An analysis of meat demand in Argentina using household survey data

ID: 1188

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Outline

- Motivation

- Objective

- Data

- Methodology

- Results

- Conclusion

Motivation

- Argentina has one of the highest levels of meat consumption in the world (similar to the USA and Brazil).

- Meat consumption represents an average of 100 kg per capita per year.

- This level has remained stable in the last 50 years.

- Its composition has changed:
    - Poultry consumption has increased steadily
    - Pork consumption has been stable
    - Beef consumption has fallen steadily (a decrease of 0.7% per year on average).

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Motivation

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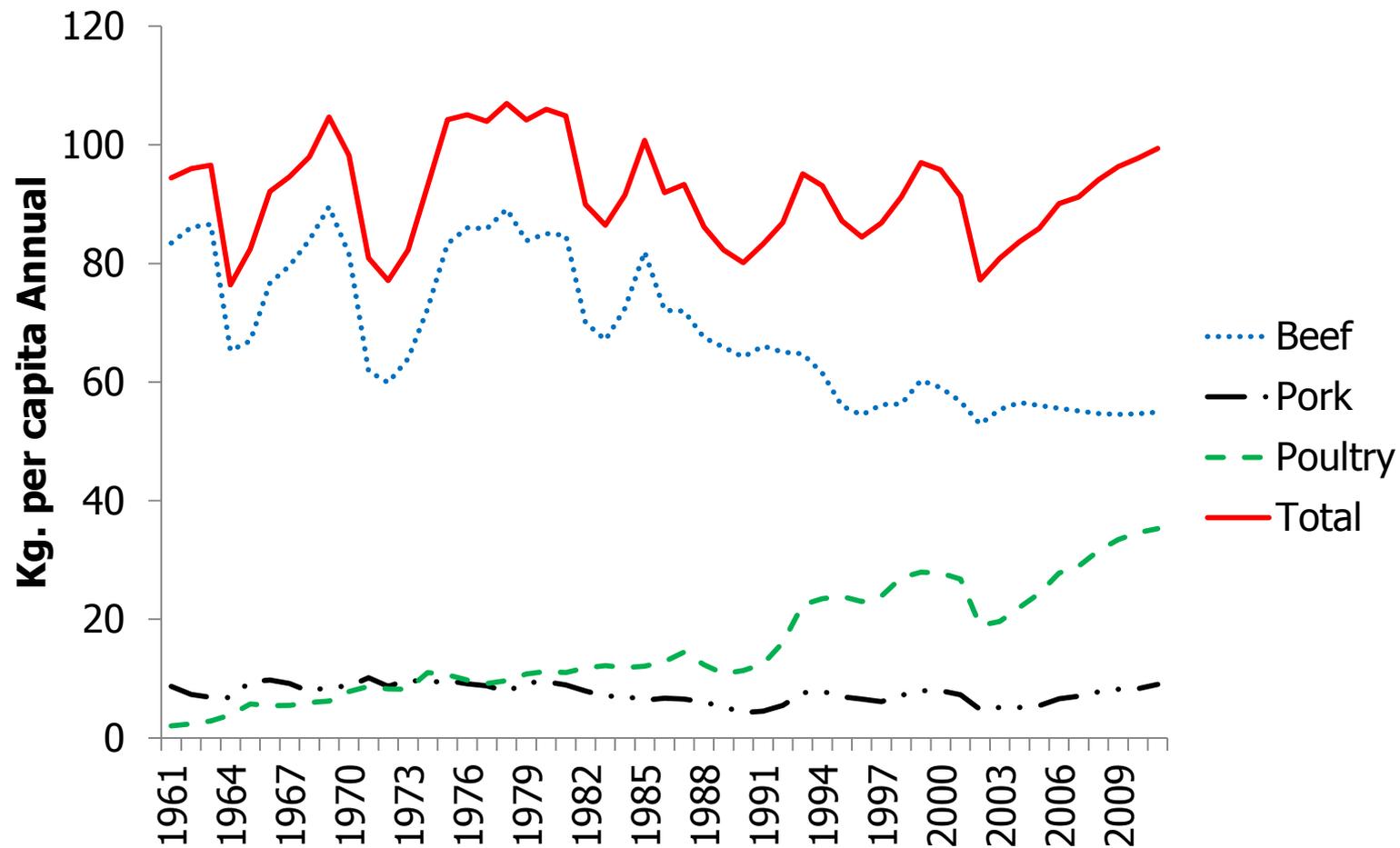
Motivation

- Changes in consumption behavior are explained by relative prices.

- Consumer price index (IPC) in the period 1996-2013:
  - General level: 246%
  - Food and Drinks: 321%

- Substitution effects among food and others goods are expected.

- In the last years, government intervention in the beef cattle market was particularly intense and focused on keeping low relative prices in the domestic market.

- Demand theory provides the methods to analyze the changes in the consumer behavior.

Objective

The aim of this study is to estimate a complete demand system in order to understand the changes in the consumption levels of three types of meat and fish in Argentina for the period between 1996/97 and 2012/13.

The Data

- The *National Survey of Household Expenditures* (ENGHo) was conducted by the *National Institute of Statistics and Census* of Argentina (INDEC) at a national level in three periods: 1996/97, 2004/05 and 2012/13.

- The sample includes household with positive meat consumption in at least one of the categories:

Households with positive meat consumption

Category	1996/97	2004/05	2012/13
Beef	23997 (96%)	24062 (94%)	16795 (91%)
Poultry	12658 (51%)	13295 (52%)	12898 (70%)
Pork	1675 (7%)	1066 (4%)	1167 (6%)
Fish	3844 (15%)	3734 (15%)	2907 (16%)
Total	**24978**	**25488**	**18304**

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Monthly Expenditures in Meat and Fish (Constant pesos)

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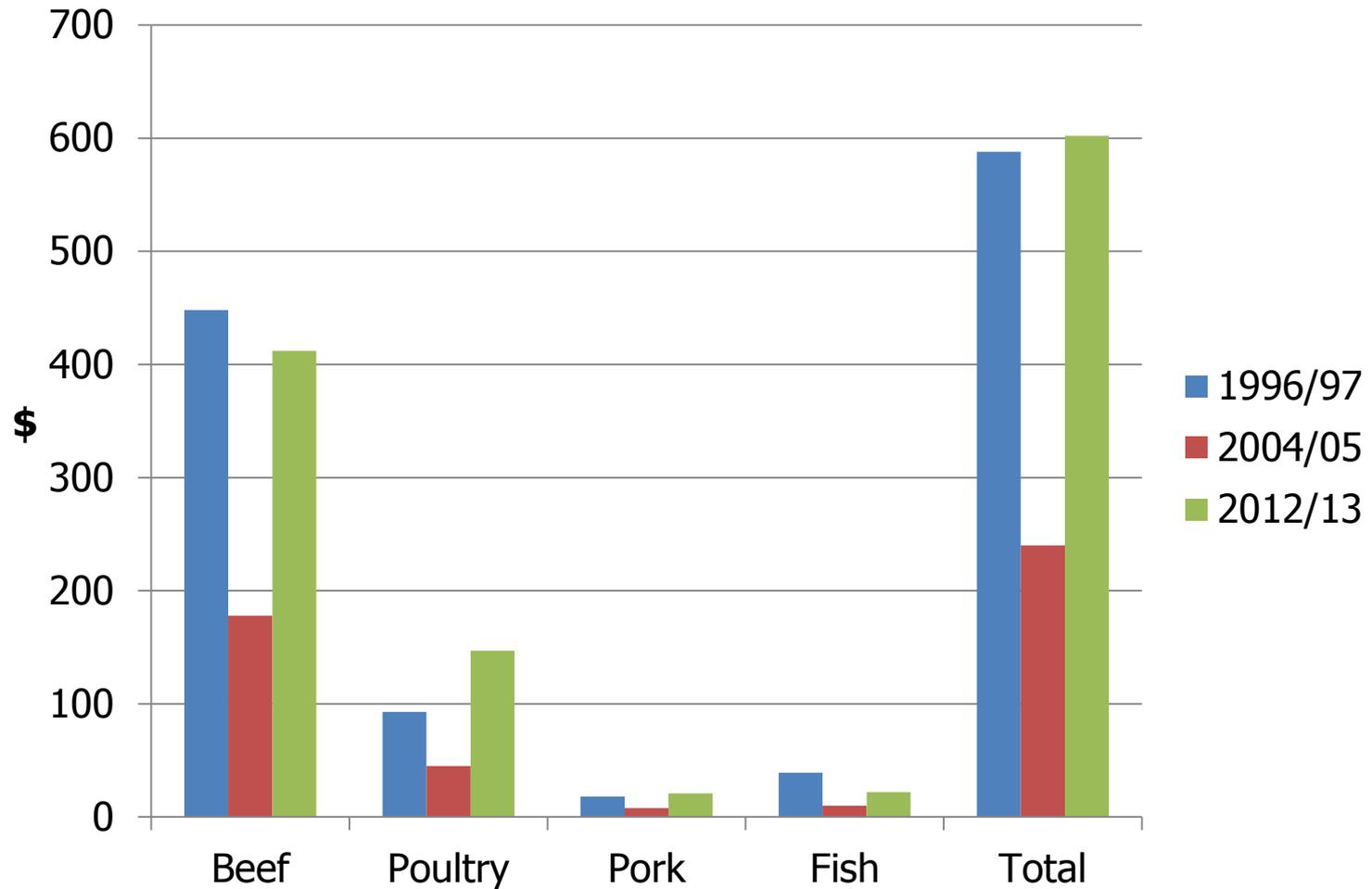
Meat and Fish Consumption (Kg./Month)
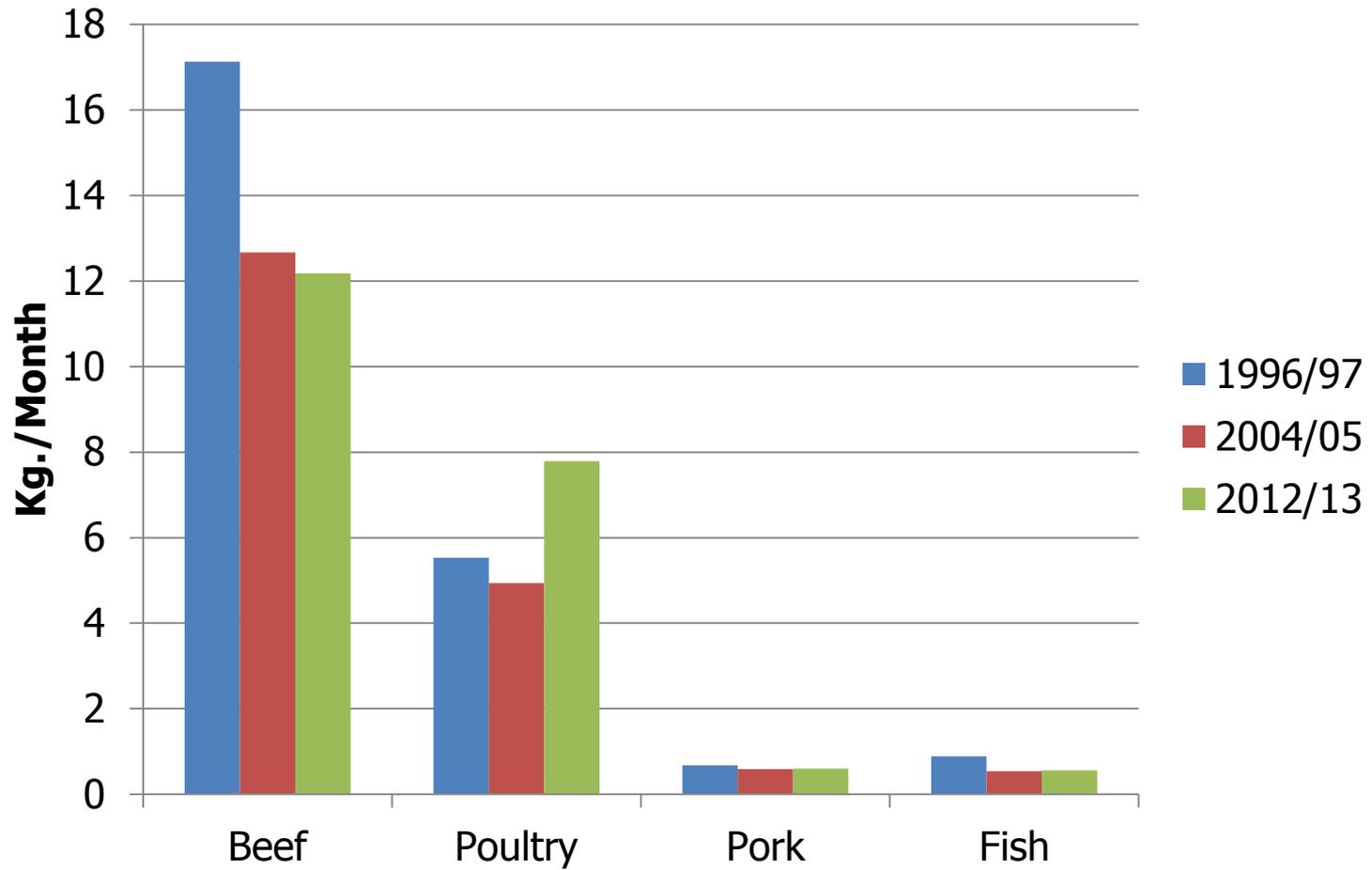
Methodology
Demand System

The QUAIDS model (Blundell and Banks) is:

$$w_i = \alpha_i + \sum_{j=1}^{4} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{m}{a(p)}\right) + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}^2 + \varepsilon_i$$

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{4} \alpha_i \ln p_i + \frac{1}{2}\sum_{i=1}^{4}\sum_{j=1}^{4} \gamma_{ij} \ln p_i \ln p_j$$

$$b(p) = \prod_{i=1}^{4} p_i^{\beta_i}$$

w_i: Share Expenditure in good i
p_i: Price of good i
m: Income

Methodology
Demand System

The restrictions imposed on parameters are:

Adding-up
$$\sum_{i=1}^{n} \alpha_i = 1; \quad \sum_{i=1}^{n} \gamma_{ij} = 0; \quad \sum_{i=1}^{n} \beta_i = 0; \quad \sum_{i=1}^{n} \lambda_i = 0$$

Homogeneity
$$\sum_{j=1}^{n} \gamma_{ij} = 0$$

Symmetry
$$\gamma_{ij} = \gamma_{ji}$$

Methodology
Quality Adjusted Prices

- The survey (ENGHo) does not collect prices of purchased goods.

- We calculated the implicit prices for each category: the ratio total expenditure/consumed quantity.

- These prices reflect *quality effects*, e.g.: regional and quality differences, seasonal effects, etc.

- These effects were corrected by the Cox and Wohlgenant (1986) method using socio-demographic information from the Surveys.

- Variables: age, gender and educational level of the householder; household size; household income and its square; dummy for the activity of the householder; dummy for each one of the sub-regions (12).

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Methodology
Bias Correction

- Zero consumption generates a selection bias problem.
- This problem was corrected by the two-steps Shonkwiler and Yen (1999) approach, so the final estimation is:

$$w_i = \mathbf{\Phi}(z_i'\hat{\theta}_i)\left[\alpha_i + \sum_{j=1}^{4} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{m}{a(p)}\right) + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{m}{a(p)}\right]\right\}^2\right]$$
$$+ \delta_i \boldsymbol{\phi}(z_i'\hat{\theta}_i) + \varepsilon_i$$

$\mathbf{\Phi}(z_i'\hat{\theta}_i)$: Cumulative Distribution Function

$\boldsymbol{\phi}(z_i'\hat{\theta}_i)$: Probability Density Function

z: age, gender and educational level of the householder; houshold size; household income and its squared; dummy for the activity of the householder; dummy for each one of the sub-regions (12); dummy minors (1 if there is minors of 14), dummy older (1 if there is olders than 65).

Results – Parameter Estimates

Parameter	1996/97		2004/05		2012/13	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
β_1	-0,0061	0,0062	-0,1089***	0,0115	-0,1802***	0,0155
β_2	0,0531***	0,0178	0,2530***	0,024	0,2948***	0,0182
β_3	0,0236**	0,0118	0,0338***	0,0065	0,0712***	0,0143
β_4	-0,0828**	0,0337	-0,3958***	0,0352	-0,5462***	0,0291
λ_1	-0,0036**	0,0014	-0,0143***	0,002	-0,0183***	0,0026
λ_2	0,0159***	0,0041	0,0337***	0,0043	0,0303***	0,0032
λ_3	0,0068**	0,0027	0,0021*	0,0011	0,0058*	0,003
λ_4	-0,0191***	0,0054	-0,0214***	0,003	-0,0178***	0,0036
δ_1	0,6238***	0,0023	0,5384***	0,0031	0,6749***	0,0075
δ_2	0,1103***	0,0037	0,4371***	0,0109	0,2626***	0,0073
δ_3	0,0573***	0,0038	-0,0039	0,0033	-0,1068***	0,0054
δ_4	-0,0933***	0,0047	-0,1352***	0,0038	0,0616***	0,0063

*** Signicant at 1%. ** Signicant at 5%. * Signicant at 10%.

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Results – Expenditure and Own-price Elasticities

Parameter	1996/97		2004/05		2012/13	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
e – Beef	1,0119***	0,0009	1,0170***	0,0077	1,2020***	0,0443
e – Poultry	0,9502***	0,0057	0,9083***	0,0402	0,3697***	0,1016
e – Pork	0,9817***	0,0051	1,0387***	0,0092	0,9061***	0,1175
e – Fish	0,9995***	0,0460	0,2778***	0,0721	0,1477	0,2534
c – Beef	-0,2687***	0,0016	-0,2319***	0,0144	-0,3412***	0,0348
c – Poultry	-1,0280***	0,0213	-0,6471***	0,1404	-0,7143***	0,0984
c – Pork	-0,9113***	0,0104	-1,0213***	0,0121	-1,1459***	0,0311
c – Fish	-1,0060***	0,0251	-0,9498***	0,0615	-1,5997***	0,1130

e: Expenditure Elasticity

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Results – Cross-price Compensated Elasticities

Parameter	1996/97		2004/05		2012/13	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Beef-Poultry	0,2052***	0,0035	0,1555***	0,0317	0,2537***	0,0429
Beef-Pork	0,0520***	0,0020	-0,0159***	0,0059	-0,1377***	0,0169
Beef-Fish	0,0116***	0,0030	0,0592***	0,0181	0,0912***	0,0306
Poultry-Beef	0,8649***	0,0088	0,6362***	0,0690	0,5276***	0,0826
Poultry-Pork	-0,0738***	0,0104	0,1527***	0,0239	0,3693***	0,0378
Poultry-Fish	0,2150***	0,0197	-0,0141	0,0813	0,0965	0,0842
Pork-Beef	0,8354***	0,0060	0,7068***	0,0116	0,3428***	0,0615
Pork-Poultry	0,0658***	0,0104	0,3341***	0,0232	0,5565***	0,0775
Pork-Fish	-0,0058	0,0129	0,0273*	0,0158	0,2595***	0,0739
Fish-Beef	0,6851***	0,0309	0,4120***	0,0727	0,5265***	0,1295
Fish-Poultry	0,3522***	0,0217	-0,1998***	0,0716	-0,2462**	0,1100
Fish-Pork	-0,0353**	0,0149	-0,015	0,0198	0,2055***	0,0463

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Poultry-Beef	0,8649***	0,0088	0,6362***	0,0690	0,5276***	0,0826
Poultry-Pork	-0,0738***	0,0104	0,1527***	0,0239	0,3693***	0,0378
Poultry-Fish	0,2150***	0,0197	-0,0141	0,0813	0,0965	0,0842
Pork-Beef	0,8354***	0,0060	0,7068***	0,0116	0,3428***	0,0615
Pork-Poultry	0,0658***	0,0104	0,3341***	0,0232	0,5565***	0,0775
Pork-Fish	-0,0058	0,0129	0,0273*	0,0158	0,2595***	0,0739
Fish-Beef	0,6851***	0,0309	0,4120***	0,0727	0,5265***	0,1295
Fish-Poultry	0,3522***	0,0217	-0,1998***	0,0716	-0,2462**	0,1100
Fish-Pork	-0,0353**	0,0149	-0,015	0,0198	0,2055***	0,0463

*** Signicant at 1%. ** Signicant at 5%. * Signicant at 10%.

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Conclusion

- There has been a decrease in the expenditure and quantities of all categories (except for poultry).

- The most important changes are:
  - An increase in the expenditure elasticity of beef.
  - A fall in the expenditure elasticity of poultry.
  - A greater own-price elasticity of the demand of beef, pork and fish, and a decline in the own-price elasticity of poultry.

- Different types of meat act as substitutes goods in the consumer preferences.

- An asymmetric cross price effect: A change in the price of beef implies a higher change in the consumption of other types of meat, compared with the change in the consumption of beef relative to the variation of the prices of substitutes.

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Thanks!

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