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 From Steer Davies Gleave
 Date []
 Project

Project No.

Ridership and Revenue Forecasts

Historical Ridership

Figures 1 and 2 show monthly ridership on the Culebra, Vieques and Metro services. Ridership displays a strongly seasonal pattern. For the island services, ridership peaks in July, when many Puerto Ricans take vacations. Metro ridership is at its highest in January, reflecting the peak in tourism from outside Puerto Rico.

In 2014, annual ridership for the three services was 513,403 (Culebra), 576,235 (Vieques) and 744,219 (Metro). From 2009 to 2015, Vieques ridership has been fairly constant, while Culebra ridership dropped during the recession and has steadily recovered. Metro ridership fell from 2009 to 2010 and then stabilized soon after. Reductions in service from April 2014 onwards had a dampening effect on ridership.

Figure 1

Island Ferry Ridership
Monthly

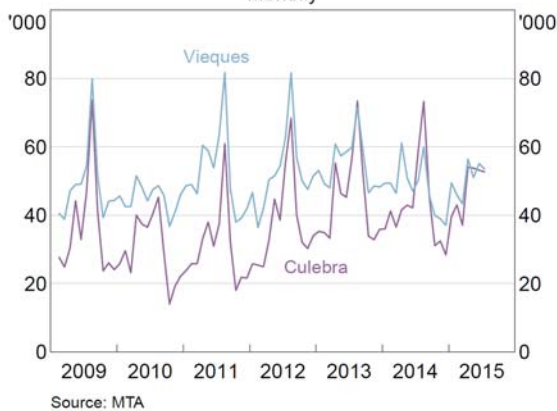
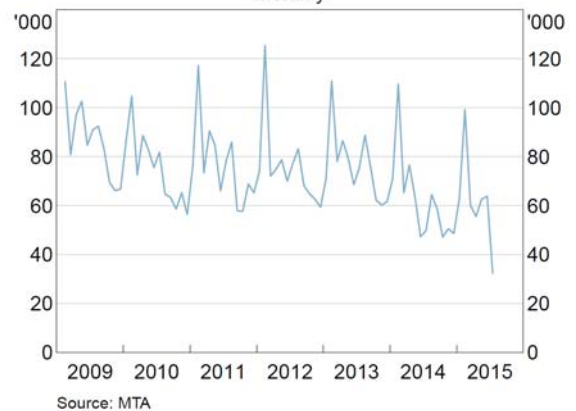


Figure 2

Metro Ferry Ridership
Monthly



Data

Economic Conditions

Puerto Rico has faced challenging economic conditions in recent years, with population and employment falling at around 1 per cent per year (Figures 3 and 4). The unemployment rate has recovered somewhat since the financial crisis, falling from a peak of 17.3 per cent in 2010 to 12.6 per cent by mid-2015, but remains high (Figure 5). The overall economic picture is expected to modestly improve over the next few decades, with Moody's predicting average employment growth of around 0.2 per cent per year.

Contrastingly, Puerto Rico tourism has grown relatively strongly, with year-on-year growth averaging around 5 per cent from 2009 to 2014 (Figure 6).

Figure 3

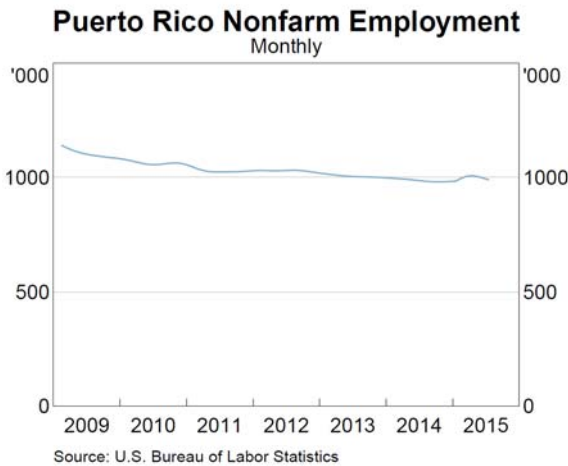


Figure 4

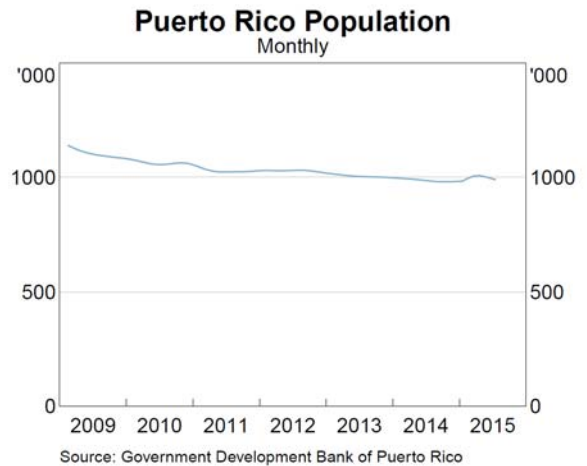


Figure 5

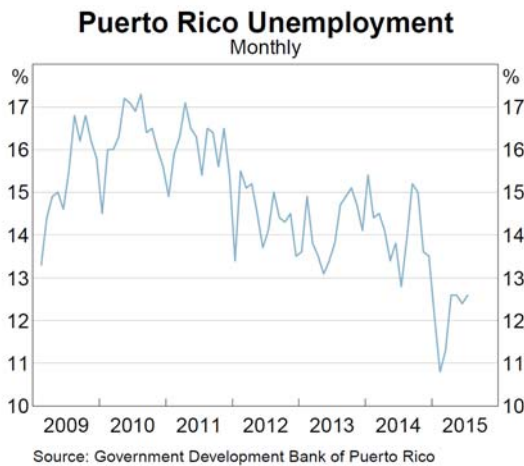


Figure 6

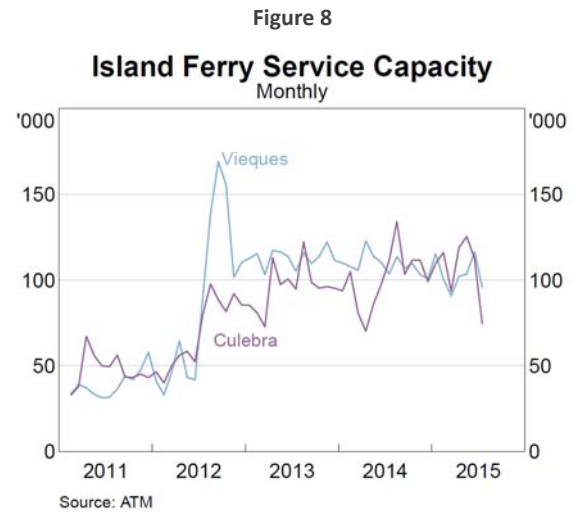
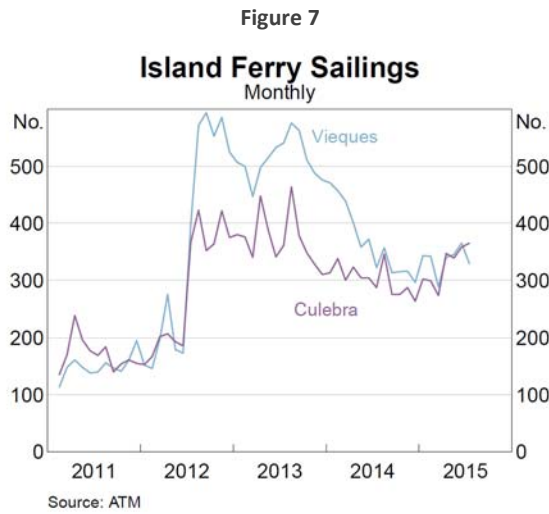


Service Conditions

ATM provided a daily record of sailings for the island services, broken down by route (Culebra/Vieques) and vessel. Figure 7 shows the number of sailings on the two routes. The fast ferry contract brought a large increase in the number of sailings in mid-2012, as more vessels were brought into service.¹ Sailings then decreased once the fast ferry contract ended in mid-2014, but service was maintained at a higher level.

¹ Under the fast ferry contract, a private operator was contracted to provide services on the two island routes with three vessels. This service supplemented existing ATM service, using the same wharf facilities and charging the same fare. It was in operation from mid-2012 to mid-2014.

We then calculated the monthly service capacity of the two routes, using the passenger capacity of each vessel (Figure 8). Comparing Figures 7 and 8, the increase in Vieques passenger capacity from 2012-14 was less dramatic than the number of sailings, because the vessels used by the private operator were generally smaller. Two of the three vessels had fewer than 70 seats, while the ATM vessels typically carry over 200 passengers. The brief spike in Vieques service capacity mid-2012 is due to the largest ATM vessel, the 600-seat *Cayo Blanco*, being used much more frequently for several months.



We do not have detailed data on sailings on the Metro service, but the service was substantially curtailed in April 2014 to reduce operating expenses. The service cuts eliminated one of the two routes (Old San Juan – Hato Rey), leaving only the Old San Juan – Cataño route, which had its frequency halved and span of operating hours reduced.

Econometric Models

The econometric models seek to explain ridership on the Culebra, Vieques and Metro services as a product of economic conditions and the characteristics of the service.

Island Services

The model for island services based on monthly data from January 2011 to June 2015, with 60 observations in total. The models take the general form:

$$\log(Ridership) = \alpha + \beta \log(Employment) + \gamma \log(Service) + \delta Seasonality + \varepsilon,$$

where:

- β is the elasticity of ridership to nonfarm employment in Puerto Rico. An elasticity measures the percentage change in one variable as a result of a 1 per cent change in another variable. For example, if the elasticity (β) were 1.3, then a 1 per cent increase in employment would lead to a 1.3 per cent increase in ridership.
- γ is the elasticity of ridership to service levels, as measured by the total monthly passenger capacity of the service.

- δ captures seasonal ridership effects through the year via a series of month-specific variables. The base month is January, so all seasonal effects are measured against January, which is a relatively average-ridership month. For example, if δ were equal to 0.3 in July, ridership would be 30 per cent higher than in January, all else equal.

Each of the models was estimated using two-stage least squares, which accounts for the potential feedback effects from ridership onto passenger capacity.

Culebra Model

The estimation results for the Culebra route are shown in Table 1.

Table 1: Estimated Culebra Ridership Model

| Model Parameter | Variable Name | Estimate | Std. Error | t value | Pr(> t) |
|---------------------------|-------------------------|----------|------------|---------|----------|
| α | (Intercept) | -5.495 | 6.973 | -0.788 | 0.435 |
| β | log(Employment) | 1.487 | 0.990 | 1.502 | 0.141 |
| γ | log(Passenger Capacity) | 0.518 | 0.040 | 12.819 | 0.000 |
| δ (vs. January) | February | -0.043 | 0.056 | -0.766 | 0.448 |
| | March | 0.137 | 0.056 | 2.440 | 0.019 |
| | April | 0.201 | 0.056 | 3.583 | 0.001 |
| | May | 0.138 | 0.056 | 2.473 | 0.018 |
| | June | 0.355 | 0.056 | 6.351 | 0.000 |
| | July | 0.532 | 0.061 | 8.751 | 0.000 |
| | August | 0.144 | 0.059 | 2.434 | 0.020 |
| | September | -0.257 | 0.059 | -4.343 | 0.000 |
| | October | -0.246 | 0.060 | -4.135 | 0.000 |
| | November | -0.201 | 0.059 | -3.393 | 0.002 |
| | December | -0.083 | 0.060 | -1.397 | 0.170 |

Vieques Model

Table 2 shows the estimation results for the Vieques route.

Table 2: Estimated Vieques Ridership Model

| Model Parameter | Variable Name | Estimate | Std. Error | t value | Pr(> t) |
|---------------------------|-------------------------|----------|------------|---------|----------|
| α | (Intercept) | -14.535 | 6.525 | -2.228 | 0.032 |
| β | log(Employment) | 3.592 | 0.946 | 3.797 | 0.000 |
| γ | log(Passenger Capacity) | 0.066 | 0.027 | 2.426 | 0.020 |
| δ (vs. January) | February | -0.012 | 0.058 | -0.202 | 0.841 |
| | March | 0.227 | 0.058 | 3.882 | 0.000 |
| | April | 0.164 | 0.058 | 2.826 | 0.007 |
| | May | 0.164 | 0.058 | 2.820 | 0.007 |

| | | | | |
|-----------|--------|-------|--------|-------|
| June | 0.237 | 0.058 | 4.066 | 0.000 |
| July | 0.457 | 0.062 | 7.348 | 0.000 |
| August | 0.114 | 0.062 | 1.827 | 0.075 |
| September | -0.071 | 0.062 | -1.136 | 0.263 |
| October | -0.074 | 0.062 | -1.185 | 0.243 |
| November | -0.058 | 0.062 | -0.938 | 0.354 |
| December | 0.059 | 0.062 | 0.948 | 0.349 |

Metro Service

The estimated equations for the Metro service take a similar form to those for the island services, with two differences:

- The service variable is no longer the total passenger capacity of the route, because these data are unavailable for the Metro service. Instead, a variable that captures the one-time effect of the April 2014 service cuts is added.
- The base month for the seasonality variables was changed from January to June. On the Metro service, January is the highest-ridership month, so the base was changed to June, which is a relatively average-ridership month.

Table 3 shows the estimated ridership model for the Metro service.

Table 3: Estimated Metro Ridership Model

| Model Parameter | Variable Name | Estimate | Std. Error | t value | Pr(> t) |
|------------------------|------------------|----------|------------|---------|-----------|
| α | Intercept | 3.152 | 2.614 | 1.206 | 0.231 |
| β | Log(Employment) | 1.178 | 0.381 | 3.091 | 0.003 |
| γ | 2014 Service Cut | -0.266 | 0.042 | -6.366 | 0.000 |
| δ (vs. June) | January | 0.411 | 0.066 | 6.254 | 0.000 |
| | February | -0.003 | 0.066 | -0.053 | 0.958 |
| | March | 0.105 | 0.066 | 1.606 | 0.112 |
| | April | 0.118 | 0.066 | 1.808 | 0.074 |
| | May | -0.010 | 0.066 | -0.155 | 0.878 |
| | July | 0.140 | 0.066 | 2.135 | 0.036 |
| | August | -0.009 | 0.066 | -0.130 | 0.897 |
| | September | -0.139 | 0.066 | -2.119 | 0.037 |
| | October | -0.118 | 0.066 | -1.799 | 0.076 |
| | November | -0.208 | 0.068 | -3.062 | 0.003 |
| | December | 0.005 | 0.068 | 0.079 | 0.937 |

Ridership Forecast

To develop ridership forecasts using our econometric model, we used forecasts of future employment and service levels, along with the elasticity parameter from our ridership model. We assume the privately run service commences operations in July 2016. Our forecasts extend out 10 years to June 2026.

For Puerto Rico nonfarm employment, we obtained forecasts from Moody's. Employment growth is expected to remain modest at around 0.2 per cent per year, in line with the slow recovery of the Puerto Rican economy.

Table 4 illustrates the assumed service plan for the island services under the PPP arrangement. We further assume the vessels in this plan are only available 90 per cent of the time; for the remainder of the trips, they are replaced by smaller vessels.² The service schedule is assumed not to change for the Metro service.

The service plan provides significantly more passenger capacity on the island routes, with the number of seats increasing from 104,869 to 199,780 for Vieques, and from 109,192 to 239,350 for Culebra.³

Table 4: Island Service Level under PPP

| Route | Vessel | Passenger Capacity | One-Way Trips (Daily) | One-Way Trips (Annual) | One-Way Trips (Monthly) |
|-------------------|--------------------------------|--------------------|-----------------------|------------------------|-------------------------|
| Culebra (Weekday) | Cayo Blanco (Passenger) | 600 | 12 | 3,120 | 260 |
| | Isleño (Passenger + Cargo) | 355 | 8 | 2,080 | 173 |
| Culebra (Weekend) | Cayo Blanco (Passenger) | 600 | 12 | 1,248 | 104 |
| Vieques (Weekday) | Isla Bonita (Passenger) | 355 | 16 | 4,160 | 347 |
| | Cayo Norte (Passenger + Cargo) | 198 | 8 | 2,080 | 173 |
| Vieques (Weekend) | Isla Bonita (Passenger) | 355 | 16 | 1,664 | 139 |

Figures 9, 10 and 11 show the projected annual ridership out to FY 2026. Culebra ridership experiences a large initial jump in ridership in FY 2017. This is due to the high responsiveness of ridership to seat availability, which more than doubles for Culebra once the PPP begins (Figure 9). For Vieques, there is a much more modest increase in ridership in FY 2017. While seat availability increases by a similar proportion, our ridership model estimates a much lower responsiveness of ridership to service level (Figure 10). After the first year of operation, ridership increases very slowly, in line with the modest prediction for employment growth for Puerto Rico. The Metro service experiences no jump in ridership in FY 2017 because service levels are unchanged (Figure 11).

² These are the Caribeña (replaces passenger-only vessels, 236 seats) and the Santa Maria (replaces combined passenger/cargo vessels, 137 seats).

³ The 'before' seat numbers in this calculation are the average of the monthly capacities provided from July 2014 to June 2015.

Figure 9

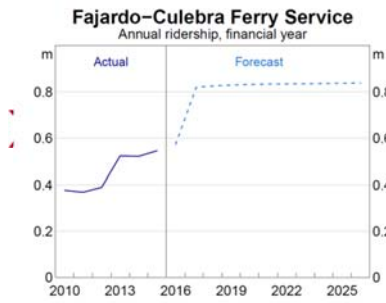


Figure 10

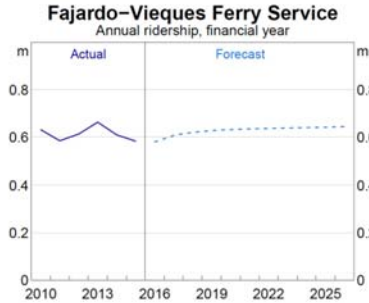


Figure 11

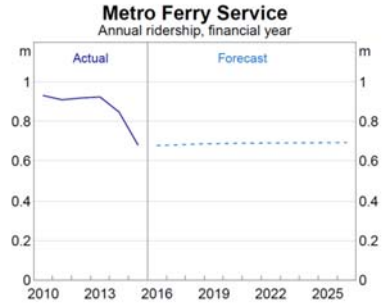


Figure 12

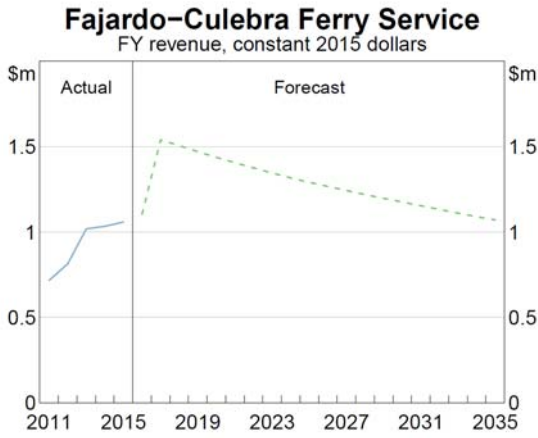


Figure 13

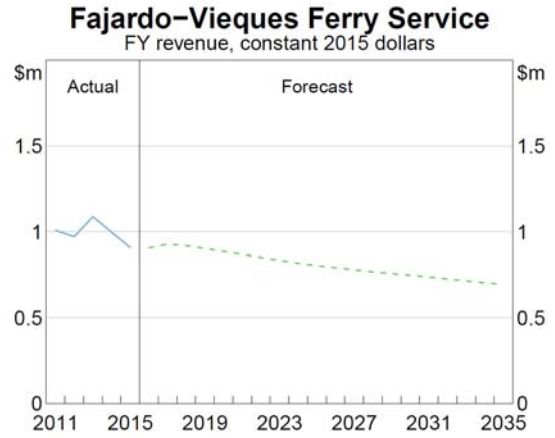


Figure 14

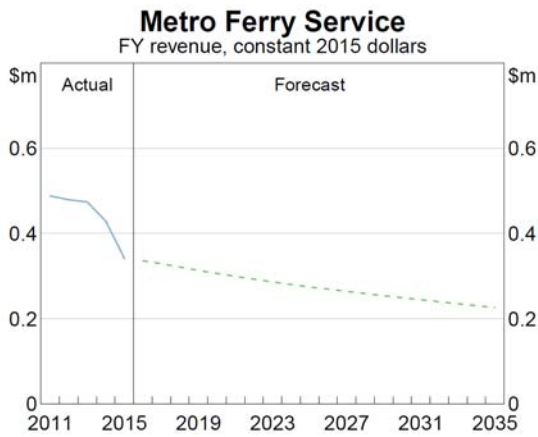


Figure 15

Revenue Summary

Figure 16

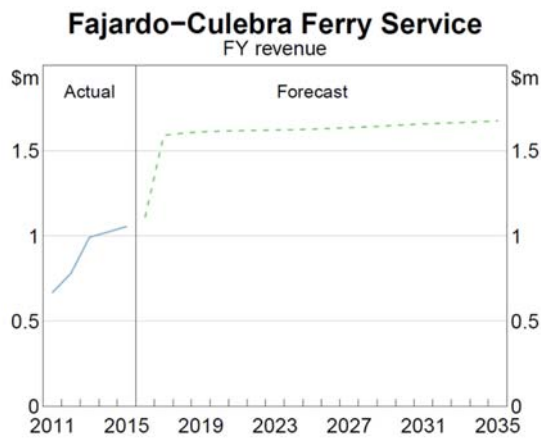


Figure 17

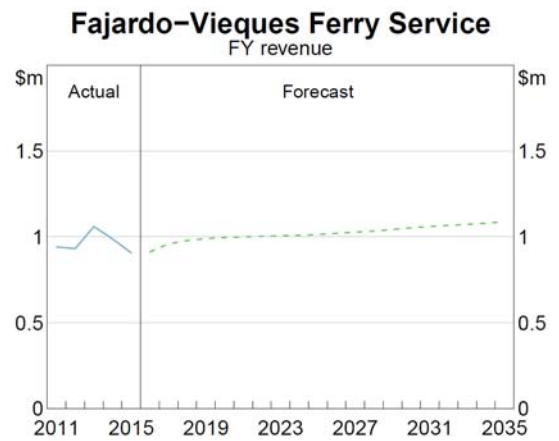


Figure 18

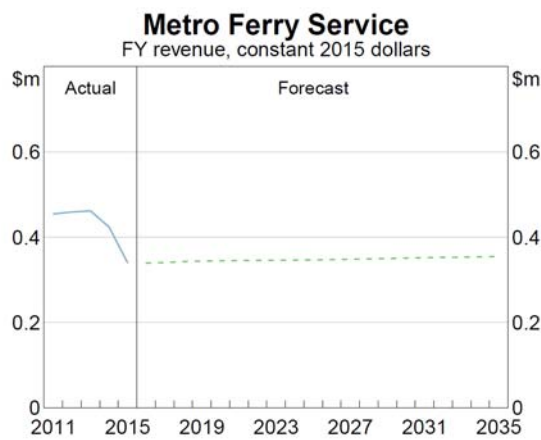


Figure 19

Maybe show nominal revenue too just to display that it does actually go up over time