demographic Variables		
Is Female	0.407	0.525	-0.117***
	(0.005)	(0.002)	(0.006)
Birth Year	1975.8	1969.1	6.705***
	(0.126)	(0.067)	(0.231)
Has Finished High School	0.859	0.594	0.264***
	(0.004)	(0.002)	(0.006)
Has Finished College	0.624	0.345	0.279***
	(0.005)	(0.002)	(0.006)
Is Head of Household (HoH)	0.419	0.391	0.028***
	(0.005)	(0.002)	(0.006)
Is Spouse of HoH	0.278	0.303	-0.024***
	(0.005)	(0.002)	(0.005)
	Reported Household Income Bracket		
Income <50K	0.233	0.293	-0.060***
	(0.005)	(0.001)	(0.005)
50-100K	0.448	0.434	0.014**
	(0.006)	(0.002)	(0.006)
100-150K	0.200	0.172	0.028***
	(0.004)	(0.001)	(0.004)
150-200K	0.071	0.061	0.011***
	(0.003)	(0.001)	(0.003)
200-250K	0.024	0.020	0.004**
	(0.002)	(0.000)	(0.002)
250-300K	0.012	0.010	0.002
	(0.001)	(0.000)	(0.001)
300-500K	0.008	0.006	0.002**
	(0.001)	(0.000)	(0.001)
>500K	0.002	0.003	-0.001*
	(0.001)	(0.000)	(0.001)
N	8,071	93,758	101,829

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows summary statistics comparing lottery entrants with other survey participants who did not enter the lottery. Columns (1) and (2) report the means of variables, with standard deviations in parentheses. Column (3) shows the difference of these columns.

Table A4: Comparability of Male Lottery Entrants Winning and Not Winning the Lottery for Key Outcomes

	All Men		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Number of cars	0.549 (0.636)	0.695 (0.029)***	0.682 (0.029)***
Is employed	0.843 (0.364)	-0.005 (0.018)	-0.005 (0.018)
Number of total tasks	1.297 (0.859)	0.087 (0.043)**	0.072 (0.043)*
Number of business tasks	0.905 (0.608)	-0.012 (0.030)	-0.010 (0.031)
Number of housework tasks	0.214 (0.575)	0.072 (0.029)**	0.059 (0.029)**
- Pickup and dropoff	0.094 (0.405)	0.024 (0.020)	0.014 (0.020)
Number of recreation tasks	0.178 (0.474)	0.026 (0.024)	0.023 (0.024)
N	4,538	4,538	4,538

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows summary statistics of key variables that can be affected by the lottery. In column (1), we report means of variables, with standard deviations in parentheses. In column (2), we use OLS to regress the fixed characteristic on a dummy forwhether the entrant won the lottery, and report coefficients and standard errors from this regression. In column (3), we again use OLS to regress the fixed characteristic on the lottery win dummy, and this time condition the regression with fixed effects for the lottery entry date and the day of week that the survey was taken.

Table A5: Comparability of Male Lottery Entrants Winning and Not Winning the Lottery for Key Outcomes

	Men with Prelottery Children		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Number of cars	0.601 (0.640)	0.755 (0.061)***	0.745 (0.063)***
Is employed	0.905 (0.293)	-0.009 (0.030)	-0.016 (0.031)
Number of tasks	1.455 (0.930)	0.194 (0.098)**	0.177 (0.102)*
Number of business tasks	0.958 (0.560)	0.046 (0.059)	0.034 (0.062)
Number of housework tasks	0.353 (0.757)	0.152 (0.080)	0.145 (0.083)
- Pickup and dropoff	0.272 (0.660)	0.087 (0.070)	0.072 (0.072)
Number of recreation tasks	0.145 (0.417)	-0.005 (0.044)	-0.005 (0.046)
N	1,065	1,065	1,065
	Men with No Prelottery Children		
	(1)	(2)	(3)
	Mean (SD)	Coeff. (SE) with No Covariates	Coeff. (SE) with Additional FE
Number of cars	0.534 (0.634)	0.677 (0.033)***	0.661 (0.033)***
Is employed	0.825 (0.380)	-0.005 (0.021)	-0.004 (0.021)
Number of tasks	1.251 (0.832)	0.056 (0.047)	0.046 (0.048)
Number of business tasks	0.889 (0.620)	-0.029 (0.035)	-0.027 (0.035)
Number of housework tasks	0.175 (0.505)	0.050 (0.028)*	0.041 (0.029)
- Pickup and dropoff	0.043 (0.273)	0.006 (0.015)	0.002 (0.016)
Number of recreation tasks	0.188 (0.489)	0.035 (0.027)	0.032 (0.028)
N	3,710	3,710	3,710

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table shows summary statistics of key variables that can be affected by the lottery. In column (1), we report means of variables, with standard deviations in parentheses. In column (2), we use OLS to regress the fixed characteristic on a dummy forwhether the entrant won the lottery, and report coefficients and standard errors from this regression. In column (3), we again use OLS to regress the fixed characteristic on the lottery win dummy, and this time condition the regression with fixed effects for the lottery entry date and the day of week that the survey was taken.

Table A6: First-Stage Regressions on Number of Household Cars, With Only Number of Cars Instrumented

	(1) Number of Cars
Won Lottery	0.636***
	(0.031)
Is Female	0.167***
	(0.018)
Age	0.002
	(0.003)
(Age*Age)	-0.000
	(0.000)
Dummies for Entry Date	Yes
Dummies for Day of the Week of Interview	Yes
Dummies for Education Level	Yes
N	8,057
F-Stat	423.14

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A7: First-Stage Regressions on Number of Household Cars, With Number of Cars and Number of Cars Interacted with Gender Instrumented

	(1) Number of Cars	(2) (Number of Cars)* (Is Female)
Won Lottery	0.676***	-0.010***
	(0.031)	(0.003)
Is Female	0.177***	0.668***
	(0.019)	(0.026)
(Won Lottery)*(Is Female)	-0.103**	0.597***
	(0.044)	(0.044)
Age	0.002	0.005
	(0.003)	(0.003)
(Age*Age)	-0.000	-0.000
	(0.000)	(0.000)
Dummies for Entry Date	Yes	Yes
Dummies for Day of the Week of Interview	Yes	Yes
Dummies for Education Level	Yes	Yes
N	8,057	8,057
F-stat	240.63	116.70

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A8: First-Stage Regressions on Number of Household Cars, With Number of Cars, Having a Child, and Number of Cars Interacted with Child Instrumented

	(1) Number of Cars	(2) Has Child	(3) (Number of Cars)* (Has Child)
Won Lottery	0.639***	0.035**	0.130***
	(0.039)	(0.016)	(0.030)
Has Prelottery Child	0.105***	0.844***	0.532***
	(0.035)	(0.015)	(0.029)
(Won Lottery)*(Has Prelottery Child)	-0.023	-0.036**	0.503***
	(0.074)	(0.017)	(0.061)
Is Female	0.163***	0.000	0.069***
	(0.018)	(0.006)	(0.010)
Age	-0.005	0.009	0.003
	(0.004)	(0.006)	(0.003)
(Age*Age)	0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
Dummies for Entry Date	Yes	Yes	Yes
Dummies for Day of the Week of Interview	Yes	Yes	Yes
Dummies for Education Level	Yes	Yes	Yes
N	8,057	8,057	8,057
F-stat	165.06	1173.76	290.31

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A9: First-Stage Regressions on Number of Household Cars, With Number of Cars, Having a Child, Gender, and All Interactions Instrumented

	(1) Number of Cars	(2) Has Child	(3) (Number of Cars)* (Is Female)	(4) (Number of Cars)* (Has Child)	(5) (Is Female) *(Has Child)	(6) (Number of Cars)*(Is Female)* (Has Child)
Won Lottery	0.657***	0.044***	-0.010***	0.130***	-0.001	-0.003
	(0.037)	(0.013)	(0.003)	(0.028)	(0.002)	(0.002)
Has Prelottery Child	0.062**	0.851***	-0.001	0.435***	-0.003	-0.001
	(0.029)	(0.015)	(0.005)	(0.027)	(0.002)	(0.003)
Is Female	0.148***	0.006	0.629***	0.020**	0.152***	0.116***
	(0.023)	(0.009)	(0.032)	(0.009)	(0.013)	(0.012)
(Won Lottery)*	0.083	-0.045***	-0.002	0.618***	0.002	0.001
(Has Prelottery Child)	(0.071)	(0.014)	(0.005)	(0.065)	(0.003)	(0.003)
(Won Lottery)*	-0.051	-0.024	0.630***	-0.005	0.032	0.136***
(Is Female)	(0.061)	(0.031)	(0.066)	(0.039)	(0.032)	(0.045)
(Is Female)*	0.096***	-0.016*	0.144***	0.217***	0.844***	0.650***
(Has Prelottery Child)	(0.033)	(0.008)	(0.045)	(0.027)	(0.012)	(0.033)
(WonLottery)*	-0.209**	0.024	-0.125	-0.242***	-0.033	0.373***
(Is Female)*	(0.100)	(0.032)	(0.110)	(0.085)	(0.030)	(0.085)
(Has Prelottery Child)						
Age	-0.004	0.009	0.001	0.003	0.002	0.001
	(0.004)	(0.006)	(0.003)	(0.004)	(0.002)	(0.002)
(Age*Age)	0.000	-0.000**	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dummies for Entry Date	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for Day of the Week of Interview	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for Education Level	Yes	Yes	Yes	Yes	Yes	Yes
N	8,057	8,057	8,057	8,057	8,057	8,057
F-stat	97.52	673.82	49.89	193.92	1960.48	166.32

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A10: IV Regressions on Household Income Brackets

	<50K	50-100K	100-150K	150-200K	200-250K	250-300K	300-500K	Above 500K
Number of Cars	-0.037	0.008	0.037*	-0.007	-0.005	-0.002	0.005	0.001
	(0.025)	(0.025)	(0.019)	(0.014)	(0.016)	(0.009)	(0.008)	(0.003)
Has Child	-0.015	0.070	0.010	-0.038	-0.034	-0.002	0.010	-0.002
	(0.031)	(0.048)	(0.056)	(0.032)	(0.032)	(0.018)	(0.010)	(0.003)
Is Female	-0.020	-0.018	0.027	0.009	0.019	0.002	-0.025	0.006
	(0.017)	(0.029)	(0.020)	(0.021)	(0.022)	(0.003)	(0.024)	(0.008)
(Number of Cars)*(Has Child)	0.033	-0.112	-0.038	0.073	0.041	0.013	-0.016	0.008
	(0.042)	(0.069)	(0.081)	(0.057)	(0.043)	(0.029)	(0.014)	(0.008)
(Number of Cars)*(Is Female)	-0.023	0.075**	-0.050*	0.001	-0.027	-0.002	0.034	-0.008
	(0.022)	(0.030)	(0.028)	(0.021)	(0.030)	(0.008)	(0.031)	(0.011)
(Is Female) * (Has Child)	0.075	-0.056	-0.046	-0.025	0.028	0.016	0.023	-0.015
	(0.048)	(0.060)	(0.061)	(0.046)	(0.026)	(0.012)	(0.031)	(0.023)
(Number of Cars)*(Is Female) * (Has Child)	-0.063	0.042	0.087	-0.006	-0.035	-0.014	-0.025	0.016
	(0.060)	(0.082)	(0.102)	(0.053)	(0.034)	(0.022)	(0.037)	(0.023)
Effect of Car for Man	-0.037	0.008	0.037*	-0.007	-0.005	-0.002	0.005	0.001
(Row 1)	(0.025)	(0.025)	(0.019)	(0.014)	(0.016)	(0.009)	(0.008)	(0.003)
Effect of Car for Man with Child	-0.004	-0.105*	-0.001	0.066	0.035	0.010	-0.011	0.009
(Row 1 + Row 4)	(0.034)	(0.057)	(0.070)	(0.050)	(0.029)	(0.020)	(0.009)	(0.010)
Effect of Car for Woman	-0.060**	0.083***	-0.013	-0.006	-0.032	0.004	0.039	-0.007
(Row 1 + Row 5)	(0.028)	(0.030)	(0.026)	(0.020)	(0.035)	(0.004)	(0.038)	(0.008)
Effect of Car for Woman with Child	-0.090*	0.012	0.035	0.060	-0.027	-0.006	-0.003	0.017
(Row 1 + Row 4 + Row 5 + Row 7)	(0.053)	(0.048)	(0.041)	(0.051)	(0.020)	(0.009)	(0.012)	(0.022)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions include only female lottery entrants. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A11: IV Regressions on Time Spent on Activities for all Household Members

	All Tasks	Business Tasks	Of which: Work Time	Housework Tasks	Of which: Pickup and Dropoff	Recreation
Number of Cars	-26.116	-26.190	-21.781	2.484	-2.266***	-2.334
	(20.456)	(28.839)	(25.345)	(6.334)	(0.754)	(9.754)
Has Child	-9.271	-1.465	-3.110	-7.661	0.004	-0.148
	(26.911)	(31.028)	(29.394)	(5.736)	(1.314)	(12.519)
Is Female	-111.354***	-118.518***	-127.011***	10.645	-1.907	3.397
	(34.090)	(43.395)	(42.694)	(8.425)	(1.223)	(7.838)
(Number of Cars)*(Has Child)	68.050**	61.207	55.075	7.443	3.247**	-1.769
	(32.628)	(42.353)	(42.226)	(10.986)	(1.421)	(20.154)
(Number of Cars)*(Is Female)	70.003*	63.151	74.174	-8.455	1.531	3.411
	(41.576)	(49.564)	(46.878)	(9.537)	(1.594)	(11.460)
(Is Female) * (Has Child)	81.806**	68.134	81.995*	5.186	4.351	1.373
	(34.309)	(47.417)	(49.390)	(10.504)	(3.571)	(16.704)
(Number of Cars)*(Is Female)	-158.415***	-129.858**	-136.087**	-3.571	-0.820	-12.630
*(Has Child)	(46.237)	(65.192)	(65.078)	(13.703)	(3.935)	(23.608)
Effect for Man	-26.116	-26.190	-21.781	2.484	-2.266	-2.334
(Row 1)	(20.456)	(28.839)	(25.345)	(6.334)	(0.754)	(9.754)
Effect for Man with Child	41.933*	35.017	33.294	9.927	0.982	-4.104
(Row 1 + Row 4)	(21.571)	(23.287)	(28.321)	(7.728)	(0.989)	(11.679)
Effect for Woman	43.887	36.960	52.393	-5.971	-0.735	1.076
(Row 1 + Row 5)	(31.798)	(32.218)	(33.191)	(6.367)	(1.528)	5.321
Effect for Woman with Child	-46.479	-31.690	-28.619	-2.098	1.692	-13.323
(Row 1 + Row 4 + Row 5 + Row 7)	(38.997)	(39.081)	(38.780)	(5.415)	(2.635)	(6.883)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions include only female lottery entrants. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A12: IV Regressions on Time Spent on Activities by Women

	All Tasks	Business Tasks	Of which: Work Time	Housework Tasks	Of which: Pickup and Dropoff	Recreation
Number of Cars	-26.116	-26.190	-21.781	2.484	-2.266***	-2.334
	(20.456)	(28.839)	(25.345)	(6.334)	(0.754)	(9.754)
Has Child	-9.271	-1.465	-3.110	-7.661	0.004	-0.148
	(26.911)	(31.028)	(29.394)	(5.736)	(1.314)	(12.519)
Is Female	-111.354***	-118.518***	-127.011***	10.645	-1.907	3.397
	(34.090)	(43.395)	(42.694)	(8.425)	(1.223)	(7.838)
(Number of Cars)*(Has Child)	68.050**	61.207	55.075	7.443	3.247**	-1.769
	(32.628)	(42.353)	(42.226)	(10.986)	(1.421)	(20.154)
(Number of Cars)*(Is Female)	70.003*	63.151	74.174	-8.455	1.531	3.411
	(41.576)	(49.564)	(46.878)	(9.537)	(1.594)	(11.460)
(Is Female) * (Has Child)	81.806**	68.134	81.995*	5.186	4.351	1.373
	(34.309)	(47.417)	(49.390)	(10.504)	(3.571)	(16.704)
(Number of Cars)*(Is Female)	-158.415***	-129.858**	-136.087**	-3.571	-0.820	-12.630
*(Has Child)	(46.237)	(65.192)	(65.078)	(13.703)	(3.935)	(23.608)
Effect for Man	-26.116	-26.190	-21.781	2.484	-2.266	-2.334
(Row 1)	(20.456)	(28.839)	(25.345)	(6.334)	(0.754)	(9.754)
Effect for Man with Child	41.933*	35.017	33.294	9.927	0.982	-4.104
(Row 1 + Row 4)	(21.571)	(23.287)	(28.321)	(7.728)	(0.989)	(11.679)
Effect for Woman	43.887	36.960	52.393	-5.971	-0.735	1.076
(Row 1 + Row 5)	(31.798)	(32.218)	(33.191)	(6.367)	(1.528)	5.321
Effect for Woman with Child	-46.479	-31.690	-28.619	-2.098	1.692	-13.323
(Row 1 + Row 4 + Row 5 + Row 7)	(38.997)	(39.081)	(38.780)	(5.415)	(2.635)	(6.883)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions include only female lottery entrants. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A13: IV Regressions on Time Spent on Activities by Men

	All Tasks	Business Tasks	Of which: Work Time	Housework Tasks	Of which: Pickup and Dropoff	Recreation
Number of Cars	-26.116	-26.190	-21.781	2.484	-2.266***	-2.334
	(20.456)	(28.839)	(25.345)	(6.334)	(0.754)	(9.754)
Has Child	-9.271	-1.465	-3.110	-7.661	0.004	-0.148
	(26.911)	(31.028)	(29.394)	(5.736)	(1.314)	(12.519)
Is Female	-111.354***	-118.518***	-127.011***	10.645	-1.907	3.397
	(34.090)	(43.395)	(42.694)	(8.425)	(1.223)	(7.838)
(Number of Cars)*(Has Child)	68.050**	61.207	55.075	7.443	3.247**	-1.769
	(32.628)	(42.353)	(42.226)	(10.986)	(1.421)	(20.154)
(Number of Cars)*(Is Female)	70.003*	63.151	74.174	-8.455	1.531	3.411
	(41.576)	(49.564)	(46.878)	(9.537)	(1.594)	(11.460)
(Is Female) * (Has Child)	81.806**	68.134	81.995*	5.186	4.351	1.373
	(34.309)	(47.417)	(49.390)	(10.504)	(3.571)	(16.704)
(Number of Cars)*(Is Female)	-158.415***	-129.858**	-136.087**	-3.571	-0.820	-12.630
*(Has Child)	(46.237)	(65.192)	(65.078)	(13.703)	(3.935)	(23.608)
Effect for Man	-26.116	-26.190	-21.781	2.484	-2.266	-2.334
(Row 1)	(20.456)	(28.839)	(25.345)	(6.334)	(0.754)	(9.754)
Effect for Man with Child	41.933*	35.017	33.294	9.927	0.982	-4.104
(Row 1 + Row 4)	(21.571)	(23.287)	(28.321)	(7.728)	(0.989)	(11.679)
Effect for Woman	43.887	36.960	52.393	-5.971	-0.735	1.076
(Row 1 + Row 5)	(31.798)	(32.218)	(33.191)	(6.367)	(1.528)	5.321
Effect for Woman with Child	-46.479	-31.690	-28.619	-2.098	1.692	-13.323
(Row 1 + Row 4 + Row 5 + Row 7)	(38.997)	(39.081)	(38.780)	(5.415)	(2.635)	(6.883)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions include only female lottery entrants. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A14: IV Regressions on Whether the Woman Has a Car

	Is Working	<50K	50-100K	100-150K	150-200K	All Tasks	Business Tasks	Housework Tasks	Recreation
Has a Car	-0.028	-0.049	0.014	0.050*	-0.013	0.039	-0.099	0.039	0.098
	(0.058)	(0.035)	(0.033)	(0.028)	(0.019)	(0.117)	(0.093)	(0.052)	(0.109)
Has Child	-0.032	-0.017	0.095	0.013	-0.053	0.039	-0.121	0.119	0.044
	(0.050)	(0.039)	(0.062)	(0.073)	(0.044)	(0.152)	(0.118)	(0.104)	(0.089)
(Has a Car)*(Has Child)	0.079	0.042	-0.178	-0.051	0.116	0.312	0.261	0.207	-0.158
	(0.091)	(0.064)	(0.109)	(0.128)	(0.090)	(0.251)	(0.210)	(0.182)	(0.180)
(Has a Car)*(Is Female)	0.206***	-0.043	0.119***	-0.073	-0.001	0.038	0.278	-0.214**	-0.023
	(0.067)	(0.035)	(0.045)	(0.044)	(0.036)	(0.165)	(0.193)	(0.100)	(0.096)
(Is Female) * (Has Child)	0.230*	0.123	-0.067	-0.077	-0.052	0.321	0.594*	-0.329	0.071
	(0.121)	(0.082)	(0.093)	(0.095)	(0.083)	(0.406)	(0.307)	(0.309)	(0.100)
(Has a Car)*(Is Female)	-0.345**	-0.133	0.070	0.146	0.019	-0.158	-0.849*	0.788*	-0.112
*(Has Child)	(0.171)	(0.117)	(0.147)	(0.173)	(0.103)	(0.538)	(0.505)	(0.405)	(0.163)
Effect for Man - No Child	-0.028	-0.049	0.014	0.050*	-0.013	0.039	-0.099	0.039	0.098
(Row 1)	(0.058)	(0.035)	(0.033)	(0.028)	(0.019)	(0.117)	(0.093)	(0.052)	(0.109)
Effect for Man with Child	0.050	-0.007	-.164*	-0.001	0.103	0.351*	0.162	0.246	-0.060
(Row 1 + Row 4)	(0.050)	(0.053)	(0.093)	(0.110)	(0.080)	(0.204)	(0.140)	(0.174)	(0.084)
Effect for Woman - No Child	0.177***	-0.092**	0.133***	-0.023	-0.013	0.077	0.179	-0.175*	0.075
(Row 1 + Row 5)	(0.042)	(0.043)	(0.048)	(0.042)	(0.036)	(0.189)	(0.136)	(0.092)	(0.091)
Effect for Woman with Child	-0.089	-0.183*	0.025	0.072	0.122	0.231	-0.409	0.820**	-0.195*
(Row 1 + Row 4 + Row 5 + Row 7)	(0.098)	(0.107)	(0.095)	(0.080)	(0.112)	(0.540)	(0.314)	(0.367)	(0.105)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Entries in this table are coefficients of interest γ_2 through γ_8 from equation 3. Regressions include only entrants. All regressions include covariates of the age and age-squared of the entrant, as well as fixed effects for the day of the week of the interview, for the education level of the entrant, and for the month of entering the lottery. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A15: IV Regressions when the Instrument is Winning an Additional Car

	Is Working	<50K	50-100K	100-150K	200-250K	All Tasks	Business Tasks	Housework Tasks	Recreation
Number of Cars	0.005	-0.013	-0.043	0.019	0.003	-0.023	0.024	0.031	-0.079***
	(0.048)	(0.031)	(0.058)	(0.050)	(0.026)	(0.091)	(0.076)	(0.070)	(0.030)
Has Child	0.047	0.007	0.030	0.015	-0.038	0.136	0.071	0.124*	-0.059
	(0.060)	(0.043)	(0.072)	(0.079)	(0.041)	(0.089)	(0.103)	(0.075)	(0.053)
Is Female	-0.198***	-0.020	-0.013	0.027	0.040	-0.240**	-0.257***	0.097	-0.081
	(0.048)	(0.035)	(0.063)	(0.028)	(0.066)	(0.102)	(0.044)	(0.061)	(0.062)
(Is Female) * (Has Child)	0.035	-0.011	0.027	-0.013	-0.117	0.295	0.079	0.132	0.089
	(0.067)	(0.059)	(0.117)	(0.081)	(0.130)	(0.267)	(0.109)	(0.208)	(0.073)
(Number of Cars)*(Has Child)	-0.071	-0.008	-0.035	-0.044	0.071	0.113	-0.120	0.173	0.060
	(0.083)	(0.062)	(0.110)	(0.123)	(0.071)	(0.153)	(0.128)	(0.133)	(0.084)
(Number of Cars)*(Is Female)	0.104*	-0.028	0.079	-0.047	-0.049	0.225	0.165**	-0.099	0.159
	(0.059)	(0.054)	(0.093)	(0.051)	(0.085)	(0.169)	(0.068)	(0.099)	(0.097)
(Number of Cars)*(Is Female)	-0.012	0.051	-0.076	0.050	0.114	-0.086	-0.014	0.124	-0.198*
*(Has Child)	(0.113)	(0.088)	(0.166)	(0.135)	(0.145)	(0.340)	(0.145)	(0.259)	(0.115)
Effect for Man - No Child	-0.005	-0.013	-0.043	0.019	0.003	-0.023	0.024	0.031	-0.079***
(Row 1)	(0.048)	(0.031)	(0.058)	(0.050)	(0.026)	(0.091)	(0.076)	(0.070)	(0.030)
Effect for Man with Child	-0.066	-0.021	-0.078	-0.025	0.075	0.089	-0.097	0.204**	-0.019
(Row 1 + Row 4)	(0.047)	(0.041)	(0.063)	(0.076)	(0.059)	(0.083)	(0.070)	(0.082)	(0.059)
Effect for Woman - No Child	0.109***	-0.041	0.037	-0.028	-0.045	0.202	0.188	-0.067	0.080
(Row 1 + Row 5)	(0.042)	(0.046)	(0.066)	(0.046)	(0.093)	(0.135)	(0.032)	(0.081)	(0.098)
Effect for Woman with Child	0.027	0.001	-0.075	-0.023	0.140	0.228	0.054	0.230	-0.058
(Row 1 + Row 4 + Row 5 + Row 7)	(0.046)	(0.024)	(0.064)	(0.058)	(0.115)	(0.243)	(0.121)	(0.154)	(0.044)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Entries in this table are coefficients of interest γ_2 through γ_8 from equation 3. Regressions include only entrants. All regressions include covariates of the age and age-squared of the entrant, as well as fixed effects for the day of the week of the interview, for the education level of the entrant, and for the month of entering the lottery. Standard errors are robust and clustered at the level of age bracket interacted with education level.

Table A16: IV Regressions with Interactions for whether the Entrant has a Spouse

	Is Working	<50K	50-100K	100-150K	200-250K	All Tasks	Business Tasks	Housework Tasks	Recreation
Number of Cars	0.089*	-0.036	-0.078	-0.005	0.046	0.015	0.040	-0.070	0.043
	(0.049)	(0.059)	(0.075)	(0.062)	(0.044)	(0.139)	(0.090)	(0.093)	(0.086)
Has Spouse	0.122***	-0.001	-0.029	-0.035	0.012	0.049	0.083	-0.072	0.036
	(0.043)	(0.049)	(0.061)	(0.049)	(0.033)	(0.112)	(0.075)	(0.080)	(0.067)
Is Female	-0.041	0.014	-0.032	-0.011	-0.016	-0.106	-0.062	-0.022	-0.020
	(0.043)	(0.050)	(0.065)	(0.052)	(0.039)	(0.109)	(0.073)	(0.073)	(0.062)
(is Female)*(Has Spouse)	-0.176***	-0.015	-0.012	0.023	0.045	0.171	-0.062	0.125	0.107
	(0.067)	(0.074)	(0.098)	(0.078)	(0.053)	(0.172)	(0.114)	(0.129)	(0.090)
(Number of Cars)*(Has Spouse)	-0.144**	0.019	0.071	0.043	-0.042	0.157	-0.075	0.254*	-0.022
	(0.070)	(0.084)	(0.106)	(0.085)	(0.056)	(0.199)	(0.131)	(0.143)	(0.119)
(Number of Cars)*(Is Female)	-0.038	-0.029	0.096	-0.024	0.031	0.191	-0.014	0.177	0.025
	(0.065)	(0.078)	(0.101)	(0.081)	(0.063)	(0.176)	(0.115)	(0.117)	(0.103)
(Number of Cars)*(IsFemale)	0.138	-0.024	-0.014	0.026	-0.070	-0.293	-0.002	-0.136	-0.154
*(Has Spouse)	(0.098)	(0.112)	(0.148)	(0.117)	(0.081)	(0.261)	(0.171)	(0.191)	(0.145)
Effect for Man - No Child	0.089*	-0.036	-0.078	-0.005	0.046	0.015	0.040	-0.070	0.043
(Row 1)	(0.049)	(0.059)	(0.075)	(0.062)	(0.044)	(0.139)	(0.090)	(0.093)	(0.086)
Effect for Man with Spouse	-0.055	-0.017	-0.007	0.039	0.004	0.172*	-0.035	0.184	0.022
(Row 1 + Row 4)	(0.035)	(0.043)	(0.052)	(0.040)	(0.025)	(0.100)	(0.067)	(0.074)	(0.058)
Effect for Woman - No Child	0.051	-0.065	0.018	-0.029	0.078*	0.206*	0.026	0.108	0.069
(Row 1 + Row 5)	(0.043)	(0.051)	(0.068)	(0.053)	(0.046)	(0.112)	(0.074)	(0.074)	(0.058)
Effect for Woman with Spouse	0.044	-0.070	0.076	0.041	-0.034	0.069	-0.051	0.226*	-0.107**
(Row 1 + Row 4 + Row 5 + Row 7)	(0.055)	(0.051)	(0.073)	(0.063)	(0.037)	(0.150)	(0.095)	(0.124)	(0.052)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Entries in this table are coefficients of interest γ_2 through γ_8 from equation 3. Regressions include only entrants. All regressions include covariates of the age and age-squared of the entrant, as well as fixed effects for the day of the week of the interview, for the education level of the entrant, and for the month of entering the lottery. Standard errors are robust and clustered at the level of age bracket interacted with education level.