*Results are included in the Results PDF file for compact code viewing
*Problem 1a
*(p_j-MC_j)/p_j
*pi_j = p_j*q_j-C_j(q_j) --> pi_j is profit of j
* first order condition:
*q_j + p_j*d(q_j)/d(p_j) - MC_j(d(q_j)/d(p_j)) where d() is partial derivation
*(p_j - MC_j) = -q_j/(d(q_j)/d(p_j))
*
* therefore
* (p_j - MC_j)/p_j = -q_j/(p_j(d(q_j)/d(p_j)))
*
* from notes: (d(q_j)/d(p_j)) = q_j(1-s_j)*-alpha/p_j
* therefore:
* (p_j - MC_j)/p_j = -q_j/(p_j(q_j(1-s_j)*-alpha/p_j)) = 1/(alpha*(1-s_j))

*Problem 1b
*reusing hw1 solutions~~~~~~~~~~~~~~~~~~~~~~~~~~~~
* import data
import delimited using ${ECO324PS}verboven_cars.csv, case(preserve) clear

sort ma ye

* construct market share s_jmt
gen mktsize = pop/4
gen mktsh = qu/mktsize

* construct outside good's market share s_0mt
egen sum_share = sum(mktsh), by(ma ye)
gen sh0 = 1-sum_share

* generate log odd ratio
gen lnsj_lns0 = log(mktsh) - log(sh0)

gen lnp = log(eurpr)
gen lnq = log(qu)
gen lnpop = log(pop)
gen lngdp = log(ngdp)
gen price = eurpr/1000

* generate country dummies
tab ma, gen(country_dum_)
gen dum_Bel_lnp = country_dum_1 * lnp
gen dum_Fra_lnp = country_dum_2 * lnp
gen dum_Ger_lnp = country_dum_3 * lnp

```
gen dum_Ita_lnp = country_dum_4 * lnp
gen dum_UK_lnp = country_dum_5 * lnp


*
===========================================================================
======
* Q1: Logit with FE
*
===========================================================================
======
* We can use "reghdfe" when the number of fixed effects is very large
reghdfe lnsj_lns0 lnp dum_Bel_lnp dum_Fra_lnp dum_Ita_lnp dum_UK_lnp hp li wi ///
 cy le he lnpop lngdp, vce(robust) a(ma ye brd)

* Alternative, we can just use "reg" along with country, year, brand FEs
egen country = group(ma)
egen year = group(ye)
egen brand_id = group(brd)
reg lnsj_lns0 lnp dum_Bel_lnp dum_Fra_lnp dum_Ita_lnp dum_UK_lnp hp li wi cy ///
 le he lnpop lngdp i.country i.year i.brand_id, vce(robust)


*
===========================================================================
======
* Q2: Test
*
===========================================================================
======
test dum_Bel_lnp = dum_Fra_lnp =dum_Ita_lnp = dum_UK_lnp = 0


*
===========================================================================
======
* Q3:Elasticities at the mean values of prices and market shares for each country
*
===========================================================================
======
gen price_dumBel = price * (country_dum_1==1)
gen price_dumFra = price * (country_dum_2==1)
gen price_dumGer = price * (country_dum_3==1)
gen price_dumIta = price * (country_dum_4==1)
gen price_dumUK  = price * (country_dum_5==1)
```

```stata
reghdfe lnsj_lns0 price_dumGer price_dumBel price_dumFra price_dumIta price_dumUK hp li
wi cy le he lnpop lngdp, vce(robust) a(ma ye brd)
gen elasticity = (1-mktsh)*price*(price_dumBel*_b[price_dumBel] +
price_dumFra*_b[price_dumFra] + price_dumGer*_b[price_dumGer] +
price_dumIta*_b[price_dumIta] + price_dumUK*_b[price_dumUK])
bysort ma: sum elasticity, detail

*hw1 end~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
* alpha*(1-s_j) is also elasticity and lerner is positive so take the absolute value of elasticity
*gen lerner = 1/abs(elasticity)
*Problem 1c
gen lerner = 1/abs(elasticity)
tab ma, sum(lerner)
*all the lerner values are very high which implies low elasticities

*Problem 1d
egen totalSales = sum(qu), by(frm)

tab frm
*top 5 frequencies:
*Fiat:1,691
*Ford:646
*Peugeot:1,370
*Renault:890
*VW:1,280
*tab frm, sum(lerner)
*The variation in lerner indices are resulting from their high market shares and low elasticities,
especially Germany (with 14.389 for lerner index due to low elasticity).

*Problem 2a
*(p_j - MC_j)/p_j =  1/(alpha*(1-s_j))
*therefore:
* MC_j = p_j - p_j/(elasticity)
*Marginal_Cost = ln(eurpr)
* (eurpr) --> p_j
gen marginalCost = (eurpr) - eurpr/(elasticity)
*tab marginalCost
*large table

*Problem 2b
reghdfe marginalCost hp li wi cy le he, vce(robust) a(ma ye brd)
*reused from hw1
```

*The most influential predictor is hp, since it has relatively low standard error and the highest coefficient value. It means that when hp increases by 1 unit, eurpr increases by 176.1292.
*"li" has a higher mean value (coefficient) but 0 is in the confidence interval which implies there is a possibility that it has no effect, and same with the rest of the predictors.