RELATIONAL ALGEBRA: EXAMPLES

CS 564- Spring 2025

EXAMPLE DB: SAILORS

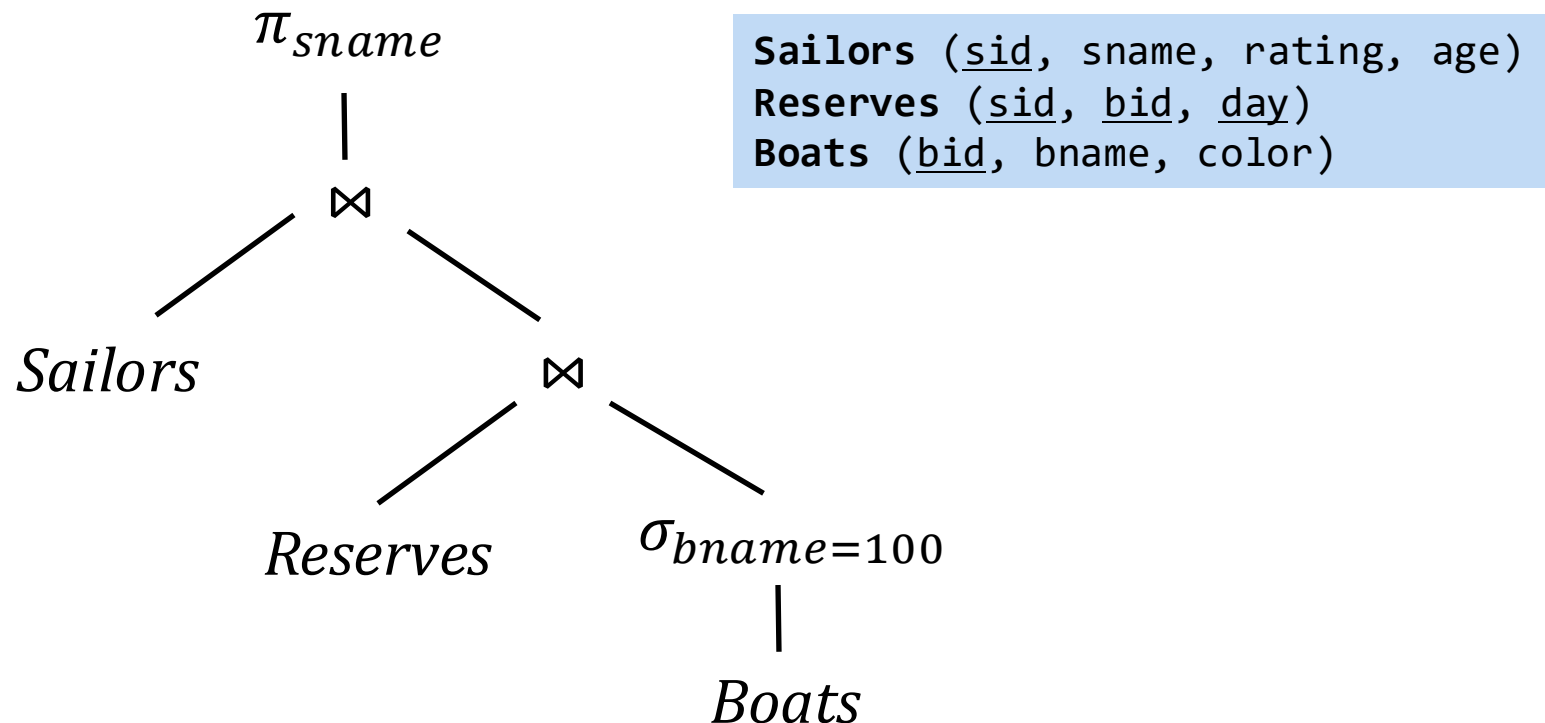**Sailors** (<u>sid</u>, sname, rating, age)

Reserves (<u>sid</u>, <u>bid</u>, <u>day</u>)

Boats (<u>bid</u>, bname, color)

EXAMPLE DB: SAILORS

***Q1**: What are the names of the sailors who have reserved boat with name "100" ?*

π_{sname}

Sailors (<u>sid</u>, sname, rating, age)
Reserves (<u>sid</u>, <u>bid</u>, <u>day</u>)
Boats (<u>bid</u>, bname, color)

$\bowtie$

Sailors

$\bowtie$

Reserves

$\sigma_{bname=100}$

Boats

EXAMPLE DB: SAILORS

Q2: *What are the names of the sailors who have reserved a red boat ?*

π_{sname}

Sailors (<u>sid</u>, sname, rating, age)
Reserves (<u>sid</u>, <u>bid</u>, <u>day</u>)
Boats (<u>bid</u>, bname, color)

$\bowtie$

Sailors

$\bowtie$

Reserves

$\sigma_{color=red}$

Boats
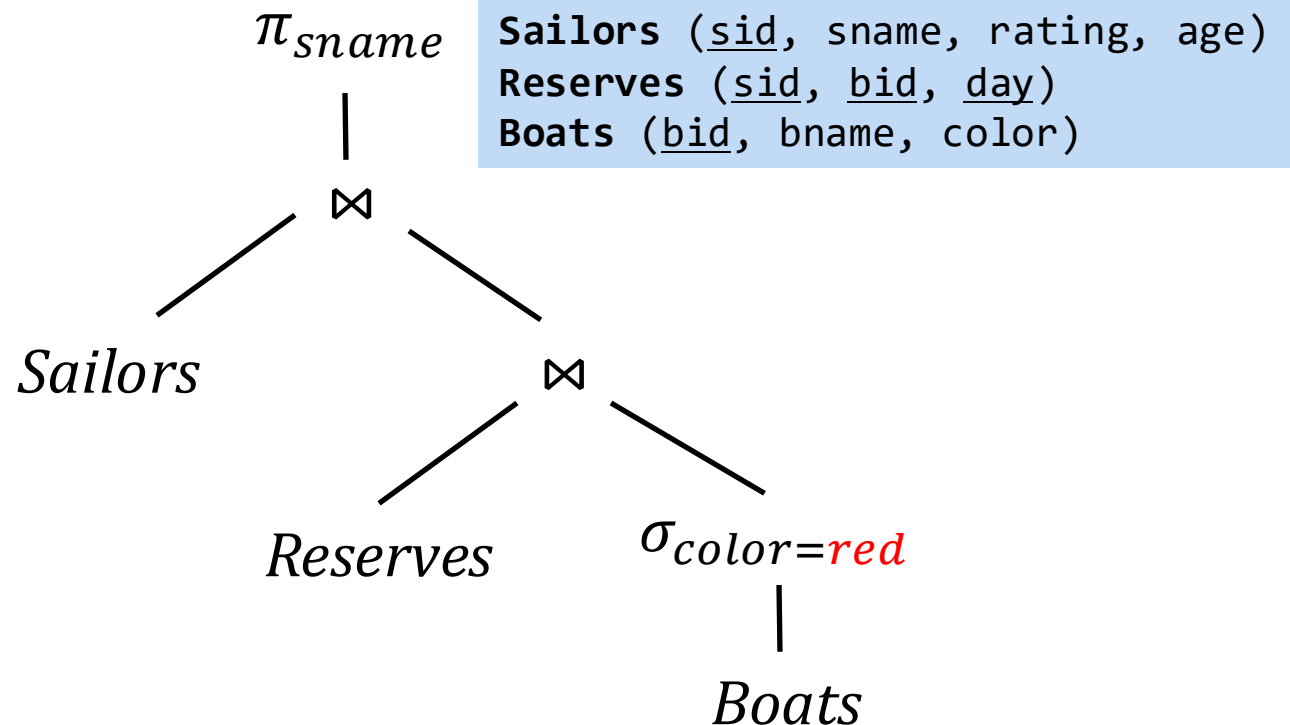
EXAMPLE DB: SAILORS

Q3: *What are the names of the sailors who have reserved a green **or** red boat ?*

π_{sname}

|

$\bowtie$

Sailors

$\bowtie$

Reserves

$\sigma_{color=red \lor color=green}$

|

Boats

Sailors (<u>sid</u>, sname, rating, age)
Reserves (<u>sid</u>, <u>bid</u>, <u>day</u>)
Boats (<u>bid</u>, bname, color)
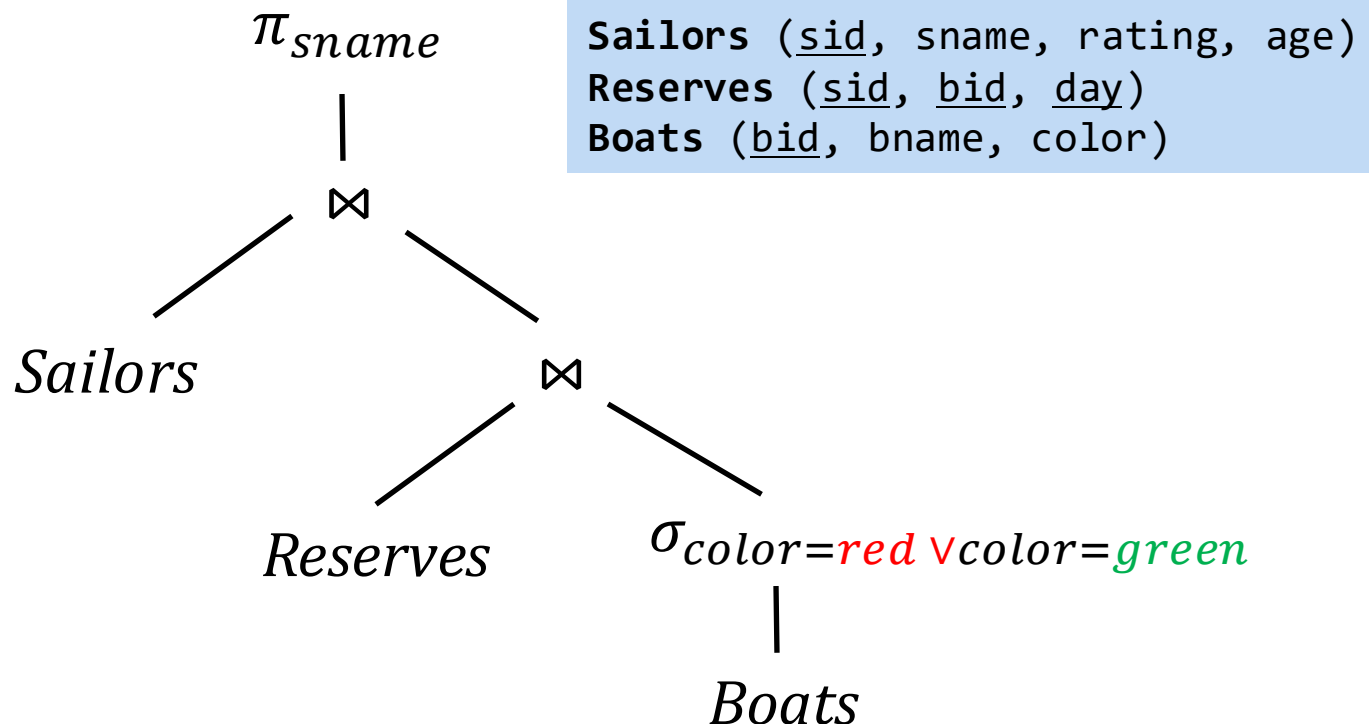
EXAMPLE DB: SAILORS

Q4: *What are the names of the sailors who have reserved a green **and** red boat ?*

$$\pi_{sname}$$

$$\cap$$

$$\pi_{sid,sname} \qquad \pi_{sid,sname}$$

$$\bowtie \qquad \bowtie$$

Sailors $\qquad \bowtie \qquad$ Sailors $\qquad \bowtie$

Reserves $\qquad \sigma_{color=green} \qquad$ Reserves $\qquad \sigma_{color=red}$

Boats $\qquad\qquad\qquad$ Boats
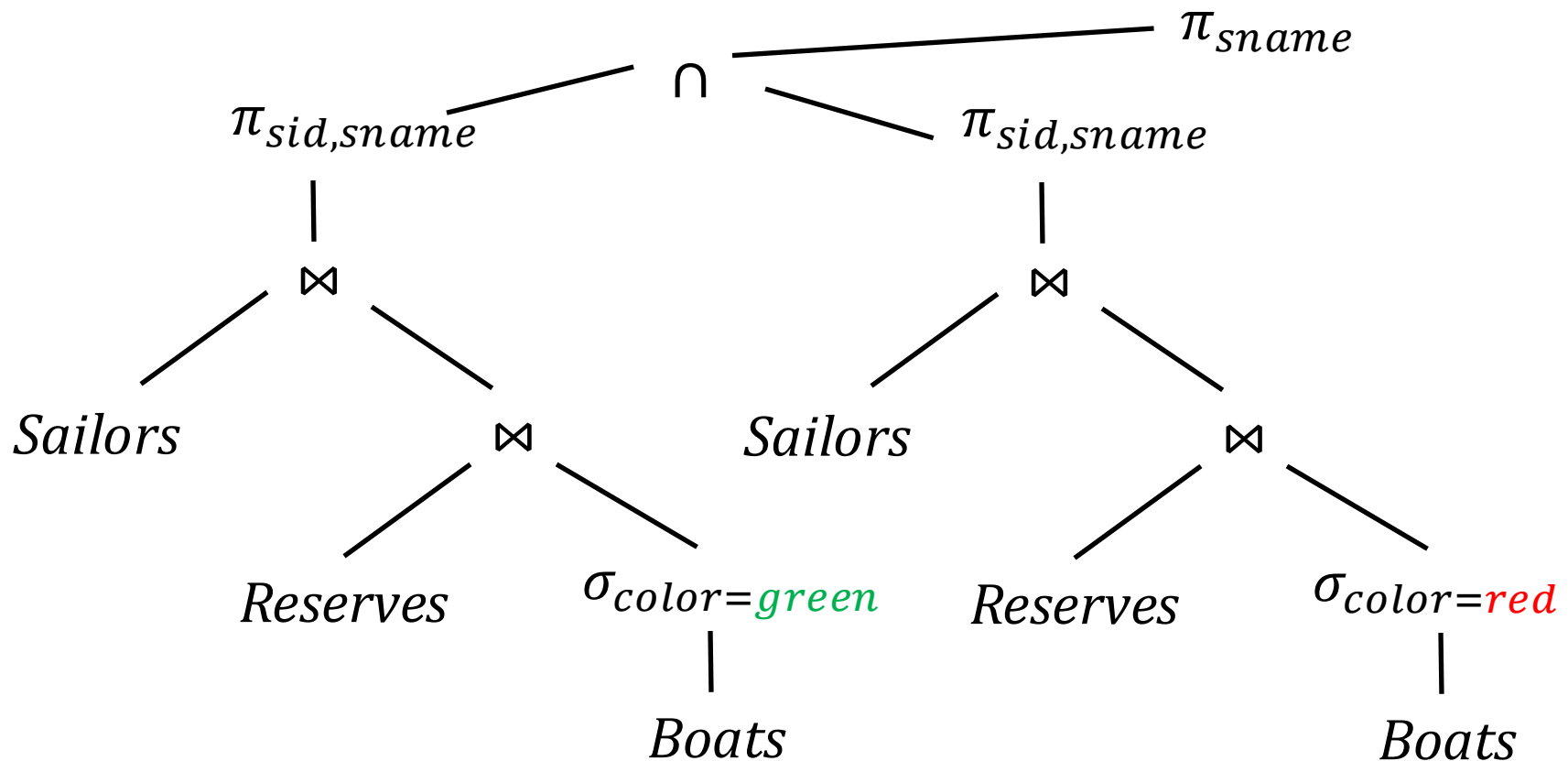
EXAMPLE DB: SAILORS

Q5: *Find the names of the sailors who have reserved all boats with name "470".*

π_{sname}

$\bowtie$

Sailors

$\pi_{sid,bid}$

$/$

π_{bid}

Reserves

$\sigma_{name=470}$

Boats

Sailors (<u>sid</u>, sname, rating, age)
Reserves (<u>sid</u>, <u>bid</u>, <u>day</u>)
Boats (<u>bid</u>, bname, color)
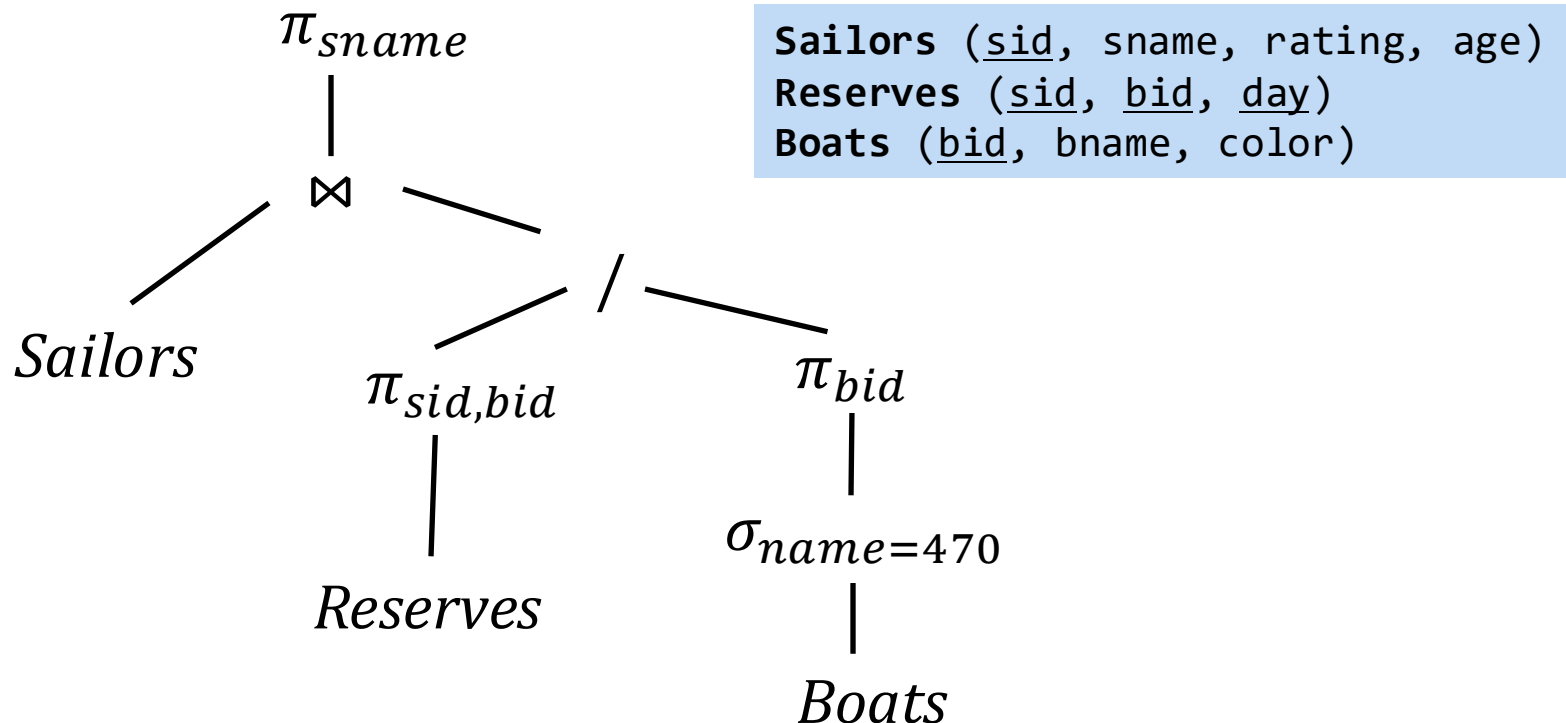
EXAMPLE DB: PRODUCTS

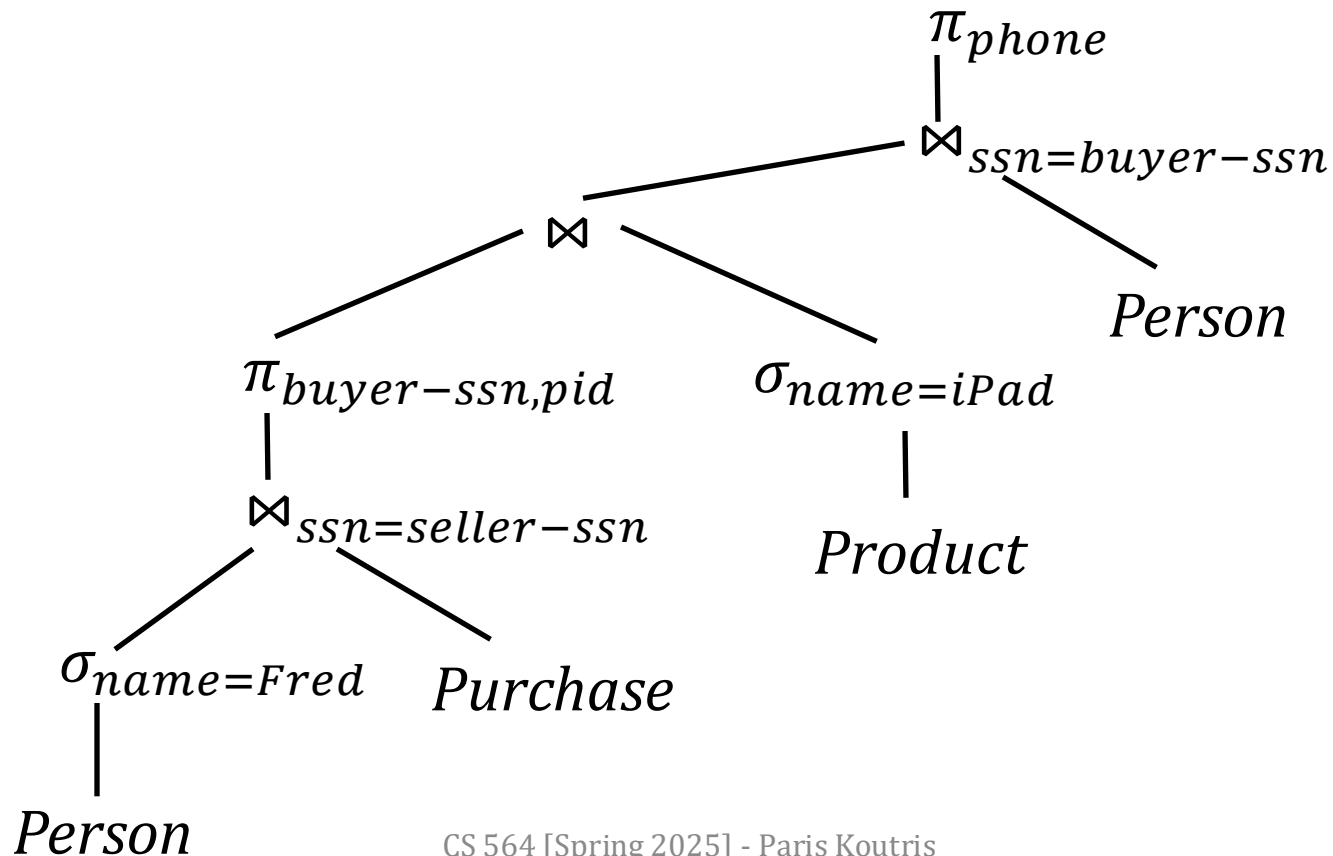**Product** (<u>pid</u>,name,price,category,maker-cid)

Purchase (buyer-ssn, seller-ssn, store, pid)

Company (<u>cid</u>, name, country)

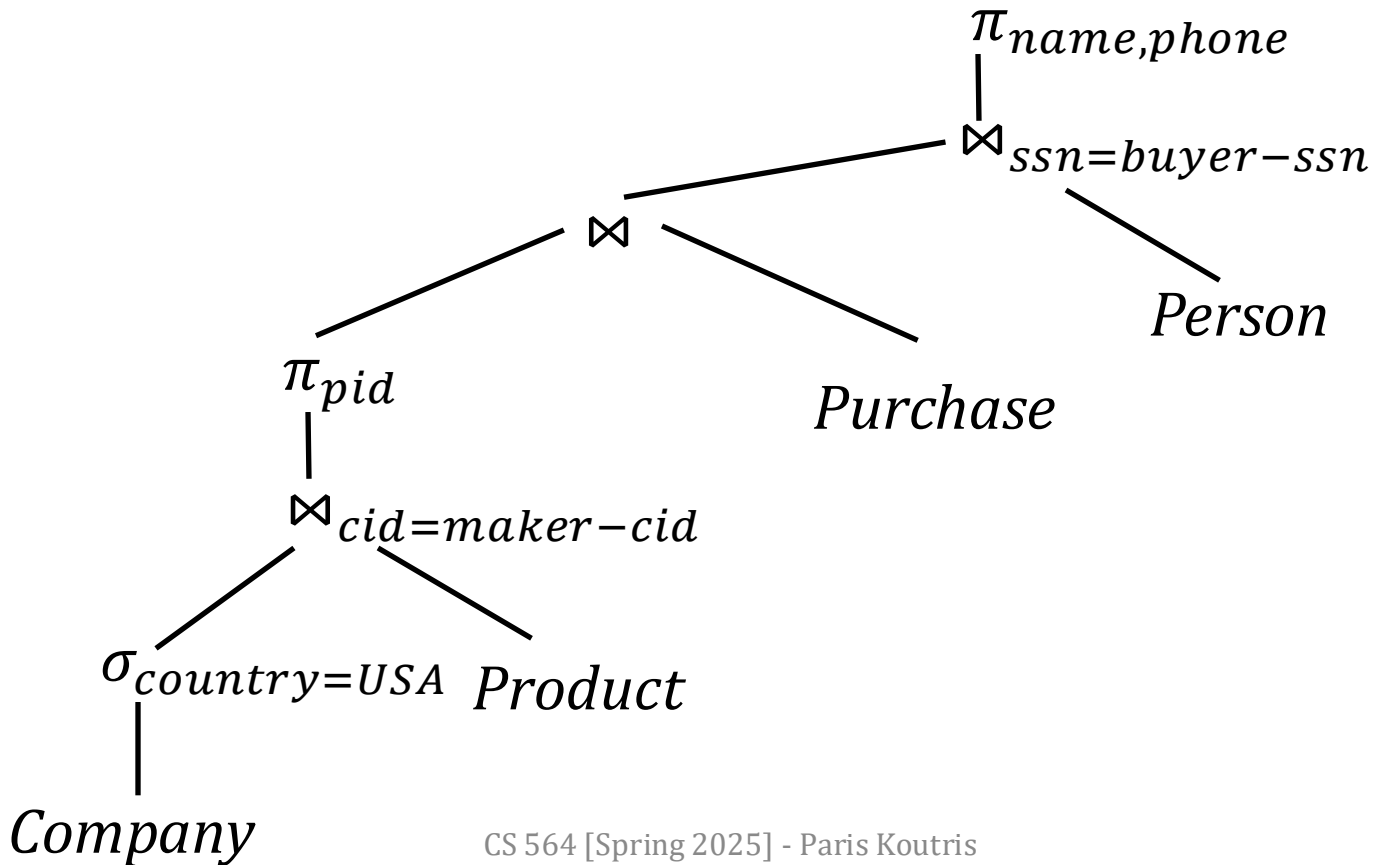**Person** (<u>ssn</u>,name, phone, city)

EXAMPLE DB: PRODUCTS

Q6: *Find the phone numbers of the people who have bought iPads from Fred (the salesman).*

$$\pi_{phone}$$

$$\bowtie_{ssn=buyer-ssn}$$

$$\bowtie$$

$$\pi_{buyer-ssn,pid}$$

$$\sigma_{name=iPad}$$

Person

$$\bowtie_{ssn=seller-ssn}$$

Product

$$\sigma_{name=Fred}$$

Purchase

Person

EXAMPLE DB: PRODUCTS

Q7: *Find the names and phone numbers of the people who have bought products from the USA.*

$$\pi_{name,phone}$$

$$\bowtie_{ssn=buyer-ssn}$$

$$\bowtie$$

Person

$$\pi_{pid}$$

Purchase

$$\bowtie_{cid=maker-cid}$$

$$\sigma_{country=USA}$$ Product

Company

EXAMPLE DB: PRODUCTS

Q8: *Find the names of the people who have bought products **only** from the USA.*

π_{name}

$\bowtie_{ssn=buyer-ssn}$

$-$

$\pi_{buyer-ssn}$

Person

$\pi_{buyer-ssn}$

$\bowtie$

Purchase *Purchase*

$\bowtie_{cid=maker-cid}$

$\sigma_{country<>USA}$

Product

Company
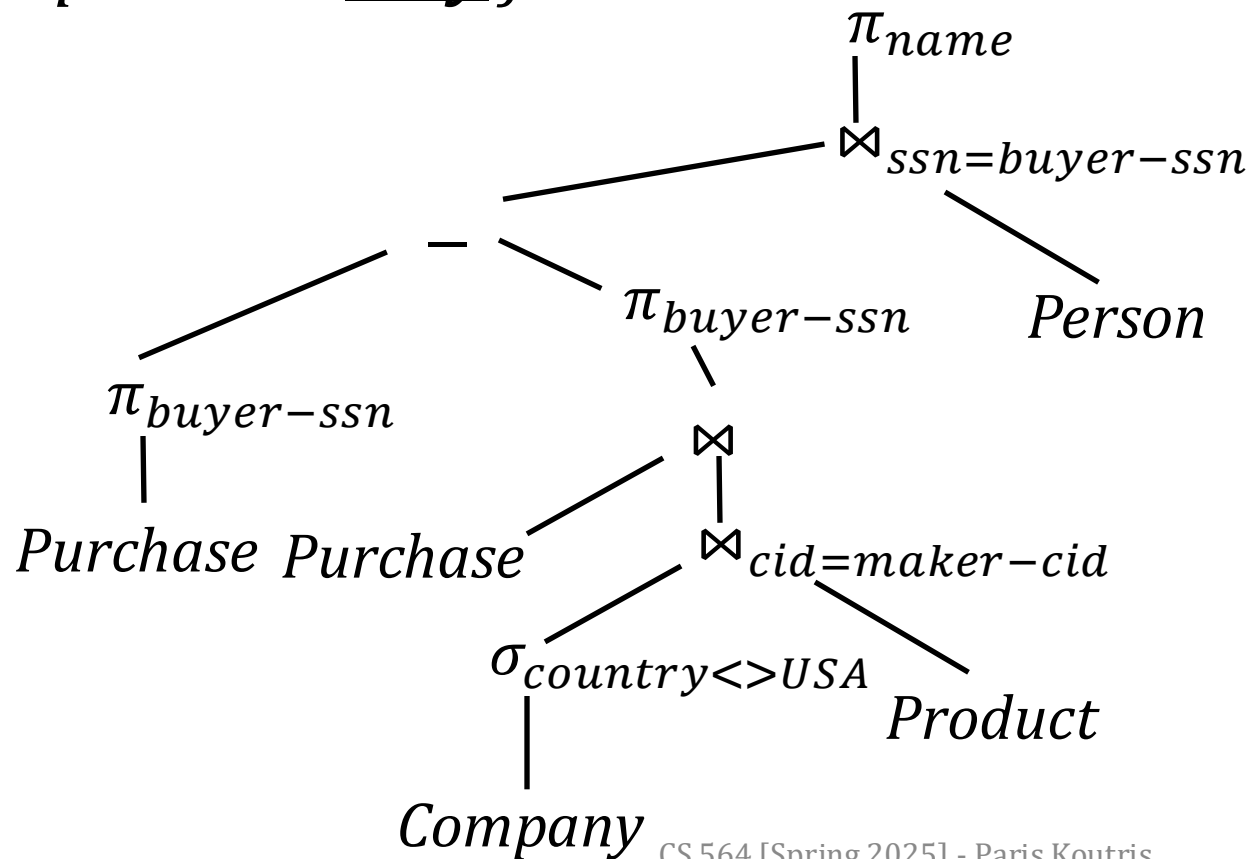
EXAMPLE DB: PRODUCTS

Q9: *Find the names of the people who have bought products from the USA but not from Greece.*

π_{name}

$\bowtie_{ssn=buyer-ssn}$

$\pi_{buyer-ssn}$ — $\pi_{buyer-ssn}$

Person

π_{pid} $\bowtie$ Purchase

π_{pid} $\bowtie$ Purchase

$\bowtie_{cid=maker-cid}$

$\bowtie_{cid=maker-cid}$

$\sigma_{country=USA}$ Product

$\sigma_{country=Greece}$ Product

Company

Company
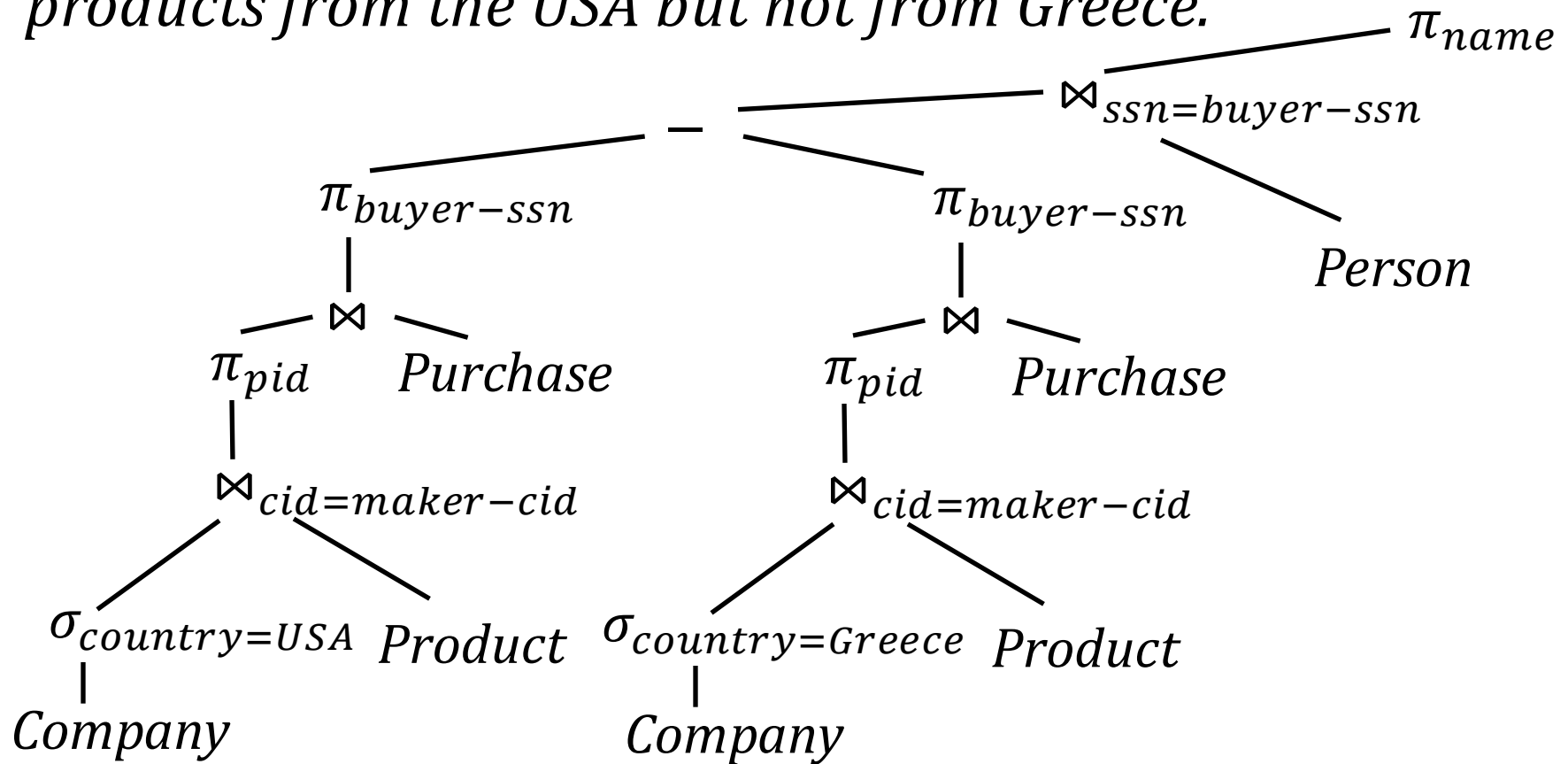
EXAMPLE DB: PRODUCTS

***Q10**: Find the names of the people who have bought products from the USA and live in Madison.*

$$\pi_{name}$$

$$\bowtie_{ssn=buyer-ssn}$$

$$\pi_{buyer-ssn}$$

$$\bowtie$$

$$\pi_{pid} \qquad Purchase$$

$$\sigma_{city=Madison}$$

$$\bowtie_{cid=maker-cid}$$

$$Person$$

$$\sigma_{country=USA} \quad Product$$

$$Company$$
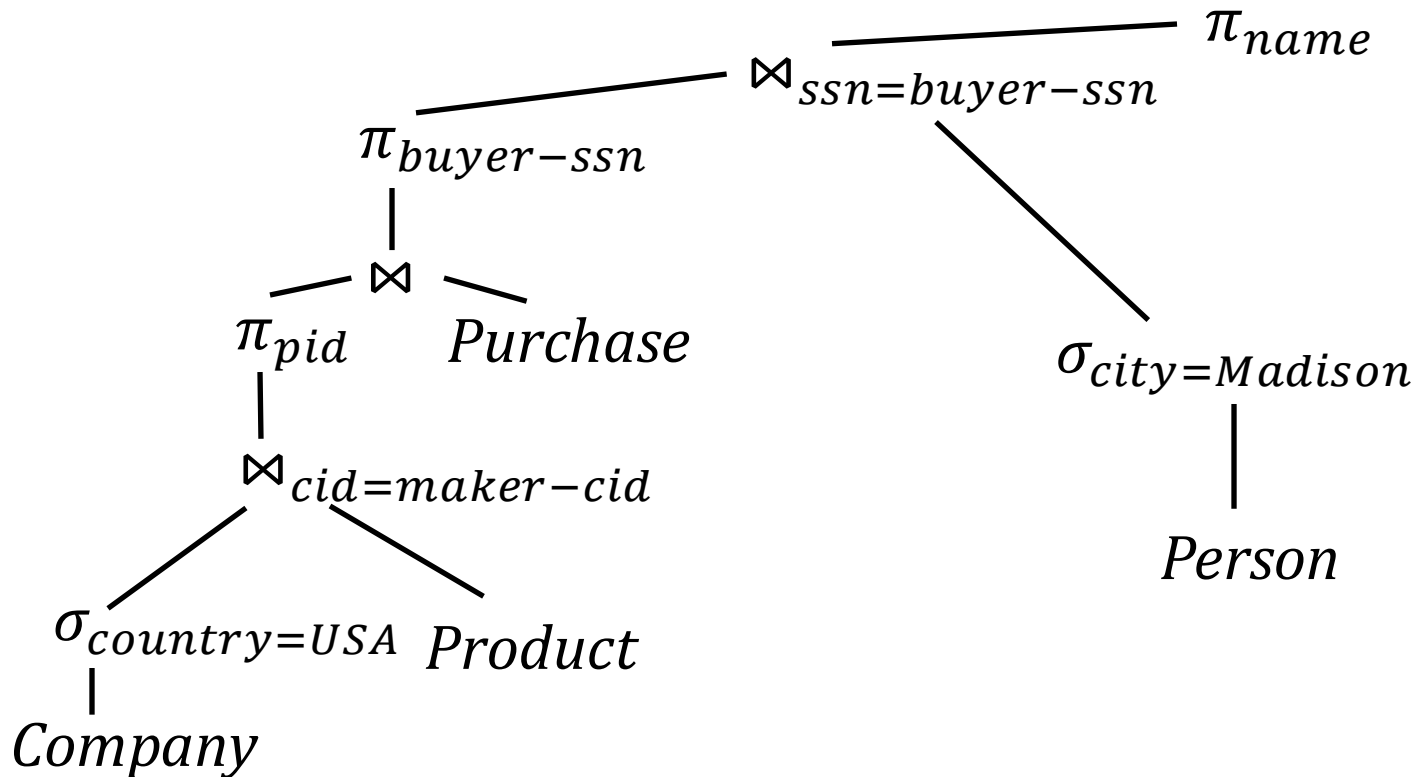
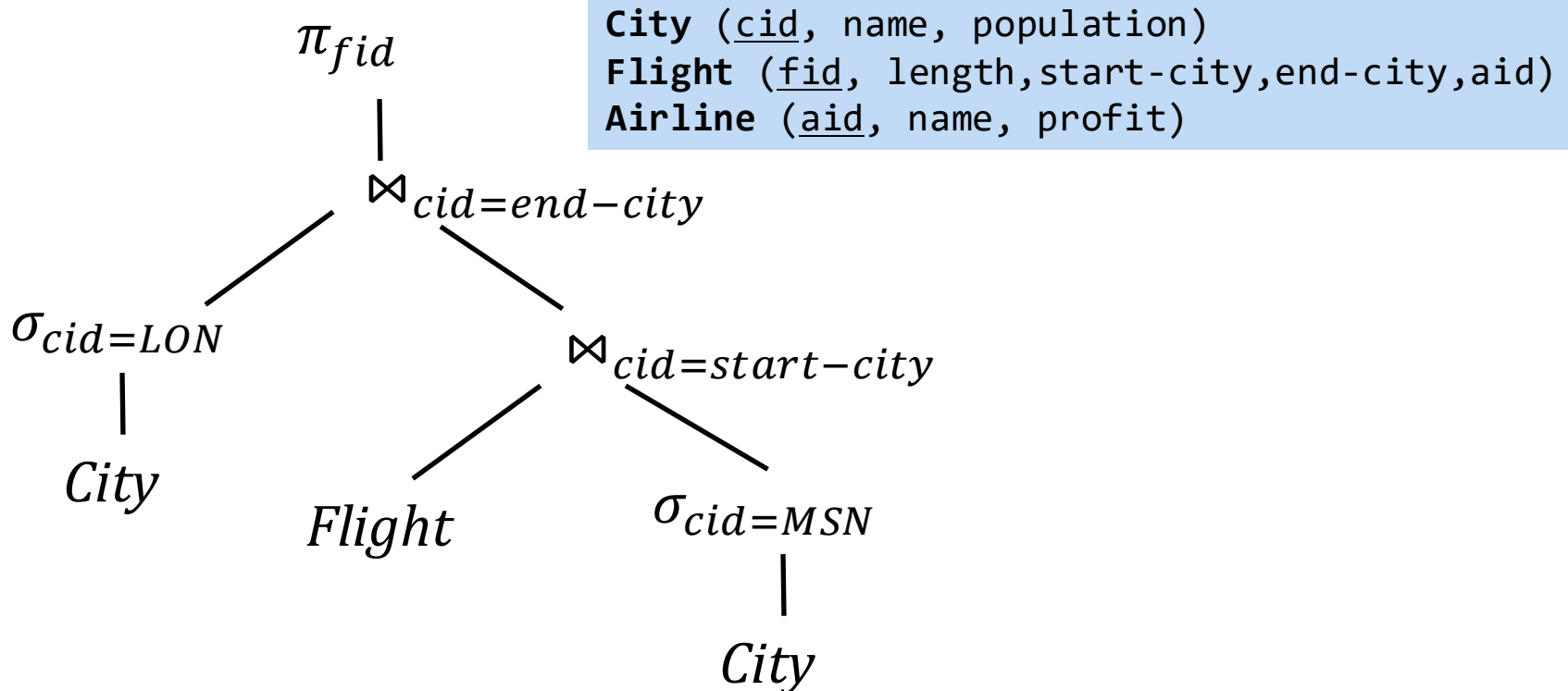# EXAMPLE DB: FLIGHTS

City (<u>cid</u>, name, population)

Flight (<u>fid</u>, length,start-city,end-city,aid)

Airline (<u>aid</u>, name, profit)

EXAMPLE DB: FLIGHTS

Q11: *Find the flight ids for flights that start in a city with id "MSN" and end in a city with id "LON".*

City (<u>cid</u>, name, population)
Flight (<u>fid</u>, length,start-city,end-city,aid)
Airline (<u>aid</u>, name, profit)

$$\pi_{fid}$$
$$\Join_{cid=end-city}$$
$$\sigma_{cid=LON}$$
$$\Join_{cid=start-city}$$
$$City$$
$$Flight$$
$$\sigma_{cid=MSN}$$
$$City$$

EXAMPLE DB: FLIGHTS

Q12: *Find the names of the cities that have a flight for* **_every_** *airline with profit more than 0.*

City (<u>cid</u>, name, population)
Flight (<u>fid</u>, length,start-city,end-city,aid)
Airline (<u>aid</u>, name, profit)

π_{name}

$\bowtie_{cid=start-city}$

$City$

$/$

$\pi_{start-city,aid}$

π_{aid}

$Flight$

$\sigma_{profit>0}$

$Airline$