Estimation of price-cost margins for Portuguese firms

A contribution for the assessment and monitoring of product market competition

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Spring 2016

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» Product Market Reforms in Portugal

» Research Question

» Literature Review and Methodology

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Product Market Reforms in Portugal

» **Energy**
» • Liberalization of the energy and gas markets
» • Limit price increases (e.g. special levy on energy operators)

» **Housing**
» • New Urban Lease Act, Renovation Works and Urban Rehabilitation Laws
» • Implementation of measures to fight tax evasion

» **Services**
» • Implementation of the Services Directive
» • Liberalization of certain regulated professions' access and exercise

» **Telecommunications**
» • Lowering of mobile termination rates
» • Transposition of EU Directives increasing the sector's competitiveness
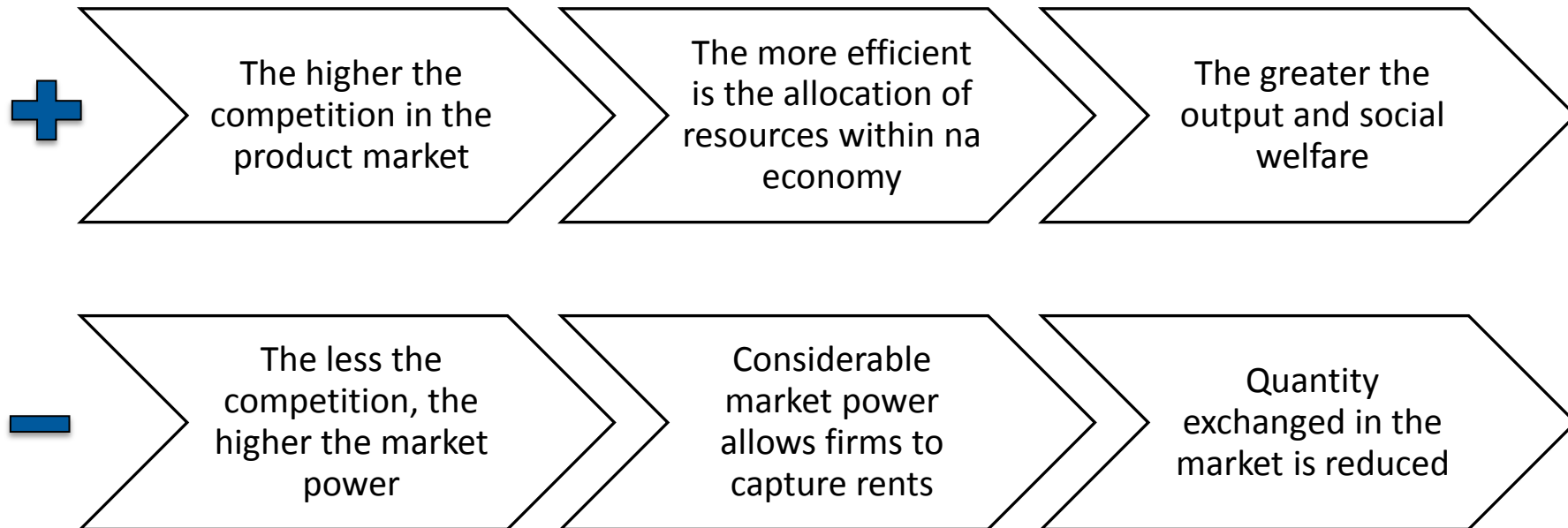» • Privatization of postal services company (CTT)

» **Transports**
» • Strategic Plan for Transports and Infrastructures 2014-2020
» • Privatizations (e.g. ANA, CP Carga)
» • Ports' reform (e.g. elimination of the TUP Carga tax, renegotiation of port terminal concession contracts)

Research Question

Product Market Reforms:

- Microeconomic nature
- Aim to improve the functioning of markets by increasing competition amongst producers (and, consequently, increasing productivity)
- They have small – if any – budgetary impact
- However, they need time to accrue tangible effects (plus, how can we measure them?)
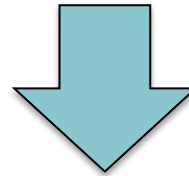
In a context where several market reforms are being implemented, how can we assess and monitor their economic impact?

Literature Review

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| The higher the competition in the product market | The more efficient is the allocation of resources within na economy | The greater the output and social welfare |

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| The less the competition, the higher the market power | Considerable market power allows firms to capture rents | Quantity exchanged in the market is reduced |

- *Blanchard and Giavazzi (2003)* argue that decreasing price-cost margins have positive effects on output

- *Syverson (2011)* argues that competition within developed economies drives productivity through (1) intramarket competition and (2) trade competition

  » Note: Mark-ups by themselves do not entirely depict the state of competition

Gabinete de Estratégia e Estudos

Initial framework – standard neoclassical production function:

- $$Q = Af(K, L, M)$$

Where A is Hicks-neutral technological parameter;

Testing for imperfect competition: $\varepsilon^j = \mu\, \alpha^j$

Growth rate of output can be derived as:

- $$\Delta q = \mu\left(\alpha^K \Delta k + \alpha^L \Delta l + \alpha^M \Delta m\right) + \theta$$

Assuming constant returns to scale: $(\varepsilon^K + \varepsilon^L + \varepsilon^M = 1)$, we may derive the SR as:

- $$SR = \left(1 - \frac{1}{\mu}\right)(\Delta q - \Delta k) + \frac{1}{\mu}\theta$$

$$Lerner\ Index = \left(1 - \frac{1}{\mu}\right) = \frac{P - MgC}{P}$$

Gabinete de Estratégia e Estudos

Considering the dual problem of cost minimization (*Roeger, 1995*), it is possible to derive a dual SR:

- $-SR^d \equiv \Delta p - \alpha^K \Delta r + \alpha^L \Delta w + \alpha^M \Delta p^m = \left(1 - \frac{1}{\mu}\right)(\Delta p - \Delta r) - \frac{1}{\mu}\theta$

Thus, we may now eliminate the source of endogeneity, yielding:

- $SR - SR^d = \left(1 - \frac{1}{\mu}\right)[(\Delta p + \Delta q) - (\Delta r + \Delta k)]$

Still, the assumption of perfectly competitive labour market is indeed very strong and severely contested by the Literature.

Assuming that wages and number of workers are chosen simultaneously according to an efficient bargaining problem, where ϕ is bargaining power:

- $\max_{L,W} \Omega = [(W - \overline{W})L]^{\phi}.(PQ - WL)^{(1-\phi)}$

Assuming an isoelastic demand for output, the elasticity of output with respect to labour is:

- $\varepsilon^L = \mu\alpha^L + \mu\frac{\phi}{1-\phi}(\alpha^L - 1)$

By adjusting the remaining elasticities, given the assumption of constant returns to scale, the sum of the primal and dual SR yields:

- $SR - SR^d =$
$\left(1 - \frac{1}{\mu}\right)[(\Delta p + \Delta q) - (\Delta r + \Delta k)] + \frac{\phi}{1-\phi}(\alpha^L - 1)[(\Delta l + \Delta w) - (\Delta r + \Delta k)]$

Now, we are able to jointly estimate the price-cost margin and the worker's bargaining power, with the use of the following equation:

$$y_{i,j} = \beta_1 x_{i,j}^1 + \beta_2 x_{i,j}^2 + \varepsilon_{i,j}$$

Where $y_{i,j}$ is:

- $SR - SR^d \equiv$
$(\Delta p + \Delta q) - \alpha^L(\Delta w + \Delta l) - \alpha^M(\Delta p^m + \Delta m) - (1 - \alpha^L - \alpha^M)(\Delta r + \Delta k)$

» Informação Empresarial Simplificada (*IES*) for the period **2010-2013** – virtually the universe of Portuguese non-financial firms

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Data Treatment
1) Only firms with strictly positive sales, labor costs, intermediate inputs and net capital stock (tangible and intangible) were considered;
2) Outliers: observations below the 1st and above the 99th percentile in the distribution of growth rates of sales, labor costs, intermediate inputs and net capital stock were excluded;
3) Observations with depreciation rates and share of labor costs and intermediate inputs in total sales outside the [0,1] range were not considered;
4) Firms reporting negative operational results in at least two years were not considered;
5) The sectors of "Agriculture", "Education" and "Health" were withdrawn.

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Definition of Markets

» Markets were defined at **3-digit** level CAE Rev.3.

Sector	Description	Market
Energy Costs	Electric power generation, transmission and distribution	351
Telecommunications and postal services	Publishing of books, periodicals and other publishing activities	581
	Motion picture, video and television programme activities	591
	Other telecommunications activities	619
	Computer programming, consultancy and related activities	620
	Data processing, hosting and related activities; web portals	631
Generic transportation services	Other passenger land transport	493
	Freight transport by road and removal services	494
	Warehousing and storage	521
	Support activities for transportation	522
	Other postal and courier activities	532
Professional services	Legal activities	691
	Accounting, bookkeeping and auditing activities; tax consultancy	692
	Management consultancy activities	702
	Architectural and engineering activities and related technical consultancy	711
	Technical testing and analysis	712
	Research and experimental development on natural sciences and engineering	721
	Advertising	731
	Specialised design activities	741
	Photographic activities	742
	Veterinary activities	750
Other services	Repair of computers and communication equipment	951
	Repair of personal and household good	952
	Other personal service activities	960

Variables

- » $\Delta p + \Delta q$ – output growth rate, represented by growth of total sales from goods and services
- » $\Delta l + \Delta w$ – labour costs growth rate, represented by growth of nominal wages and other benefits
- » α^L - shares of employment, given by the ratio of labor costs to total sales
- » α^M - share of intermediate inputs, given by the ratio of costs of intermediate inputs to sales
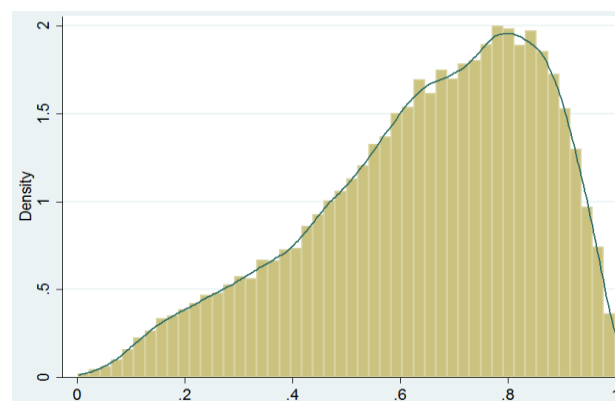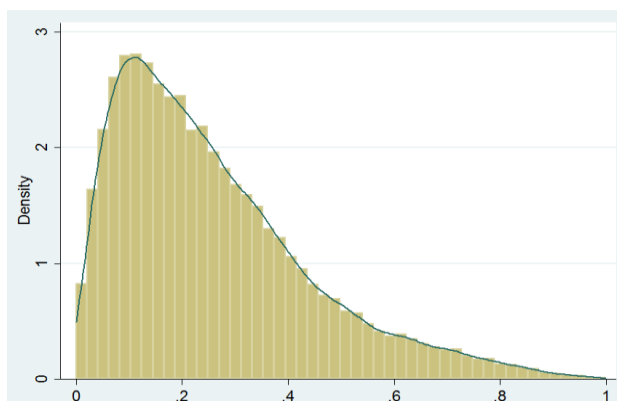
(Left) Share of Employment costs; **(Right)** Share of Intermediate inputs costs; **Source**: Author's calculations

Variables

» Δk - growth rate of net capital accumulation, includes both tangible and intangible assets (net of depreciations at book value)

» $r_{i,t} = \left(i_{i,t} - \widehat{P_t^I} + \delta_{i,t} \right) P_t^I$ - User cost of capital, calculated at firm-level

» $i_{i,t}$ - represents the financial cost of capital, and is computed as:

$$i_{i,t} = \frac{interest\ paid}{financial\ debt\ outstanding}$$

» $\delta_{i,t}$ - represents the depreciation rate, and is computed as:

$$\delta_{i,t} = \frac{depreciation_{i,t}}{K_{i,t-1}}$$

» P_t^I and $\widehat{P_t^I}$ - represent the level and growth rate of investment goods price, respectively

Descriptive statistics of Variables

Table 4 - Descriptive statistics of variables used, Portugal, Sample

Variable	2011	2012	2013
Output growth rate	-0.042	-066	0.016
	(0.272)	(0.272)	(0.268)
Labour costs growth rate	0.002	-0.036	-0.001
	(0.254)	(0.256)	(0.256)
Gross capital growth rate	-0.104	-0.127	-0.087
	(0.589)	(0.557)	(0.592)
Financial Cost of Capital	0.059	0.063	0.061
	(0.081)	(0.084)	(0.083)
Depreciation Rate	0.191	0.185	0.194
	(0.144)	(0.143)	(0.152)
Real User Cost of Capital	0.248	0.244	0.250
	(0.167)	(0.167)	(0.173)

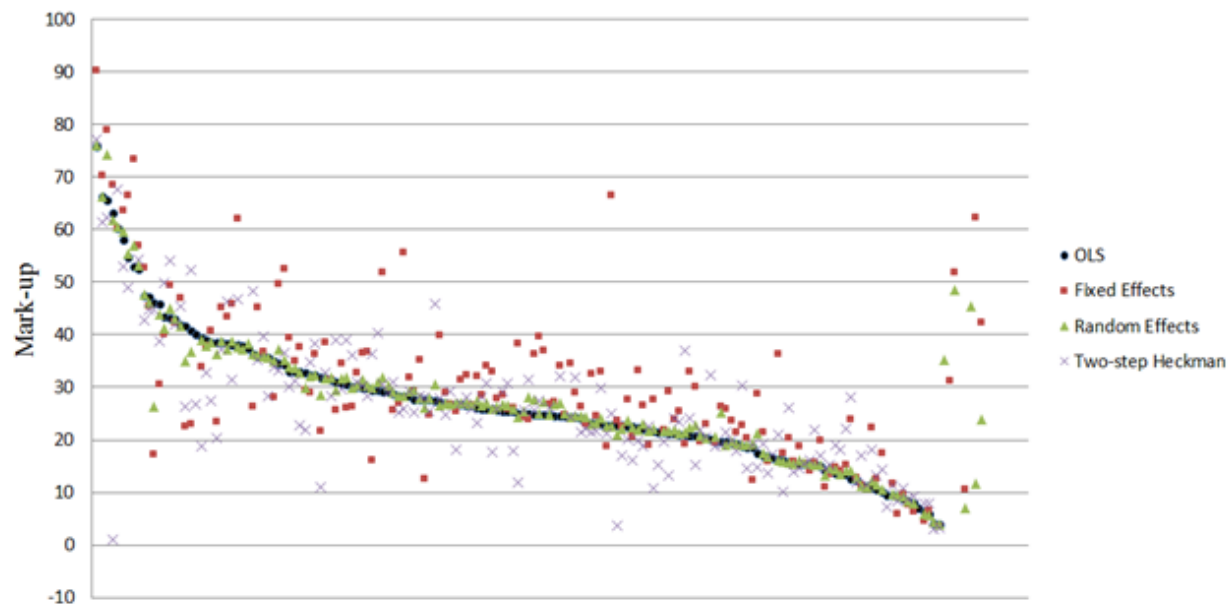Source: Author's calculations – average; standard deviation in parenthesis

Results

» Estimation Equation was run, by market, with 4 different specifications for the whole period:

  > OLS with clustered errors

  > Fixed Effects

  > Random Effects

  > Two-step Heckman

» Then, for the years of 2012 and 2013, with OLS with clustered errors (benchmark)

» Total of 1,794 estimates (considering only estimates significant at 10p.p. confidence level; in the case of 2012 and 2013 only markets where estimates were significant for both periods)

Table 6 - Different specification results, Overall Period

| Specification	Number of markets	Avg. Mark-up	Avg. B. Power
OLS with clustered errors	163	26.9	16.2
Fixed Effects	155	30.4	20.1
Random Effects	163	27.5	17.2
Two-step Heckman	157	26.1	17.9

Source: Author's calculations

Figure 5 - Mark-up estimates by market, Overall Period

Source: Author's Calculations

Figure 6 - Correlation between market Bargaining Power and Mark-up. Overall Period
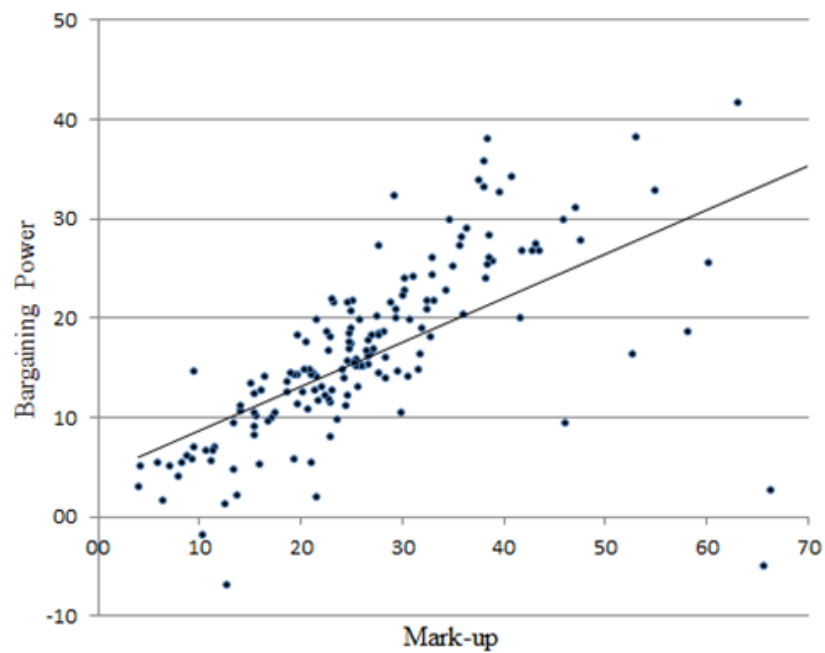
Source: Author's Calculations

Results

Overall period 2010-2013			
Sectors	nº of markets	Avg. Price-cost margin	Avg. Bargaining power
Overall economy	163	26.9	16.2
Manufacturing	70	26.4	17.4
Non-manufacturing	93	27.3	15.2
T	127	27.8	17.1
T (excluding sector D and J)	113	26.6	16.6
NT	36	23.9	12.9
NT (including sector D and J)	50	27.6	15.1
Electricity, Gas & Water	5	44.5	23.7
Construction	9	33.7	18.3
Trade	19	12.4	7.9
Transports and Communications	15	29.3	17.4
Other Services	45	29.8	16.1
Hotels, Restaurants	6	33.7	26.8
Real Estate	3	52.4	14.4
Technical Services	16	28.2	15.9
Admin and Support Services	15	24.3	10.6
Art, Sports and Recreative Events	5	33.0	21.0

Amador 2004-2009			
Sectors	nº of markets	Avg. Price-cost margin	Avg. Bargaining power
Overall economy	156	26.6	13.5
Manufacturing	93	24.7	13.1
Non-manufacturing	63	29.5	14.0
T	108	25.8	13.5
NT	48	28.5	13.5
Electricity & Water	3	35.8	14.0
Construction	5	38.9	20.6
Trade	23	20.9	11.4
Transports and Communications	10	31.7	16.1
Other services	22	34.4	14.2

Results

Market description	Market	2012		2013		Change 1	Change 2
		PCM	B. P	PCM	B.P		
Electric power generation, transmission and distribution	351	71.2	33.5	50.8	13.6	-20.5	-19.9
Publishing of books, periodicals and other publishing activities	581	23.4	17.6	25.2	14.8	1.8	-2.9
Motion picture, video and television programme activities	591	29.7	12.7	40.2	25.8	10.5	13.2
Other telecommunications activities	619	20.2	14.7	25.0	14.0	4.8	-0.7
Computer programming, consultancy and related activities	620	25.1	18.5	18.2	10.0	-6.9	-8.5
Data processing, hosting and related activities; web portals	631	47.6	42.7	29.2	19.7	-18.4	-23.0
Non-weighted average		29.2	21.2	27.6	16.9	-1.6	-4.4
Other passenger land transport	493	32.6	15.4	28.7	7.6	-3.9	-7.8
Freight transport by road and removal services	494	24.1	16.1	24.6	14.0	0.5	-2.1
Warehousing and storage	521	28.6	23.3	44.8	32.2	16.2	8.9
Support activities for transportation	522	19.3	14.3	23.3	14.5	3.9	0.2
Other postal and courier activities	532	25.1	15.3	22.6	11.4	-2.5	-3.9
Non-weighted average		25.9	16.9	28.8	15.9	2.9	-0.9
Legal activities	691	61.5	18.9	53.5	17.5	-8.1	-1.4
Accounting, bookkeeping and auditing activities; tax consultancy	692	23.7	16.3	21.4	7.2	-2.3	-9.1
Management consultancy activities	702	35.4	19.7	14.5	0.9	-20.9	-18.7
Architectural and engineering activities and related technical consultancy	711	31.7	24.0	34.5	19.3	2.8	-4.8
Technical testing and analysis	712	26.5	18.6	36.3	23.3	9.8	4.7
Research and experimental development on natural sciences and engineering	721	40.0	30.4	48.3	44.5	8.4	14.1
Advertising	731	26.7	18.8	26.7	16.9	0.1	-1.9
Specialised design activities	741	23.3	17.0	33.7	21.3	10.4	4.3
Photographic activities	742	30.9	19.8	29.8	25.0	-1.1	5.2
Veterinary activities	750	25.3	17.6	20.0	15.2	-5.2	-2.4
Non-weighted average		32.5	20.1	31.9	19.1	-0.6	-1.0
Repair of computers and communication equipment	951	33.6	17.0	37.1	26.7	3.5	9.7
Repair of personal and household good	952	19.6	13.3	19.1	16.0	-0.4	2.7
Other personal service activities	960	30.8	16.1	23.8	13.8	-7.0	-2.3
Non-weighted average		28.0	15.5	26.7	18.8	-1.3	3.4

Results

Market	2012		2013		Change 1	Change 2
	PCM	B. P	PCM	B.P		
910	56.9	42.8	31.0	7.1	-25.9	-35.6
702	35.4	19.7	14.5	0.9	-20.9	-18.7
351	71.2	33.5	50.8	13.6	-20.5	-19.9
631	47.6	42.7	29.2	19.7	-18.4	-23.0
257	56.3	32.1	38.9	22.1	-17.4	-10.0
161	46.1	29.2	28.9	21.3	-17.2	-7.9
108	36.9	27.0	19.9	11.3	-17.0	-15.7
274	64.7	38.1	48.0	28.0	-16.7	-10.1
237	32.7	27.3	16.2	18.0	-16.5	-9.3
203	37.6	26.1	22.1	11.7	-15.5	-14.4
181	29.4	17.4	16.1	9.0	-13.3	-8.3
245	39.7	21.3	28.0	19.4	-11.7	-1.9
204	20.9	18.0	10.5	9.3	-10.5	-8.7
932	39.1	21.0	29.1	23.1	-10.1	2.1

Results

Market	2012		2013		Change 1	Change 2
	PCM	B. P	PCM	B.P		
265	20.8	16.8	56.3	36.9	35.5	20.1
682	52.0	5.3	81.9	7.9	29.9	2.6
353	69.7	40.7	96.6	100.0	26.9	59.3
275	22.6	18.0	46.2	30.6	23.6	12.6
521	28.6	23.3	44.8	32.2	16.2	8.9
104	24.4	16.3	39.7	19.2	15.3	2.8
325	17.7	4.2	32.1	20.0	14.4	15.8
234	17.9	14.7	32.3	22.9	14.4	8.2
324	31.9	26.3	45.5	48.4	13.6	22.1
103	17.4	15.2	30.7	27.7	13.3	12.4
139	10.5	10.3	23.2	15.9	12.7	5.6
551	33.6	25.3	46.0	27.1	12.4	1.7
791	20.7	13.6	32.7	17.4	12.0	3.7
255	22.7	11.7	34.6	17.5	11.9	5.7
422	35.0	28.1	45.6	27.6	10.6	-0.5
591	29.7	12.7	40.2	25.8	10.5	13.2
741	23.3	17.0	33.7	21.3	10.4	4.3

Thank you