

# ISSUE BRIEF **06.13.18**

## **Women Driving in Saudi Arabia: Ban Lifted, What are the Economic and Health Effects?**

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### **INTRODUCTION**

Driving in Saudi Arabia has long been a male-only preserve, and one in which chaotic traffic and risky habits combined to render the kingdom's roadways among the deadliest in the world.

In June 2018, the kingdom finally put an end to its legal ban on women driving, opening the way for millions of new drivers to navigate across a country three times bigger than Texas.

While the long-overdue policy shift provides relief to women who lacked freedom of mobility, the onset of so many new drivers—many of them inexperienced—has enormous consequences for transportation and the energy sector, as well as labor market participation and public health.

Many businesses are expecting a boost. These include car manufacturers, auto dealerships, driving schools, and insurers. Others may suffer. There are many unknowns.

For starters, what will happen to gasoline demand and carbon dioxide emissions in the kingdom? What about traffic congestion, road safety, and air quality?

Women's participation in the labor force looks set to increase, and with it increased access to child care and health care. But increased female mobility also increases competition for employment with existing workers, many of them foreigners.

We argue that the long-term outcomes of ending the ban are far from clear, and will present the Saudi government with several policy challenges.

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### **HOW MANY NEW DRIVERS?**

If every age-eligible woman in Saudi Arabia—citizen and expatriate—decided to drive, the kingdom of 32 million could see another 9 million drivers take to the roads, implying a doubling of the number of motorists. While such a high figure is probably unattainable, eventually, some 6 million women—65% of the female driving-age population—could obtain licenses.<sup>1</sup> However, owning a license does not automatically confer access to a vehicle. Consultancy PwC estimates that 3 million women in Saudi Arabia will receive licenses and actively begin driving as soon as 2020.<sup>2</sup>

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### **DIFFICULTIES IN FORECASTING**

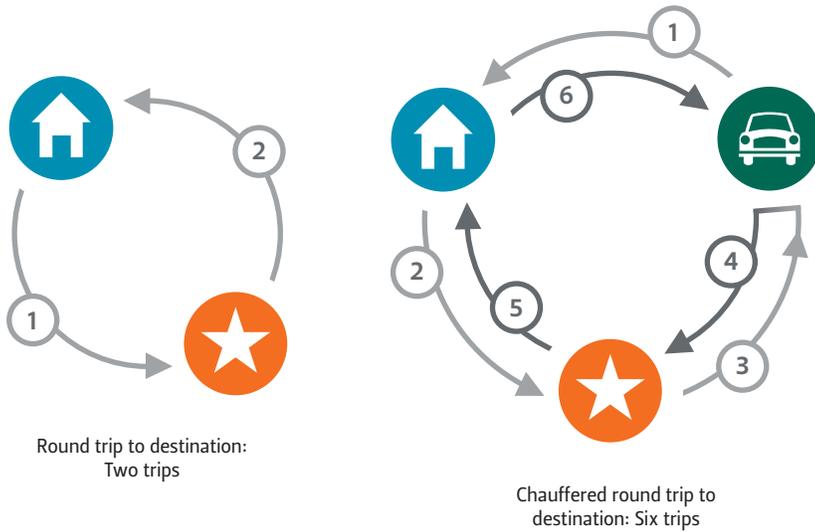
Another ambiguity relates to how often women take to the roads. Not only do policymakers not know how many women will drive, they also do not know how much they will drive.

Recent experience with gender-based driving bans like Saudi Arabia's is almost nonexistent. In 2018, the kingdom was the only country in the world that enshrined a legal prohibition on women driving,



**Road traffic deaths have become a public health crisis in Saudi Arabia, representing the primary cause of death among young adults.**

**FIGURE 1 — EFFICIENCY IMPROVEMENTS: WOMEN WHO DRIVE THEMSELVES MAKE FEWER TRIPS THAN THOSE USING A CHAUFFEUR**



**NOTES** Self-driving can result in fewer trips than using a driver or ride-sharing service. In this diagram, the house represents the woman's home and the star represents her destination. The car represents the driver's location at the time pickup is requested. Of course, chauffeurs may make fewer than six trips. In cases where a driver opts to wait for his female client, a chauffeured trip could even result in identical amount of driving as a self-driven trip. Chauffeured trips carry other benefits, including allowing door-to-door drop-off and help carrying baggage.

although Turkmenistan reportedly imposed a similar ban in January 2018.<sup>3</sup> Female driving is technically legal but uncommon in Afghanistan.

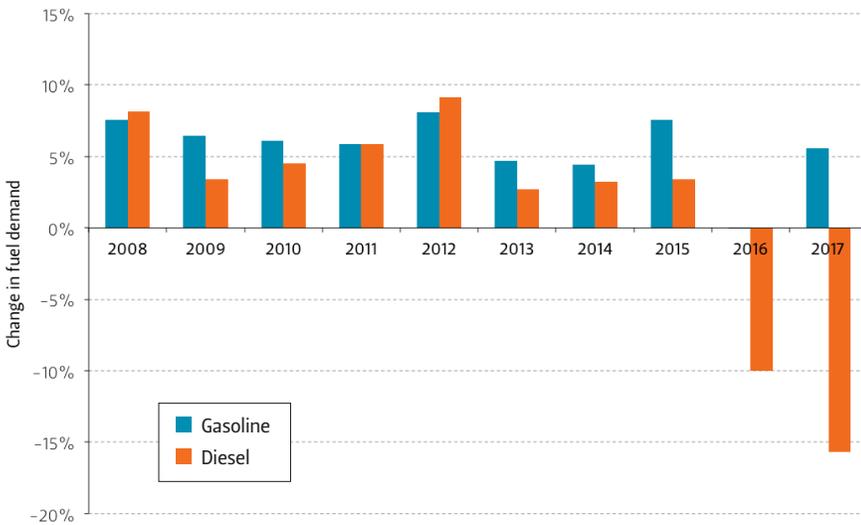
Will lifting the ban result in more driving or less?

Prior to the change, women in Saudi Arabia were not necessarily stranded. Many paid men to drive them, either by taking a taxi or using a common ride-sharing service like Uber and Dubai-based Careem, popular in the Middle East. In fact, women comprised three-quarters of the kingdom's Careem and Uber customers.<sup>4</sup> Other women were driven to their destinations by a male relative or family driver. Of course, many women will continue to use these services.

Among women who drive themselves, it is possible that lifting the ban will result in less driving. That's because chauffeuring is inefficient. Driving a woman passenger to and from her destination might require four or even six trips. In the worst case scenario, the chauffeur drives to collect his passenger, then drives her to her destination, and then drives back to his base. The process is reversed on the return voyage: three more trips. When a woman drives herself, she requires just two trips.

However, it is also possible that women may use their newfound independence—or the savings of not having to pay a male driver—to opt for additional trips, or even to begin working as a Careem or Uber driver. Unknowns like these make forecasting difficult.

**FIGURE 2 — YEARLY CHANGE IN SAUDI FUEL DEMAND**



**NOTE** Increases in fuel prices in 2016 and 2018 have dampened demand growth for diesel and gasoline in Saudi Arabia.

**SOURCE** Joint Organizations Data Initiative, 2018

**OIL DEMAND**

On its face, ushering in such a huge number of new motorists would seem to be inviting a spike in demand for gasoline, and the Saudi crude oil that provides it. An increase in fossil fuel combustion would also exacerbate Saudi Arabia's already disproportionate emissions of climate-damaging carbon dioxide.

One study forecast the onset of women driving would trigger a modest increase in gasoline demand, with consumption rising from 600,000 barrels per day in 2017 to 660,000 b/d by 2021. Such an increase,

just over 10%, would be sufficient to outstrip domestic production of gasoline and force the kingdom to resort to imports once again.<sup>5</sup>

Saudi energy policymakers are loath to increase domestic demand for gasoline, given that oil exports underpin the government budget and GDP. Gasoline remains subsidized in the kingdom, albeit by much smaller levels than in 2015. Then, it cost just 46 cents for a gallon of regular gasoline and 61 cents for a gallon of premium. Those prices have since jumped to \$1.40 and \$2.09 per gallon, and consumers have responded with a decrease in demand.<sup>6</sup> (Figure 2)

The kingdom plans to continue raising fuel prices to levels at or near international prices.<sup>7</sup> Thus the increase in number of drivers in the kingdom coincides with a period of increasing fuel prices, which should offset some of the effects on fuel demand—and CO<sub>2</sub> emissions. The increased efficiency of self-driving over chauffeuring could also play a mitigating role.

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## TRAFFIC CONGESTION AND POLLUTION

In a fashion similar to fuel demand, effects on traffic congestion and pollution are difficult to predict. Women driving themselves could increase the number of cars on the roads, while offsetting that growth with lower rates of use per auto, as chauffeuring activity declines.

Will adding millions of new drivers worsen traffic or improve it? One suspects that traffic congestion and air quality will worsen due to the lifting of the female driving ban. Why? Because even if all of the 1.4 million foreign chauffeurs lost their jobs and departed the kingdom—a very unlikely outcome—there would still be a net increase in the number of drivers. Thus the kingdom is likely to experience an overall increase in vehicle ownership, trips taken, and drivers licensed. Pollution is likely to be exacerbated by the increase in traffic congestion, given that congestion lengthens the average time a vehicle's engine is burning fuel and emitting exhaust and CO<sub>2</sub>.

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## LABOR DEMAND

One of the few certainties of lifting the ban is the decrease in employment for foreign men who earn a living by chauffeuring women passengers. Women who drive themselves won't need them as often or at all. Careem and Uber won't go out of business, but after June 24, women drivers, including Saudis, can sign up as drivers. They can also get licensed to drive trucks, delivery vans, and motorcycles.

Male professional drivers face the simultaneous challenges of a dwindling number of customers and a rising number of potential competitors for their jobs. Many will seek work in other professions. Foreign drivers who cannot find new jobs will probably depart the kingdom.

Making matters worse for foreign professionals, increased female mobility means that more Saudi women will be able to take advantage of the ongoing relaxation of restrictions on workforce participation.<sup>8</sup> As women increase their numbers within the kingdom's labor pool, some will inevitably replace expatriate contract workers. While this outcome is negative for foreign laborers, employment of Saudi women is a central goal of the kingdom's Vision 2030 development plan, which aims to raise female workforce participation from 22% to 30%.<sup>9</sup>

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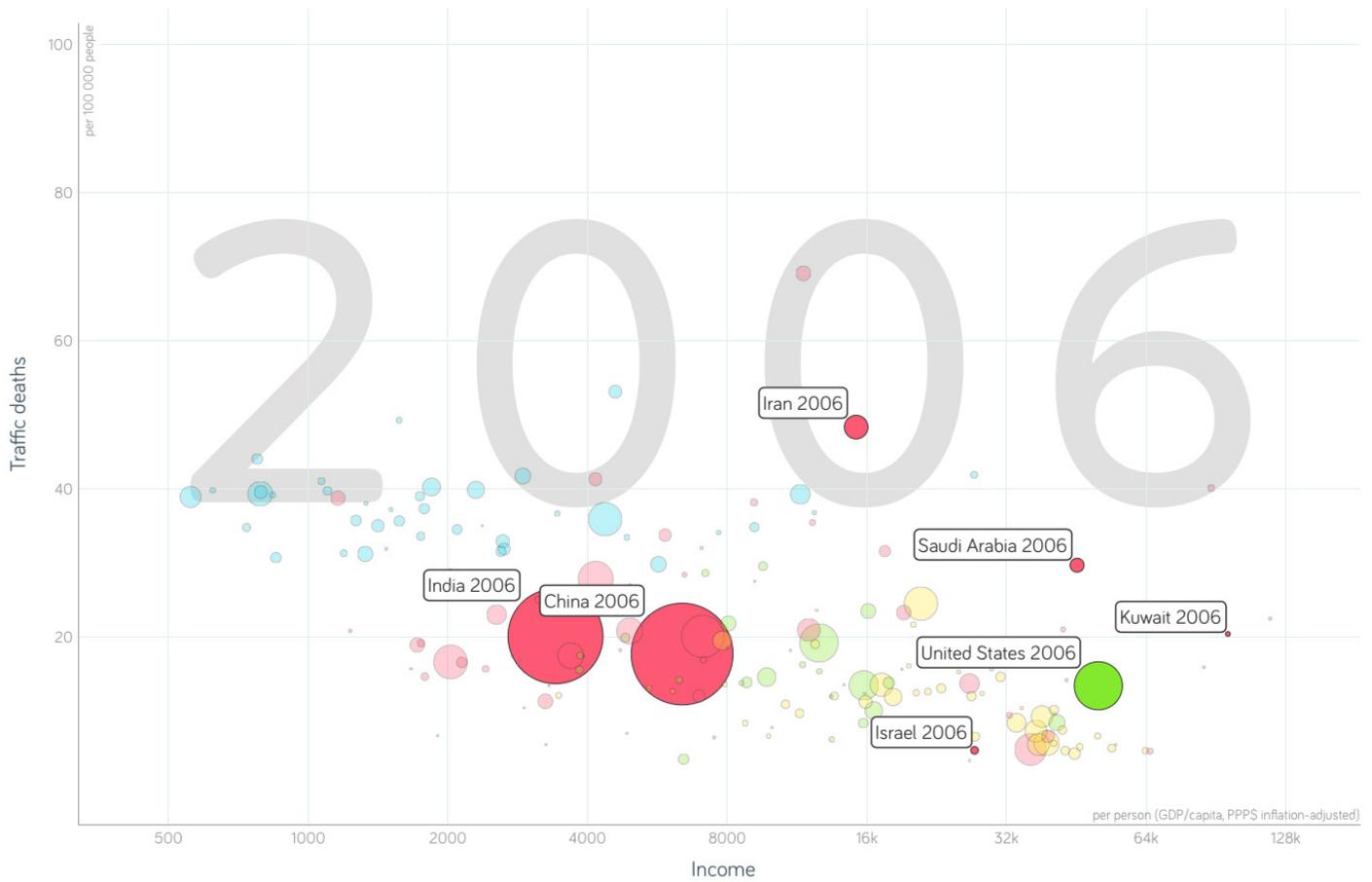
## VEHICLE SALES

Saudi Arabia and the Gulf monarchies already form one of the most lucrative markets for vehicle manufacturers. The region is a top destination for high-profit luxury and sports cars, as well as large sport-utility vehicles. As the number of licensed female drivers increases, vehicle sales should get a major boost. PwC forecasts that a typical 3% annual sales growth will jump to 9% per year, with car sales remaining at elevated levels until at least 2025.<sup>10</sup>

**There is some evidence to suggest that women drive at slower speeds and operate vehicles in a less aggressive manner than men.**

**For social scientists, the sudden addition of millions of new drivers of a single gender to a country's roadways provides a unique natural experiment for study of gender effects on driving behavior, energy demand, and public health.**

**FIGURE 3 — SAUDI ARABIA HAS ONE OF THE HIGHEST ROAD TRAFFIC DEATHS RATES IN THE WORLD**



**NOTES** Saudi Arabia (depicted in red) suffers 29.6 traffic deaths per 100,000 residents. The size of the bubbles represents the size of the population in various color-coded regions: Red for Asia and the Middle East, green for the Americas, blue for Africa, and yellow for Europe.

**SOURCES** Gapminder Foundation, World Bank

## PUBLIC HEALTH

As women merge onto highways known for reckless habits and chaotic traffic, safety—even survival—become major worries. How might adding females to the traffic flow influence driving behavior? It is possible that dire mortality levels on Saudi roadways could improve over time. There is some evidence to suggest that women drive at slower speeds and operate vehicles in a less aggressive manner than men, particularly in Middle Eastern countries like Jordan<sup>11</sup> and the United Arab Emirates.<sup>12</sup> If this pattern holds true in Saudi Arabia, the kingdom could see a welcome improvement in driving habits and, eventually, a reduction in deadly crashes.

Road traffic deaths have become a public health crisis in Saudi Arabia, representing the primary cause of death among young adults. Nearly half of road fatalities (49%) were of people under 30 years old. Excess speed accounted for 43% of accidents in 2010.<sup>13</sup>

In 2006, the kingdom had the highest traffic mortality rate among countries with its level of income, with 29.6 traffic deaths per 100,000 residents—more than double the 13.3 deaths per 100,000 residents in the United States (Figure 3). Traffic deaths in Saudi Arabia were among the highest in the world, including populous and lower income countries such as India and China. Regionally, only Iran fared worse, with more than 40

deaths per 100,000 residents. WHO Statistics from 2013 continue to report similar rankings in road traffic deaths for Saudi Arabia.<sup>14</sup>

However, the increase in traffic associated with women driving could outweigh the behavioral factors above, resulting in an increase in accident risk. Again, outcomes remain difficult to forecast.

## OTHER HEALTH FACTORS

In addition to the direct effects of traffic injuries and mortality, there are four additional mechanisms through which we may expect public health to benefit directly or indirectly.

1. **Access to child care:** Reduced travel costs<sup>15,16</sup> and increased female mobility should increase opportunities for female child care professionals such as nannies and allow working mothers to drive their children to day care. Child care and day care have been shown to yield long-term benefits in the next generation on a wide range of outcomes including risk of cardiovascular disease, test scores, employment, and earnings, and even personality traits.<sup>17</sup> High-quality child care for disadvantaged children can deliver a 13% per year return on investment.<sup>18,19,20</sup>
2. **Access to health care:** Increased female mobility could improve access to health facilities and laboratory testing, potentially improving health for women and reducing child mortality rates.<sup>21</sup>
3. **Reduced birth rate:** Increased female participation in the labor force could, over the long run, bring indirect changes in family planning that further reduce the kingdom's relatively high birth rate.<sup>22</sup>
4. **Increased supply of health professionals:** The health sector is the No. 2 employment sector for women in Saudi Arabia's gender-segregated job market. Health jobs are geographically widely distributed. Aided by increased mobility, the health sector should provide significant opportunity for increased female employment.<sup>23</sup>

## CONCLUSION

Allowing women to drive in Saudi Arabia represents a major achievement in social freedom and mobility for millions of women in the kingdom, although the lifting of the ban was preceded by arrests of more than a dozen activists, mainly women who had protested the ban on driving.<sup>24</sup>

For social scientists, the sudden addition of millions of new drivers of a single gender to a country's roadways provides a unique natural experiment for the study of gender effects on driving behavior, energy demand, and public health.

As we have attempted to show, the long-run outcomes are anything but clear. The lifting of the ban appears likely to improve access to child care and health care, and reduce high levels of female unemployment and gender segregation in the kingdom. Oil demand and car sales appear likely to rise. Some foreign laborers will depart. Effects on road safety could go either way.

Adding millions of new drivers into a chaotic and congested road network, one of the world's deadliest, will undoubtedly bring unnecessary tragedy. Saudi policymakers have taken a bold and long-overdue step in lifting the ban. One hopes that the Saudi government launches complementary policy changes that address driving habits that have made the kingdom such a dangerous place to operate a vehicle.

## ENDNOTES

1. Jennifer Gnana, "Saudi gasoline demand to hold steady despite new price regime, analysts say," *The National*, Abu Dhabi, December 12, 2017, <https://www.thenational.ae/business/energy/saudi-gasoline-demand-to-hold-steady-despite-new-price-regime-analysts-say-1.683952>.

2. "Women driving the transformation of the KSA automotive market," PwC, March 2018.

3. Clifford Atiyeh, "Turkmenistan Reportedly Bans Women from Driving," *Car and Driver*, January 12, 2018, <https://www.caranddriver.com/news/turkmenistan-reportedly-bans-women-from-driving>.

**Male professional drivers face the simultaneous challenges of a dwindling number of customers and a rising number of potential competitors for their jobs.**

4. Alexandra Zavis, "Women are the bulk of ride-app customers in Saudi Arabia. Soon they will be ride-app drivers," *Los Angeles Times*, March 27, 2018, <http://www.latimes.com/world/middleeast/la-fg-saudi-women-ride-hailing-apps-20180327-htmstory.html>.
5. Gnana, "Saudi gasoline demand."
6. Jim Krane, "Political Enablers of Energy Subsidy Reform in Middle Eastern Oil Exporters," *Nature Energy*, April 2018, <https://doi.org/10.1038/s41560-018-0113-4>.
7. Kingdom of Saudi Arabia, "Fiscal Balance Program: 2018 Update," Government report, Vision 2030 (Riyadh 2018), <http://vision2030.gov.sa/download/file/fid/1392>.
8. Sarah Hassan, "Saudi women join the workforce as country reforms," CNN, February 7, 2018, <https://www.cnn.com/2018/02/06/middleeast/saudi-women-in-the-workforce/index.html>.
9. "Goals," Vision 2030, Kingdom of Saudi Arabia, June 2018, <http://vision2030.gov.sa/en/goals>.
10. "Women driving the transformation of the KSA automotive market," PwC, March 2018.
11. Adli H. Al-Balbissi, "Role of Gender in Road Accidents, Traffic Injury Prevention," *Traffic Injury Prevention* 4, no.1, (2003): 64-73, <https://doi.org/10.1080/15389580309857>.
12. Men cause 9 out of 10 accidents in Dubai," *Gulf News*, October 2016
13. Farah A. Mansuri, et al, "Road Safety and Road Traffic Accidents in Saudi Arabia: A Systematic Review of Existing Evidence," *Saudi Medical Journal* 36 no. 4 (2015): 418-424.
14. World Health Organization, *Global Status Report on Road Safety 2013* (Geneva: World Health Organization, 2013). Available at [http://www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/2013/en/](http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/).
15. Erica Field, et al., "Allowing Women to Drive in Saudi Arabia May Reduce Cost of Travel. Case Study: Riyadh" (EPoD Evidence-Based Policy for the Saudi Labor Market Initiative, Harvard University, 2017), <https://epod.cid.harvard.edu/sites/default/files/inline-files/Women-Driving-Policy-Brief.pdf>.
16. W. Qiu, "Increasing Saudi females' accessibility to employment via car-pooling in Riyadh: measure the realistic commute cost by network computing methods and investigate the share-ability based on actual taxi trip data" (Doctoral dissertation, Massachusetts Institute of Technology, 2017).
17. Douglas Almond, Janet Currie, and Valentina Duque, "Childhood Circumstances and Adult Outcomes: Act II," National Bureau of Economic Research, No. w23017, 2017.
18. F. Campbell, G. Conti, J.J. Heckman, S.H. Moon, et al., "Early Childhood Investments Substantially Boost Adult Health," *Science* 343 (2014): 1478-1485.
19. J.L. García, J. L., J.J. Heckman, et al., "The life-cycle benefits of an influential early childhood program," National Bureau of Economic Research, No. w22993, 2016.
20. J.J. Heckman, "Skill formation and the economics of investing in disadvantaged children," *Science* 312, no. 5782 (2006): 1900-1902.
21. M. Karra, G. Fink, and D. Canning, "Facility distance and child mortality: a multi-country study of health facility access, service utilization, and child health outcomes," *International Journal of Epidemiology* 46, no. 3 (2016): 817-826.
22. A. Matysiak and D. Vignoli, "Fertility and women's employment: A meta-analysis," *European Journal of Population/Revue européenne de Démographie* 24, no. 4 (2008): 363-384.
23. Qiu Waishan, "Increasing Saudi females' accessibility to employment via car-pooling in Riyadh: measure the realistic commute cost by network computing methods and investigate the share-ability based on actual taxi trip data," Massachusetts Institute of Technology, 2017, <https://dspace.mit.edu/handle/1721.1/111478>.
24. "Saudi Arabia releases eight people held in activist crackdown," *Reuters*, June 2, 2018, <https://www.reuters.com/article/us-saudi-arrests/saudi-arabia-says-it-released-eight-people-in-activist-crackdown-idUSKCN11Y0V7>.

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