

Revealed Comparative Advantage and Competitiveness: A Case Study for Turkey towards the EU

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Abstract. This paper seeks to quantify the extent to which Turkey has a comparative advantage in the tomato, olive oil, and fruit juice industries and how this has changed over the period 1995-2005 in the EU market. To study Turkey's competitiveness and its progress two widely used indexes are calculated: the revealed comparative advantage (RCA) and the comparative export performance (CEP) index. In addition, import demand functions of the EU are estimated for rival countries. Using regression analysis we hypothesize that if Turkey is a competitor for these countries, its price will have a statistically significant effect on export demand functions. Both index and regression results indicate that Turkey has a strikingly high comparative advantage in the fruit juice and olive oil markets in the EU but this is not the case in the tomato market.

JEL Classification Codes: Q10, Q17, F14.

Keywords: Agriculture, Fruit and Vegetable Industry, Competitiveness, Revealed Comparative Advantage, Comparative Export Performance, EU, Turkey, Greece, Spain, Italy.

1. Introduction

In 1995 Turkey signed the Customs Union Agreement with the European Union.¹ A Customs Union (CU) has been in place for industrial and processed agricultural products since January 1996. However, the Customs Union does not cover a number of essential areas, such as traditional

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¹ It is determined by the Ankara Agreement and additional protocols but mainly defined by the January 1995 decision of the Association Council. The Customs Union between Turkey and the EU has been in force since the beginning of 1996. It is more than a typical Customs Union, which foresees arrangements on areas including competition, state aids, technical legislation and intellectual property rights. (Kabalioğlu, 1999)

agriculture, to which bilateral trade concessions apply. Concerning processed agricultural products, the parties have agreed on the establishment of a system in which Turkey would differentiate between agricultural and industrial components with regards to duties applied on these products in a way similar to the model applied in the European Community (Yörük, 2005). Thus, Turkey's tariffs and levies on imports of industrial products from the EU were eliminated. Turkey has also begun to apply the European Union's common external tariff on imports from third-party countries. Turkey has reduced the average protection level from 10.9% to 5% (Bekmez and Genç, 2002).

Another criterion for goods to be included in the CU is their place of origin. The Association Agreement provided that "The Association shall likewise extend to agriculture and trade in agricultural products, in accordance with special rules which shall take into account the Common agricultural Policy of the European Community" (Kabalioglu, 1999).

The European Union is the largest export market for Turkish fruit and vegetable processing industry goods. In the last ten years Turkey's agricultural exports to the EU increased by almost 10 percentage points.² Turkey is one of the most important agricultural trade partners of the EU and exports more than half of its fruit and vegetable volume to the EU. This partnership will strengthen if Turkey becomes a member of the EU. The food manufacturing sector is of notable importance, making up a 19% share of Turkey's total production of manufactured goods and an 11% share of Turkey's total exports.³ The fruit and vegetable processing industry is the second largest industry in the food manufacturing sector, covering almost one-half of Turkey's total food industry exports (State Planning Organization, 1998).

However, there are concerns about the effect of the recent enlargement of the European Union on Turkey's agricultural exports. Many new EU member countries have great similarities with Turkey in terms of both the magnitude of agricultural goods as a share of total exports, and ratios of exports from these countries to others EU countries. Due to the membership of new member countries, the community preference principle of the CAP is expected to work beneficially for the export of agricultural products of these countries and disadvantageously for agricultural exports of

² (<http://dtm.gov.tr/ab/rakamlar/genel>)

³ (<http://dtm.gov.tr/ab/rakamlar/genel>)

Turkey. A similar development has been previously seen with the accession by Spain, Greece, and Portugal to the EU.⁴ In the 1980s, numerous studies were conducted to examine the effects on the agricultural exports of full membership to the union.

Accordingly, agricultural products exports of Turkey were significantly adversely affected by the membership of Mediterranean countries. From 1977 to 1984, the share of total exports from Turkey to the EU made up by cereals, animal and vegetable oils dropped from 8% to 7%. On the other hand, the share of exports of the same products from Greece to the Union increased from 1.7% in 1977 to 33.9% in 1984. A similar impact was experienced following the accession by Spain in 1986. Thus, it can be argued that accession to the EU by 12 new countries which have significant similarities with Turkey in terms of exports to the EU will have trade diversion effects. The community preference principle of the CAP is one of the most important factors motivating this trade diversion effect. Karakaya and Özgen (2002) studied the potential trade effects of economic integration for Turkey and the EU. They also used the revealed comparative advantage index to analyze Turkey's effect on southern EU member countries. They concluded that Turkey and southern EU countries are significantly different enough and concluded that Turkey does not jeopardize rival countries' trade positions. In a similar study Akgüngör *et al.* (2002) measured the competitiveness of Turkish agriculture in the EU market. They found that Turkey's competitive power is higher than Spain, Portugal and Greece in some processed vegetable and fruit products.

⁴ Table 1 compares several agricultural indicators of Turkey, Spain, Italy, and Greece.

Table 1: Selected Agricultural Indicators

Countries	Share of Agriculture in GNP (%)		Share of Agriculture in Exports (%)		Share of Agriculture in Imports (%)		Share of Population Employed in Agriculture in Active Population (%)		Total Agricultural Land (1000 ha.)	Employment in Agriculture (1000 people)
	1998	2003	1998	2003	1998	2003	1998	2003	2003	2003
Italy	2,5	2,2	6,8	7,2	11,2	9,4	6,4	4,7	15.097	1.040
Greece	5,8	5,4	27,4	22,7	13,9	11,2	17,7	16,3	3.897	654
Spain	3	3,6	14,7	14,6	9,8	8,3	7,9	5,6	25.270	934
EU (25)	1,5	1,6	7	6,5	7,7	6,4	4,7	5,2	163.479	10.082
Turkey	17	11,5	10	10,3	4,6	6,1	43	32,7	26.578	6.799

Source:

<http://www.tarim.gov.tr/arayuz/1/icerik.asp?efl=uretim/istatistikler/istatistikler.htm>
(accessed on 16.02.2006)

To understand potential effects of new member countries on the Turkish agricultural sector, we studied the performance patterns of Turkey and Spain, Italy and Greece in the 1990s and early 2000s for both EU Trade and World Trade in three product categories, tomato, olive oil, and fruit juice. Better understanding of these interactions might enable us to predict the future of Turkish agriculture.

We used two indexes, revealed comparative advantage (RCA) and comparative export performance (CEP). The basic logic behind RCA is to evaluate comparative advantage on the basis of a country's specialization in exports relative to some reference group countries. CEP deals with a similar concept but uses the whole world instead of only intra-EU trade. We have chosen to use data on intra-EU trade as well as trade between the EU and our sample countries in this study. We also applied the same approach to world trade as far as the available data allowed. Trade volume and price data was collected from Eurostat, WTO, and FAO datasets. In the last section we estimate a particular form of import demand function of the EU for rival countries. The degrees of substitutability of Turkish fruit and vegetables are estimated on these regressions.

2. Revealed Comparative Advantage Index

In the light of an increasingly competitive international environment, it is useful to examine where Turkey's comparative advantage lies. Comparative advantage is the term used to describe the tendency for countries to export those commodities which they are relatively adept at producing, vis-à-vis the rest of the world. In other words, if a country can produce a good at a lower relative cost than other countries, then with trade, that country should devote more of its scarce resources to the production of that particular good. Through trade, that country can obtain other goods at a lower price (opportunity cost), in exchange for the good in which it has a comparative advantage.

In the literature several techniques are used to measure the weak and strong sectors of a country. One of the most widely used methods involves the concept of "revealed comparative advantage" developed by Balassa (1965). The Balassa index basically measures normalized export shares, with respect to the exports of the same industry in a group of reference countries. Although pros and cons of the Balassa index are still debated in the literature, it stands as the most widely used revealed comparative advantage index.⁵ In the literature numerous empirical studies have used the Balassa index to identify a country's strong sectors.⁶ The index is not satisfactory as a cardinal or ordinal measure but provides a useful tool in detecting comparative advantages of Turkey in particular sectors.

The Revealed Comparative Advantage (RCA) index is measured by this formula

$$RCA = \ln (X_{iB} / X_B) / (X_{iA} / X_A),$$

Where

X_{iB} : Turkey's exports of good i to the European Union

⁵ See Kunimoto (1977), Hillman (1980), and de Benedictis (2005).

⁶ Some examples are Ariovich (1979), Reza (1983), Peterson (1988), Amity (1999), and Fertő, Imre & Hubbard, L. J. (2003). Many studies have used the Balassa index and/or modified versions of revealed comparative index to measure competitiveness of particular Turkish sectors. Some examples are Hatırlı and Fert (2004), Akgüngör *et al.* (2002), Yılmaz (2003), and Tutkulu and Seymen (2004).

X_B : Turkey's total exports to the European Union

X_{iA} : the rival country's exports of good i to the European Union

X_A : the rival country's total exports to the European Union

A positive value of RCA might be interpreted as an indication of Turkey's comparative advantage against a rival EU country in the EU market. Table 2 lists the Balassa index values calculated for olive oil, tomato, and fruit juice.

Table 2: Revealed Comparative Advantage Index

RCA	OLIVE OIL										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SPAIN	0.227312038	-0.871551423	-1.360843774	-1.681813517	0.213311383	-2.540313114	-0.858403951	-2.279010045	-1.073816373	-2.189296078	
GREECE	-2.257179088	-3.088684448	-2.801816011	-3.322525477	-2.441938002	-4.1682253	-2.246308473	-3.072827317	-2.340801898	-2.385455888	
ITALY	1.205338921	0.538952112	0.505834823	0.116840463	-1.070555886	-1.229178498	0.551952705	-0.59894046	0.374579877	-0.611123721	
RCA	TOMATO										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SPAIN	0.650223259	1.372808205	0.879975943	0.578145091	0.3384129	-0.059988799	-0.481458883	-0.686587095	-0.545123953	-0.649701458	
GREECE	-1.768509808	-1.118507819	-1.811008429	-2.284854431	-2.171380255	-2.544898054	-2.821248387	-2.726821757	-2.382213798	-2.460529801	
ITALY	-0.340299372	0.171204881	-0.340585588	-0.74801993	-0.855148595	-1.282408629	-1.778685681	-1.873719023	-1.597114185	-1.65114846	
RCA	FRUIT JUICE										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SPAIN	0.529899981	0.762454729	0.582032497	0.358155182	0.218408639	-0.208674503	-0.167733795	-0.709825853	-0.534381747	-0.836828707	
GREECE	0.35383064	1.369751372	0.698394473	-0.132575764	0.571663568	0.049843399	0.700690304	0.710115974	1.283363418	0.94122404	
ITALY	0.545038751	0.981130638	0.752890782	0.686677801	0.513887982	0.168209656	0.150215365	-0.274594498	0.028807121	-0.288885592	

Note: Orange fields indicate comparative advantage of Turkey for that product category.

In the olive oil markets, Greece has a significant comparative advantage over Turkey as measured by the Balassa index. Turkey had a comparative advantage over Italy until 1999, and after that year the comparative advantage changed hands yearly between Turkey and Italy. Annual fluctuations of harvest quality of olives might be responsible for this interesting observation.

For tomato, Turkey has the upper hand over Spain until 1999, however, lost its edge starting with the year 2000 whereas Greece and Italy

have always (excluding 1996) been superior over Turkey in terms of tomato exports. Exports of tomato are decreasing since 1996.

With fruit juice, Turkey has the comparative advantage in general terms, with the exception of 1998 and 1999, the Turkish fruit juice sector has always performed better than the fruit juice sector in Greece. Compared to Italy, apart from the years 2002 and 2004, Turkey has always been superior. Spain has performed better against Turkey since 2000. Turkey's exports have remained the same within that period examined but its ratio decreases since exports increase. In contrast, Italy's fruit juice exports to the EU have increased every year.

3. Comparative Export Performance (CEP) Index

Another index used to measure comparative advantage is the Comparative Export Performance (CEP) index. It is a slightly modified version of the Balassa index. It measures the export specialization of a country for particular product groups using the formula

$$CEP = \ln (X_{iB} / X_B) / (X_{iA} / X_A)$$

Where

X_{iB} : country B's exports of good i

X_B : country B's total exports

X_{iA} : total world exports of good i

X_A : total world exports

An index value of Turkey higher than the index value of country r indicates relative comparative advantage of Turkey against country r.

Table 3: Comparative Export Performance (CEP) index

CEP	Olive Oil									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Turkey	2.485	1.916	1.951	1.973	2.552	1.453	2.457	1.758	2.131	1.585
Greece	1.758	2.131	1.585	2.457	1.758	2.131	4.181	4.42	4.103	3.534
Italy	1.59	1.645	1.594	1.575	1.721	2.069	1.836		1.819	2.001
Spain	2.875	2.952	3.099	3.026	2.738	3.117	3.105	3.539	3.108	3.08

CEP		Tomato									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
Turkey	1.855	2.148	2.176	2.151	1.943	1.874	1.801	1.822	2.175	2.002	
Greece	2.483	2.551	2.877	2.813	2.436	2.11	2.417	2.576	2.35	2.088	
Italy	1.243	1.386	1.431	1.504	1.597	1.522	1.658	1.823	2.093	1.948	
Spain	2.061	2.113	2.289	2.096	2.176	2.1	2.184	2.311	2.616	2.412	

CEP		Fruit Juice									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
Turkey	2.507	1.591	1.601	1.838	1.551	1.292	1.542	1.052	0.909	0.765	
Greece	0.439	0.592	0.23	1.03	0.234	0.787	0.745	0.462	0.567	0.78	
Italy	-0.627	-0.562	-0.538	-0.38	-0.864	-0.969	-0.87	-0.684	-0.811	-0.952	
Spain	0.917	1.052	1.189	1.308	1.565	1.434	1.138	1.021	1.025	1.055	

Note: Bold fields indicates that the competitiveness of Turkish exports is higher than the rival country's exports

In the case of tomato exports, Spain and Greece have always had higher competitiveness than Turkey, whereas Turkey was superior to Italy except in 1996 and 1999. Although Italy is superior to and Spain inferior to than Turkey in terms of EU trade for the period, the reverse is true in terms of world trade. Greece has had a consistent competitive advantage over Turkey. Although Italy has a comparative advantage over Turkey in EU Trade, Turkey has the edge on Italy since Italy exports nearly half of its tomatoes to EU countries. Spain is exporting three times more tomatoes to non-EU countries but this ratio is much higher for its total exports.

As for fruit juice, Turkey has always performed better than the other countries except for 2003 and 2004. With the exception of 2002 and 2004 Turkey has the edge on Spain until recently. The index is very similar to the RCA index, and shows that although countries have slight exports differences this does not change for each region.

Turkey has competitive advantage over Greece and Italy in terms of olive oil exports.

4. Regression Analysis

This section investigates the interactions of the Turkish, Greek, Italian and Spanish exports markets to the European Union. If Turkey has competitive power, and therefore substitutes its goods for products of rival countries we expect that EU exports from these countries will be significantly affected by

Turkish export prices. Thus our hypothesis is that if Turkey is a competitor for these countries, its price will have a statistically significant effect on export demand functions for selected product groups. Akgüngör *et al.* (2002) used a similar methodology to estimate competitiveness of Turkish processed tomato and fruit products.

A particular form of import demand function was estimated for the EU for olive oil, tomatoes and fruit juice exports of Spain, Greece and Italy. The effects of own price, price of the rival countries' export price, and EU per capita income was modeled. Differences were used as we are interested in short term effects. Moreover, because seasonal effects are significant for the goods under examination, monthly differences are examined against their corresponding levels in the same month last year. Thus our dependent variable is the difference between the level of export of good A from country X to the European Union in this month and the same month last year. Independent variables are the change in the own-price and the rival's price and the per capita income of EU. Our hypothesis is that if Turkey is a competitor for these countries, its price will have a statistically significant effect on export demand functions.

Regression results are presented in Tables 4A, 4B and 4C. The first column in Table 4A represents the export demand for Greece; the second and third columns are export demands for Spain and Italy. Log-log specification is used, thus coefficients are estimated elasticities. According to our results, Turkish olive oil is a significant substitute for Greek and Italian olive oil, though its effect on Greek export is much bigger, with a coefficient of 0.21; implying that a 100% rise in the Turkish olive oil price increases Greek exports to the EU by 21%.

Table 4B presents the export demands for fruit juice. The results imply that, the Turkish fruit juice price has significant effects on export levels of Spain and Italy. A 100% rise in Turkish fruit juice price increases Spanish exports by 24%. However, as the results presented in table 1.C indicate, Turkish tomatoes are not a good substitute for Greek, Italian or Spanish tomatoes.

Table 4A: Export Demand of Olive Oil

Dependent Variable	Change in Greek Olive-Oil Exports to EU	Change in Spanish Olive-Oil Exports to EU Change	Change in Italian Olive-Oil Exports to EU
Change in Olive-Oil Price of Turkey	0,21 (1,91)	-0,21 (-4,27)	0,09 (3,23)
Change in Olive-Oil Price of Greece	-0,91 (-6,70)	0,22 (3,81)	-0,02 (-0,78)
Change in Olive-Oil Price of Spain	1,51 (2,84)	-1,99 (-7,22)	0,42 (3,25)
Change in Olive-Oil Price of Italy	-6,75 (-3,71)	1,19 (2,17)	-1,52 (-5,31)
Change in per capita Income of EU	-19,25 (-3,07)	6,16 (2,34)	-1,14 (-2,69)
Constant	0,27 (1,50)	0,02 (0,27)	0,09 (4,81)
# of Obs.	60	60	60
R ²	0,71	0,66	0,53
The numbers in parentheses are Newey-West standard errors			

Table 4B: Export Demand of Fruit Juice

Dependent Variable	Change in Greek Fruit Juice Exports to EU	Change in Spanish Fruit Juice Exports to EU Change	Change in Italian Fruit Juice Exports to EU
Change in Fruit Juice Price of Turkey	-0,20 (-0,54)	0,24 (4,47)	0,08 (4,22)
Change in Fruit Juice Price of Greece	-1,04 (-3,78)	0,09 (2,84)	-0,01 (-0,31)
Change in Fruit Juice Price of Spain	-1,60 (-1,38)	0,03 (0,15)	0,10 (2,00)
Change in Fruit Juice Price of Italy	10,15 (6,61)	-0,48 (-2,34)	-0,62 (-7,99)
Change in per capita Income of EU	-12,36 (-2,04)	0,26 (0,53)	1,85 (5,89)
Constant	0,41 (2,12)	0,11 (3,82)	-0,02 (-1,24)
# of Obs.	60	60	60
R ²	0,23	0,24	0,15
The numbers in parentheses are Newey-West standard errors			

Table 4C: Export Demand of Tomatoes

Dependent Variable	Change in Greek Tomatoes Exports to EU	Change in Spanish Tomatoes Exports to EU Change	Change in Italian Tomatoes Exports to EU
Change in Tomatoes Price of Turkey	-0,13 (-0,68)	-0,30 (-2,00)	-0,05 (-0,91)
Change in Tomatoes Price of Greece	-1,00 (-7,45)	0,19 (2,93)	0,01 (0,21)
Change in Tomatoes Price of Spain	0,32 (0,88)	-0,70 (-1,62)	-0,21 (-1,42)
Change in Tomatoes Price of Italy	0,57 (1,81)	1,65 (8,60)	-0,39 (-2,28)
Change in per capita Income of EU	3,00 (1,86)	5,11 (4,07)	1,18 (1,58)
Constant	-0,19 (-,311)	-0,8 (-1,71)	-0,03 (-1,48)
# of Obs.	60	60	60
R ²	0,12	0,38	0,24
The numbers in parentheses are Newey-West standard errors			

5. Conclusions

This paper has presented an analysis of the competitiveness of Turkey's fruit juice, olive oil and tomato sectors against its main rivals in EU market, Spain, Italy and Greece for the period 1995 to 2004. The empirical findings suggest that Turkey has a comparative advantage over its main rivals in EU market in the fruit juice and olive oil sectors, but not in the tomato sector. However, the results also showed that the advantages of Turkey have been declining from 2000. Thus the recent enlargement of the European Union and new rivals for the Turkish agro-food industry might further lower the competitiveness of Turkey in these sectors. However, since the revealed comparative and comparative export performance indexes only measure observed trade data, this observation alone does not prove significant

problems for Turkey. Distortions arising from both Turkish and European Union regulations might have contributed to declining competitiveness.

Moreover; Turkey's import demand estimations imply that Turkish prices significantly determine the market shares of the rival countries in the EU market. The econometric import demand of the EU model reveals that relative export prices matter in determining Turkey's competitive power in the EU olive oil and fruit juice sectors.

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Appendix I – EU Trade Data Sheets 1

	TOTAL EXPORTS		(\$)								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TURKEY	9.244.547.818	10.183.975.007	11.871.505.205	13.623.974.276	15.070.564.352	17.546.700.272	20.231.229.874	22.061.463.460	24.044.386.778	29.095.288.429	
SPAIN	48.302.378.586	54.936.362.685	62.379.882.554	69.354.831.775	72.714.138.206	84.708.054.184	86.069.891.231	89.874.854.266	94.159.077.078	100.011.007.930	103.059.807.371
GREECE	4.720.738.852	4.861.361.585	4.805.431.884	4.725.386.730	5.314.276.551	5.703.880.234	6.100.195.743	6.068.912.268	6.620.800.112	6.233.371.675	6.192.224.510
ITALY	93.280.815.886	100.311.087.639	105.075.805.135	114.746.948.374	116.577.368.279	132.003.335.470	132.299.316.961	129.269.831.496	132.978.822.062	141.085.997.258	141.894.182.604
	OLIVE OIL EXPORTS		(\$)								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TURKEY	75.946.168	47.503.322	38.894.499	25.014.477	108.755.930	10.652.511	74.476.124	27.254.755	83.582.329	40.847.590	113.933.724
SPAIN	316.527.978	612.599.239	798.955.160	670.935.506	423.937.989	652.266.700	747.823.003	1.084.442.884	957.984.487	1.253.694.789	1.147.552.686
GREECE	370.604.413	487.838.981	286.853.685	240.590.022	440.846.008	223.702.992	212.274.549	181.915.202	239.115.924	93.190.392	288.941.429
ITALY	229.534.175	273.501.843	207.598.907	187.450.062	288.403.929	273.947.207	280.441.557	290.103.584	317.833.200	364.951.660	421.672.374
	TOMATO EXPORTS		(\$)								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TURKEY	27.319.050	48.199.655	33.622.812	27.304.571	27.037.918	17.132.700	12.705.858	13.940.679	19.938.802	20.017.056	18.002.770
SPAIN	74.593.516	65.884.522	73.283.145	78.125.288	93.001.882	87.822.918	87.514.141	113.157.734	134.676.516	131.781.066	133.033.417
GREECE	81.779.404	70.411.780	83.247.417	93.020.758	83.620.101	70.964.963	64.354.375	58.163.104	60.051.116	50.222.129	55.765.145
ITALY	387.319.413	400.057.309	422.137.623	486.371.266	491.863.168	464.684.567	491.060.959	528.160.712	544.601.927	505.993.854	472.807.300
	FRUIT JUICE EXPORTS		(\$)								
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TURKEY	37.463.199	53.084.024	46.874.149	47.209.953	49.733.755	40.894.289	45.669.793	33.920.365	50.504.451	40.105.727	54.040.205
SPAIN	116.371.539	133.590.770	140.405.638	167.981.410	192.879.881	243.230.535	229.855.137	281.019.719	337.487.107	318.318.310	283.126.177
GREECE	13.429.581	6.440.626	9.437.374	18.695.720	9.901.376	12.647.320	6.833.522	4.585.582	3.853.619	3.352.265	5.172.488
ITALY	219.135.096	221.009.615	195.413.256	204.348.187	230.121.542	260.536.259	256.996.173	261.564.169	271.436.336	259.814.667	260.974.663

