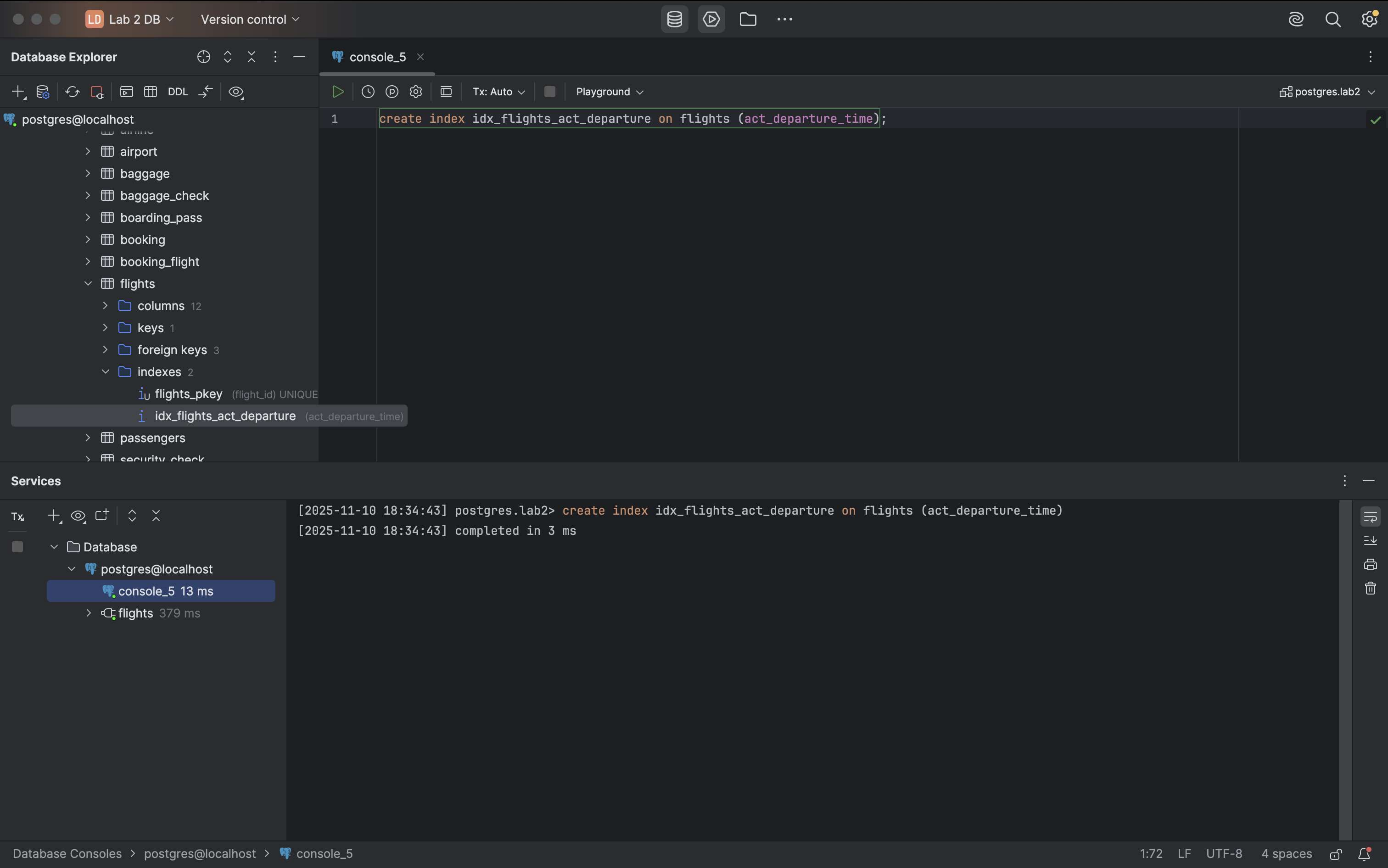
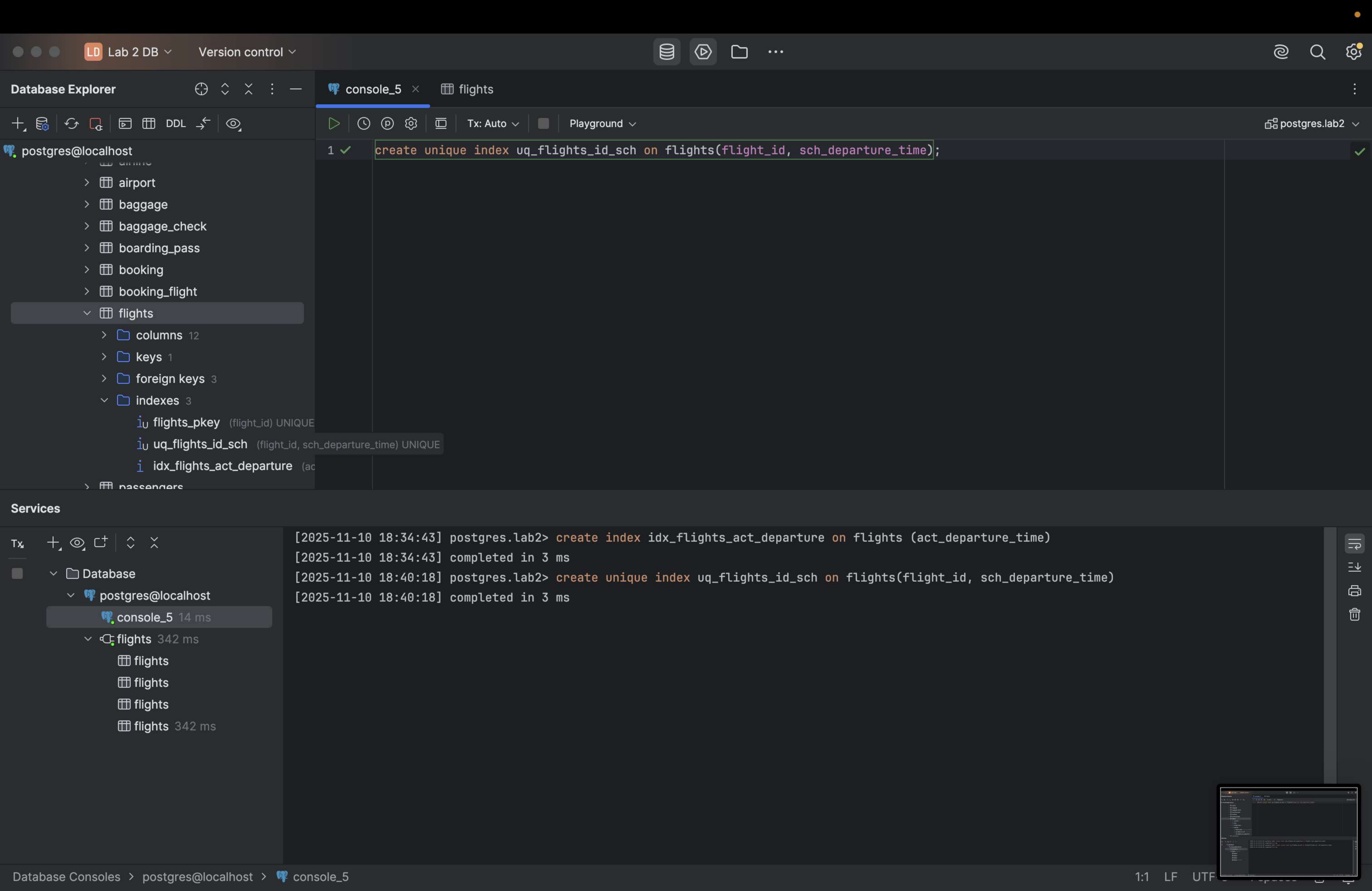


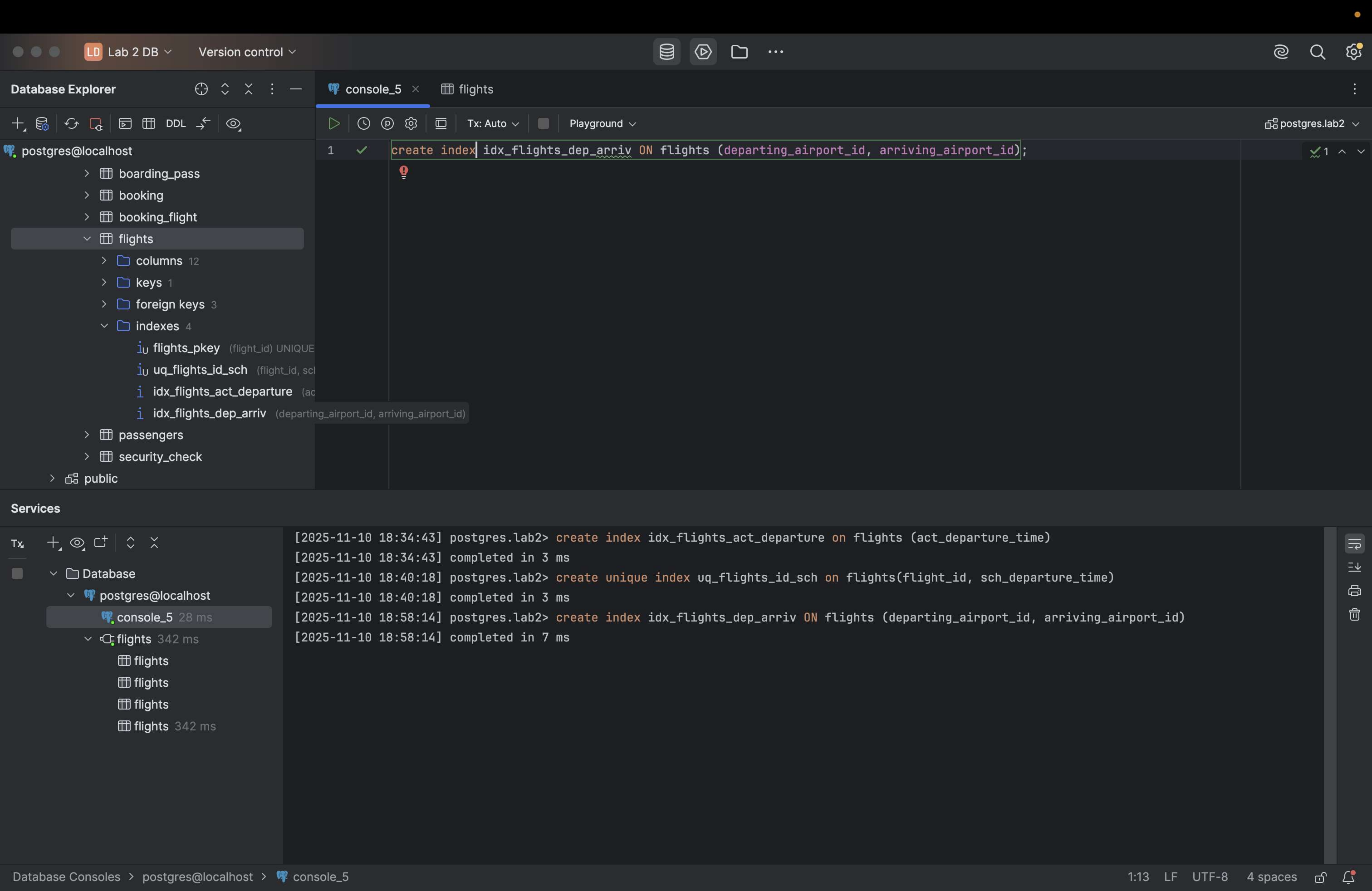
```
create index idx_flights_act_departure on flights (act_departure_time);
```

```
[2025-11-10 18:34:43] postgres.lab2> create index idx_flights_act_departure on flights (act_departure_time)
[2025-11-10 18:34:43] completed in 3 ms
```



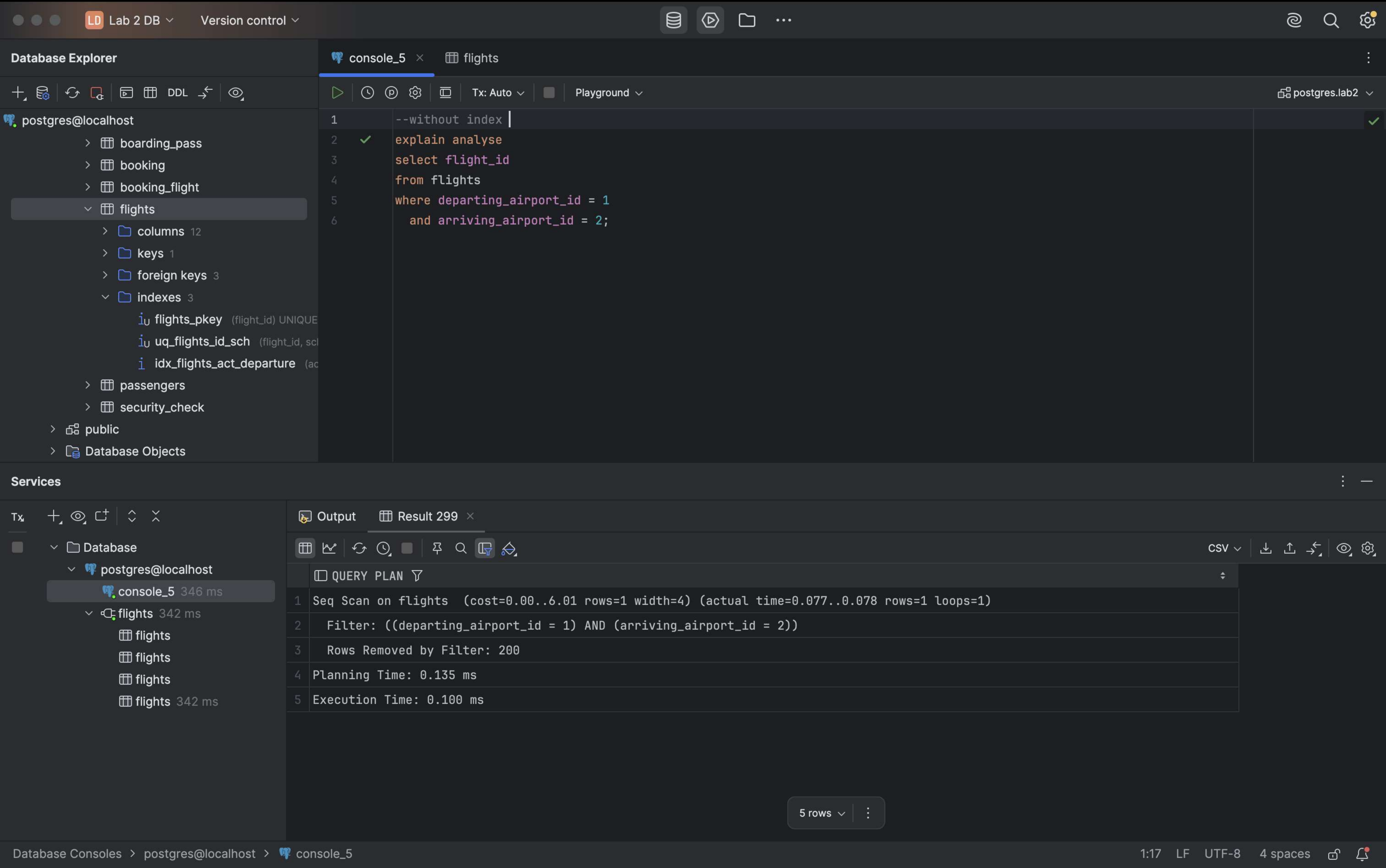
```sql
create unique index uq_flights_id_sch on flights(flight_id, sch_departure_time);
```

```
[2025-11-10 18:34:43] postgres.lab2> create index idx_flights_act_departure on flights (act_departure_time)
[2025-11-10 18:34:43] completed in 3 ms
[2025-11-10 18:40:18] postgres.lab2> create unique index uq_flights_id_sch on flights(flight_id, sch_departure_time)
[2025-11-10 18:40:18] completed in 3 ms
```



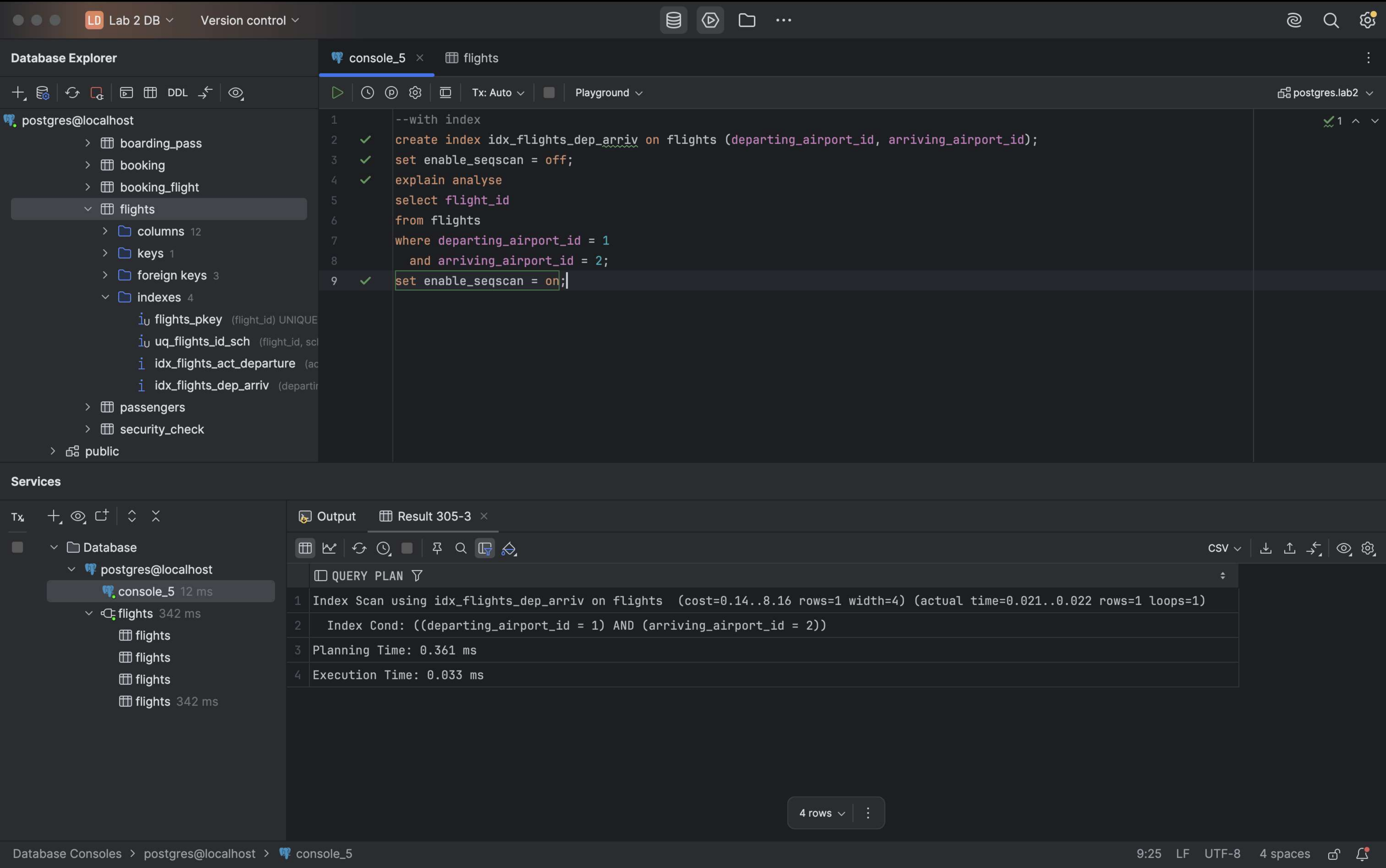
```sql
create index idx_flights_dep_arriv ON flights (departing_airport_id, arriving_airport_id);
```

```
[2025-11-10 18:34:43] postgres.lab2> create index idx_flights_act_departure on flights (act_departure_time)
[2025-11-10 18:34:43] completed in 3 ms
[2025-11-10 18:40:18] postgres.lab2> create unique index uq_flights_id_sch on flights(flight_id, sch_departure_time)
[2025-11-10 18:40:18] completed in 3 ms
[2025-11-10 18:58:14] postgres.lab2> create index idx_flights_dep_arriv ON flights (departing_airport_id, arriving_airport_id)
[2025-11-10 18:58:14] completed in 7 ms
```



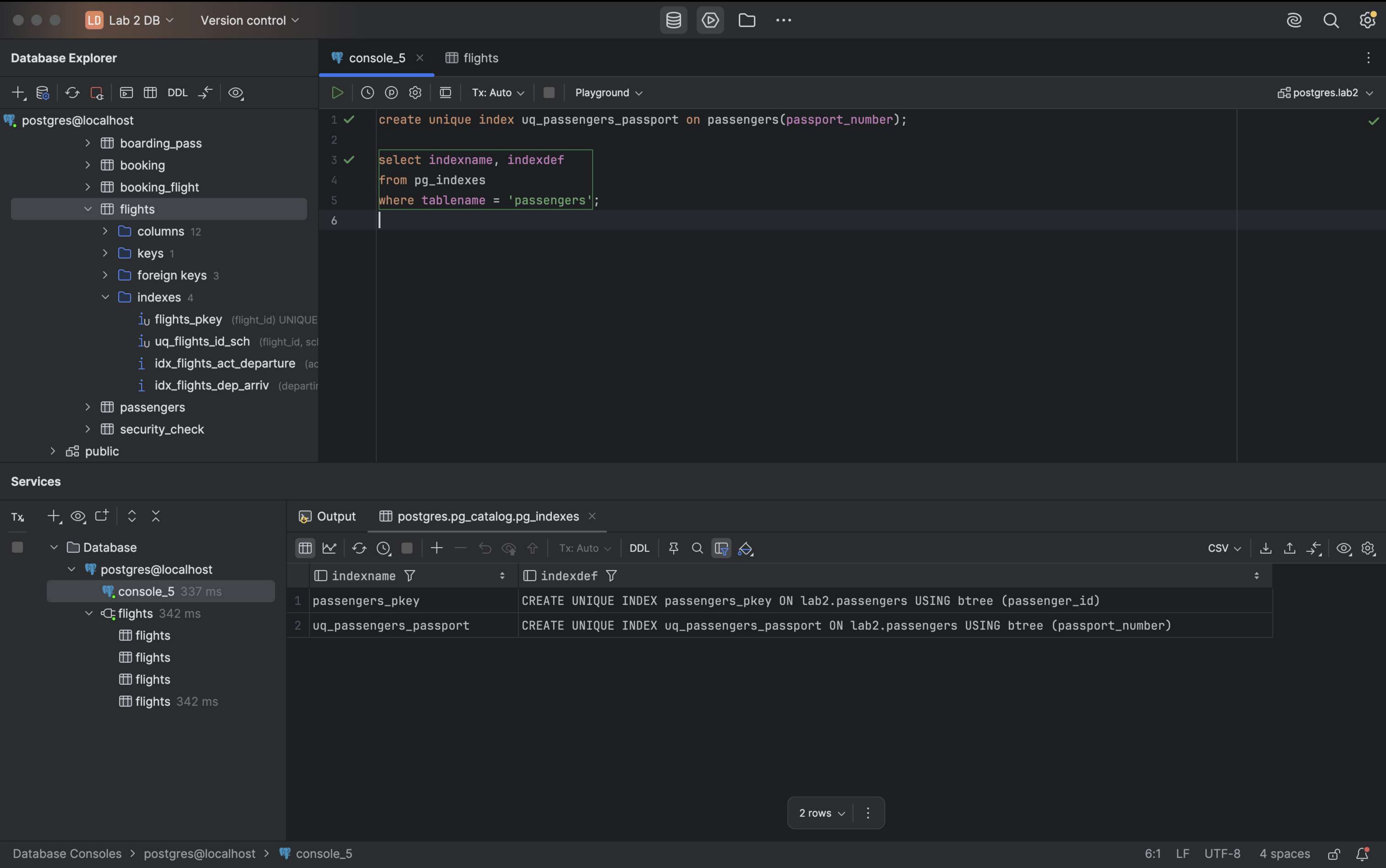
```sql
--without index 
explain analyse
select flight_id
from flights
where departing_airport_id = 1
  and arriving_airport_id = 2;
```

```
QUERY PLAN
Seq Scan on flights  (cost=0.00..6.01 rows=1 width=4) (actual time=0.077..0.078 rows=1 loops=1)
  Filter: ((departing_airport_id = 1) AND (arriving_airport_id = 2))
  Rows Removed by Filter: 200
Planning Time: 0.135 ms
Execution Time: 0.100 ms
```



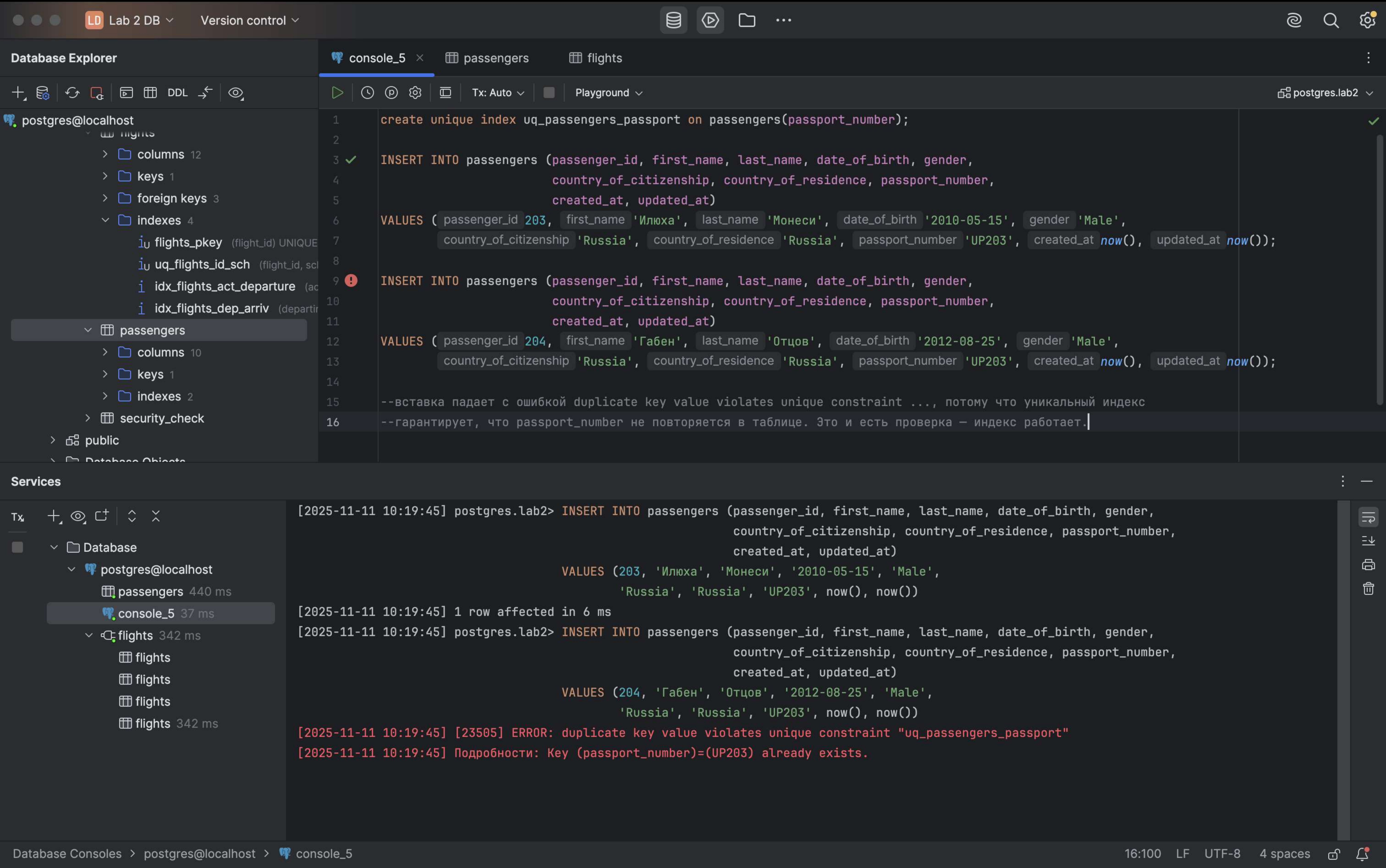
```
--with index
create index idx_flights_dep_arriv on flights (departing_airport_id, arriving_airport_id);
set enable_seqscan = off;
explain analyse
select flight_id
from flights
where departing_airport_id = 1
  and arriving_airport_id = 2;
set enable_seqscan = on;
```

```
QUERY PLAN
Index Scan using idx_flights_dep_arriv on flights  (cost=0.14..8.16 rows=1 width=4) (actual time=0.021..0.022 rows=1 loops=1)
  Index Cond: ((departing_airport_id = 1) AND (arriving_airport_id = 2))
Planning Time: 0.361 ms
Execution Time: 0.033 ms
```



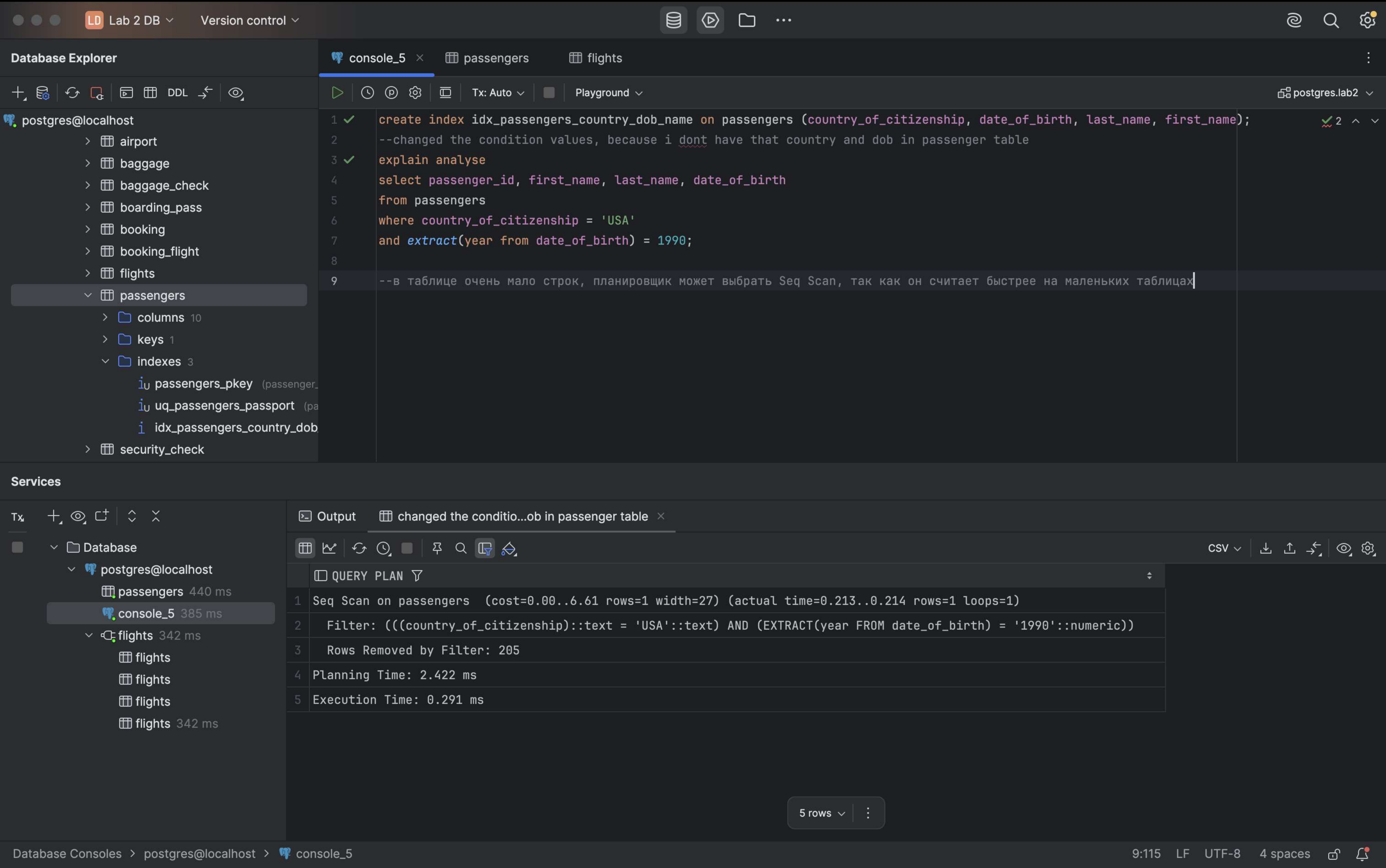
```sql
create unique index uq_passengers_passport on passengers(passport_number);

select indexname, indexdef
from pg_indexes
where tablename = 'passengers';

```

	indexname	indexdef
1	passengers_pkey	CREATE UNIQUE INDEX passengers_pkey ON lab2.passengers USING btree (passenger_id)
2	uq_passengers_passport	CREATE UNIQUE INDEX uq_passengers_passport ON lab2.passengers USING btree (passport_number)



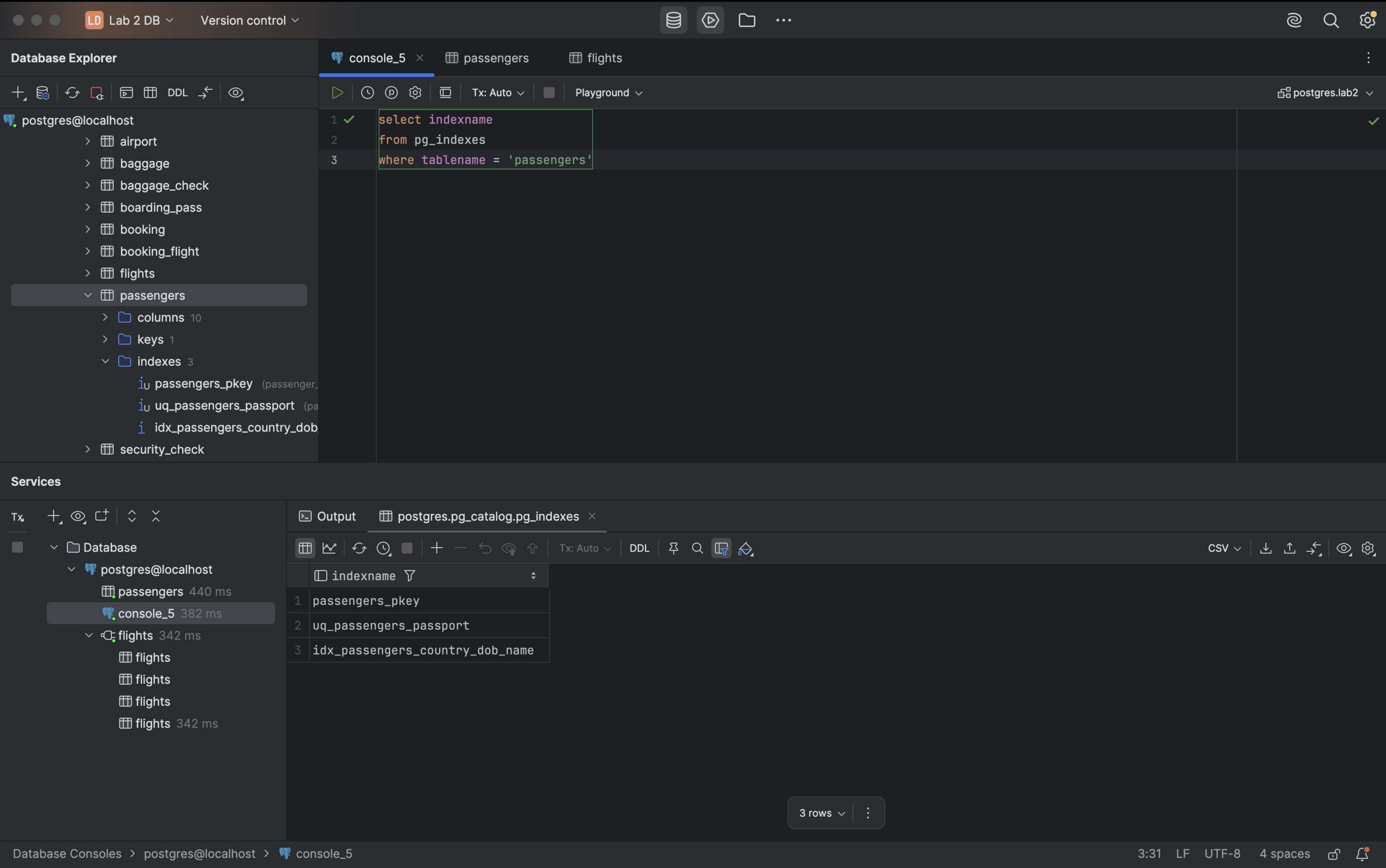
```
create unique index uq_passengers_passport on passengers(passport_number);

INSERT INTO passengers (passenger_id, first_name, last_name, date_of_birth, gender,
                        country_of_citizenship, country_of_residence, passport_number,
                        created_at, updated_at)
VALUES ( passenger_id 203,  first_name 'Илюха',  last_name 'Монеси',  date_of_birth '2010-05-15',  gender 'Male',
         country_of_citizenship 'Russia',  country_of_residence 'Russia',  passport_number 'UP203',  created_at now(),  updated_at now());

INSERT INTO passengers (passenger_id, first_name, last_name, date_of_birth, gender,
                        country_of_citizenship, country_of_residence, passport_number,
                        created_at, updated_at)
VALUES ( passenger_id 204,  first_name 'Габен',  last_name 'Отцов',  date_of_birth '2012-08-25',  gender 'Male',
         country_of_citizenship 'Russia',  country_of_residence 'Russia',  passport_number 'UP203',  created_at now(),  updated_at now());

--вставка падает с ошибкой duplicate key value violates unique constraint ..., потому что уникальный индекс
--гарантирует, что passport_number не повторяется в таблице. Это и есть проверка — индекс работает.
```

```
[2025-11-11 10:19:45] postgres.lab2> INSERT INTO passengers (passenger_id, first_name, last_name, date_of_birth, gender,
                                                    country_of_citizenship, country_of_residence, passport_number,
                                                    created_at, updated_at)
                                     VALUES (203, 'Илюха', 'Монеси', '2010-05-15', 'Male',
                                             'Russia', 'Russia', 'UP203', now(), now())
[2025-11-11 10:19:45] 1 row affected in 6 ms
[2025-11-11 10:19:45] postgres.lab2> INSERT INTO passengers (passenger_id, first_name, last_name, date_of_birth, gender,
                                                    country_of_citizenship, country_of_residence, passport_number,
                                                    created_at, updated_at)
                                     VALUES (204, 'Габен', 'Отцов', '2012-08-25', 'Male',
                                             'Russia', 'Russia', 'UP203', now(), now())
[2025-11-11 10:19:45] [23505] ERROR: duplicate key value violates unique constraint "uq_passengers_passport"
[2025-11-11 10:19:45] Подробности: Key (passport_number)=(UP203) already exists.
```



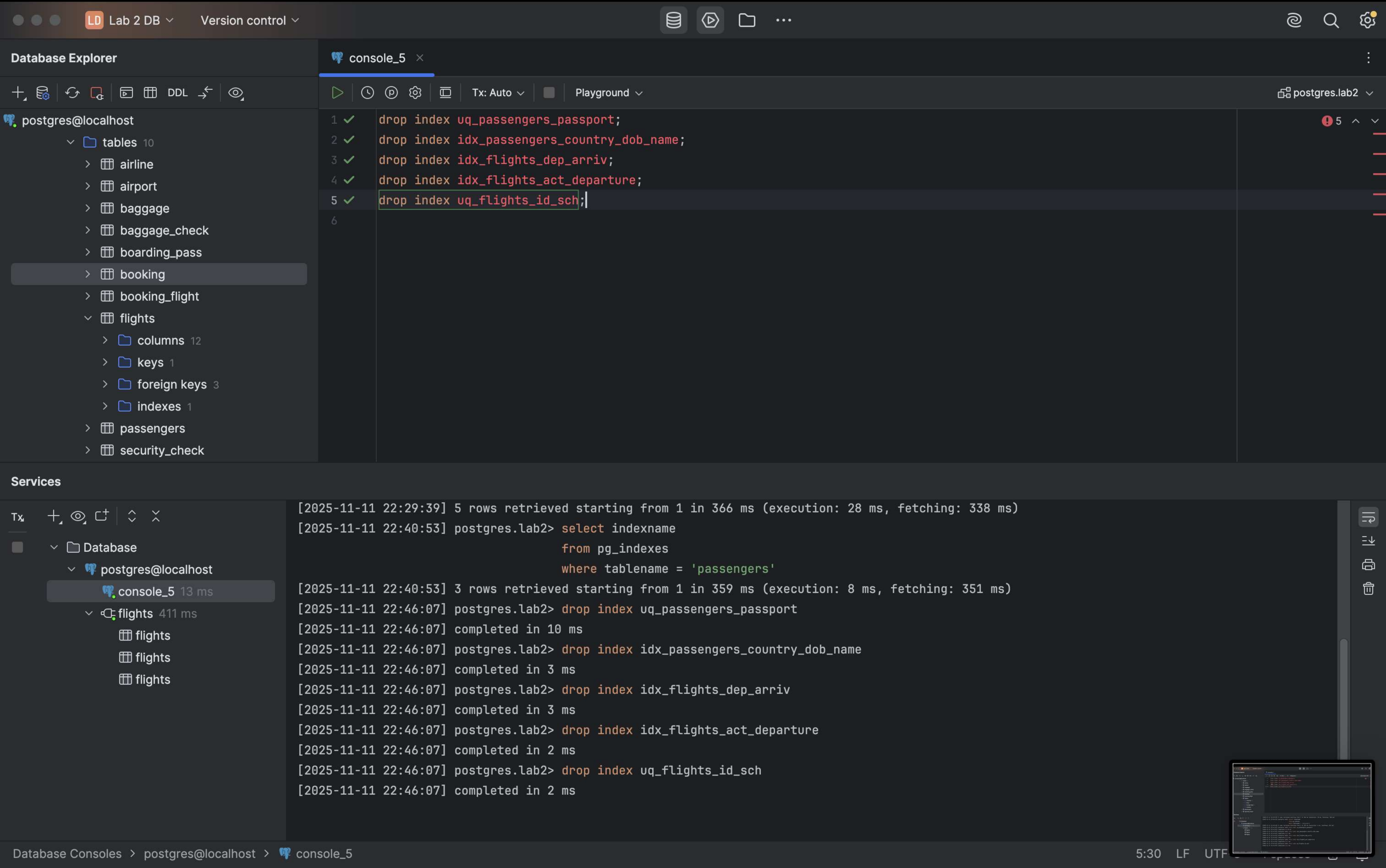
```sql
create index idx_passengers_country_dob_name on passengers (country_of_citizenship, date_of_birth, last_name, first_name);
--changed the condition values, because i dont have that country and dob in passenger table
explain analyse
select passenger_id, first_name, last_name, date_of_birth
from passengers
where country_of_citizenship = 'USA'
and extract(year from date_of_birth) = 1990;

--в таблице очень мало строк, планировщик может выбрать Seq Scan, так как он считает быстрее на маленьких таблицах
```

```
QUERY PLAN
Seq Scan on passengers  (cost=0.00..6.61 rows=1 width=27) (actual time=0.213..0.214 rows=1 loops=1)
  Filter: (((country_of_citizenship)::text = 'USA'::text) AND (EXTRACT(year FROM date_of_birth) = '1990'::numeric))
  Rows Removed by Filter: 205
Planning Time: 2.422 ms
Execution Time: 0.291 ms
```



```sql
select indexname
from pg_indexes
where tablename = 'passengers'
```

	indexname
1	passengers_pkey
2	uq_passengers_passport
3	idx_passengers_country_dob_name



```sql
drop index uq_passengers_passport;
drop index idx_passengers_country_dob_name;
drop index idx_flights_dep_arriv;
drop index idx_flights_act_departure;
drop index uq_flights_id_sch;
```

```
[2025-11-11 22:29:39] 5 rows retrieved starting from 1 in 366 ms (execution: 28 ms, fetching: 338 ms)
[2025-11-11 22:40:53] postgres.lab2> select indexname
                                     from pg_indexes
                                     where tablename = 'passengers'
[2025-11-11 22:40:53] 3 rows retrieved starting from 1 in 359 ms (execution: 8 ms, fetching: 351 ms)
[2025-11-11 22:46:07] postgres.lab2> drop index uq_passengers_passport
[2025-11-11 22:46:07] completed in 10 ms
[2025-11-11 22:46:07] postgres.lab2> drop index idx_passengers_country_dob_name
[2025-11-11 22:46:07] completed in 3 ms
[2025-11-11 22:46:07] postgres.lab2> drop index idx_flights_dep_arriv
[2025-11-11 22:46:07] completed in 3 ms
[2025-11-11 22:46:07] postgres.lab2> drop index idx_flights_act_departure
[2025-11-11 22:46:07] completed in 2 ms
[2025-11-11 22:46:07] postgres.lab2> drop index uq_flights_id_sch
[2025-11-11 22:46:07] completed in 2 ms
```