



## **August 2015 – Volume 7, Number 14**

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**ISSN: 2211-8691**

**<http://www.centerforenergyandvalue.org/publications.html>**



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The Energy and Value Letter brings together academics and practitioners worldwide to discuss timely valuation issues in the energy sector. It publishes news from the Centre for Energy and Value Issues (CEVI), its linked organizations and others (including calls for papers), columns on topical issues, practitioners' papers: short articles from institutions, firms, consultants, etcetera, as well as peer-reviewed academic papers: short articles on theoretical, qualitative or modeling issues, empirical results and the like. Specific topics will refer to energy economics and finance in a broad sense. The journal welcomes unsolicited contributions. Please e-mail to [w.westerman@rug.nl](mailto:w.westerman@rug.nl) (Wim Westerman), a copy of a news item, column or a completed paper. Include the affiliation, address, phone, and e-mail of each author with your contribution. A column or news item should not have more than 400 words and a paper should not exceed 3,000 words.



## **About the CEVI books and future meetings**

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As I noted earlier, one of the core activities of researchers is to publish articles. CEVI offers a platform for energy-related articles in the financial economics area. The Energy and Value Letter is such an outlet, as are the series of books that we publish in cooperation with Springer Verlag in Heidelberg (Germany). The first book was titled Financial Aspects in Energy (FAIE). It was published in 2011. The second book, called Energy Economics and Financial Markets (EEFM), was published in 2012. The third book, Perspectives on Energy Risk (PER), was published in 2014.

I am very pleased to note that in 2014, the number of downloads of the first three CEVI books was more than 13,500. This means that on average every chapter in these books was downloaded 365 times in 2014. In other words, during last year, all chapters of these books were on average downloaded every day. I hope that the newly launched fourth book, Energy Technology and Valuation Issues (ETVI), will go the same way. The individual chapters are most worth reading!

As I am writing this, we already underway with the fifth book. Provisionally called “Energy, Sustainability and Finance” (ESF), the book takes special interest in corporate social responsibility issues. Özgür Arslan-Ayaydin, André Dormsan and Mehmet Baha Karan are the editors. A number of authors are already working on their texts and the review process has already started. I hope that the book will be published in the fall of 2016. If we respect our deadlines and strive for the best quality, in line with the former books, it will be possible to attain that goal.

While we are still recalling the successful 5th CEVI conference in Istanbul this Spring (see also elsewhere in this issue), we are already working on our future meetings. Our 6<sup>th</sup> conference is planned in Spring 2017 and we hope to hold it somewhere in the Mediterranean area. We are also working on a plan to have a special workshop in a large energy conference in 2018. Next to this, we hope to be able to hold an Energy School somewhere in Europe, funding and organizational issues permitting.



**“The 5th Multinational Energy and Value Conference”**

**Organized by:**

**Center For Energy and Value Issues (CEVI),  
Amsterdam, The Netherlands**

**and**

**The Kadir Has University, Istanbul, Turkey**

**and**

**Energy Markets Research and Application Center of  
The Hacettepe University, Ankara, Turkey**

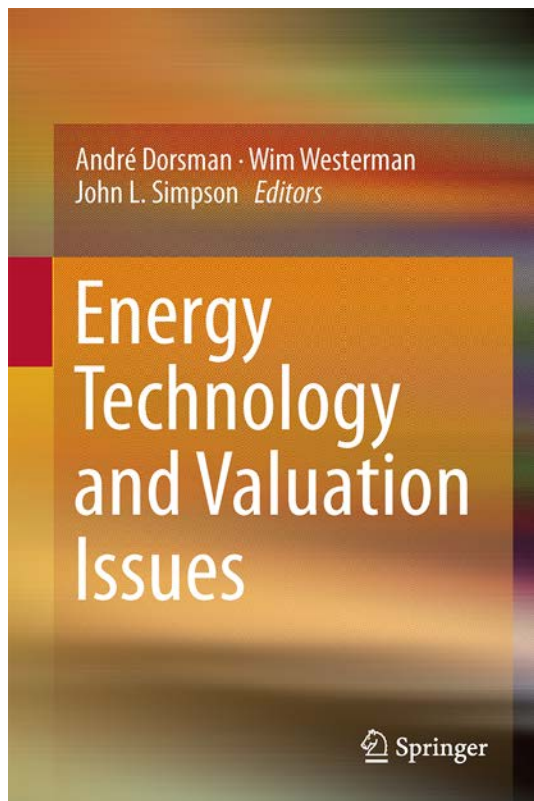
<http://www.centerforenergyandvalue.org/>

**May 7 – 10, 2015, Istanbul, TURKEY**

No, it is not possible to join the conference anymore, but it is nice to recall its success here. Chaired by Volker Erdinger, Mehmet Baha Karan and Necmiddin Bağdadioğlu, about 80 persons gathered to listen to 19 speakers and to join 20 paper presentations. Emphasis was laid on energy markets and hubs, renewables issues and (Islamic) financing. Furthermore, via the social functions, people got to know each other better, while having a good time together.

By way of a non-random list of highlights, the author of this section recalls the distinguished interest of Professor Ali Çağlar, vice-rector of Hacettepe University and Professor Dr. Mustafa Aydin, Rector of the Kadir Has University, the notion by André Dorsman that Turkey benefits from its long-lasting EU candidate status, a wealth of interesting presentations and discussions on energy markets, hubs and projects, as well as the thunderstorm organized by Mehmet Karan at the first evening's dinner.

Furthermore, the present author recalls the helpful paper discussions on various issues by young and old, male and female, Turkish and other academics. Whereas one is always sorry that some of our closest friends could not make it this time, it was nice to meet some scholar for the second, third or even fourth time, and one is of course always happy to make so many new acquaintances. Lastly, it was great to witness perhaps the oldest attendee, John Simpson, to hold the most presentations of all.



- Comprehensive collection of fresh research on energy finance and valuation
- Mix of authors from academia and practice
- International diversification of authors and topics

This volume investigates the impact of energy technology innovations on economic development and presents new areas of research into the financial economics of energy as well as new studies into valuation, electricity pricing and the economic, regulatory and environmental costs of alternative energy sources. Academics and practitioners take a global perspective and present cases from several countries. The book concentrates on three issues: 1) innovation and shocks in energy markets; 2) environment and renewables and 3) fossil fuel regulation. The book will provide a useful resource for anyone with an academic or business interest in energy and value issues.

This is the fourth volume in a series on energy organized by the Center for Energy and Value Issues (CEVI). The previous volumes in the series include *Financial Aspects in Energy* (2011), *Energy Economics and Financial Markets* (2012) and *Perspectives on Energy Risk* (2014).

**Content Level** » Research

**Keywords** » Alternative energy sources - Economic development - Electricity markets - Electricity pricing - Energy economics - Energy market regulation - Energy technology and innovation - Financial economics - Fossil fuel regulation - Renewable energy sources

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## **On the Influence of European Trade Barrier on Chinese Solar Panel Industry: Is the Solution of the Solar-Dispute “Successful”?**

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### **Abstract**

In July 2013 the European Union imposed restrictions on the import of Chinese produced solar panels, in an effort to protect European manufacturers from what was alleged to be state-sponsored dumping by state-sponsored Chinese firms. But how efficient and effective has that solution been? To consider the impact of the trade barrier on the solar panel producing industry, we build a sample of 454 solar-panel producing firms, from 58 countries, active in the industry in the period 1980-2015. We then consider: how the announcement of the trade barrier impacted: (1) the value of these firms; and (2) the behaviour of these firms, in terms of their domestic and international reorganisations (through, for example, mergers and acquisitions). Our results suggest: (1) that the announcement of the trade barrier saw US\$ 8,19 million erased off the value of the average European solar-panel producing firm – possibly due to the fact that, at €0.56/Wp, the barrier did not offer European manufacturers sufficient protection – and erased US\$ 247.03 million off the value of the average Chinese solar-panel producer – probably because of the extra cost that the barrier implied, and (2) that fewer acquisitions, in general, were done after the introduction of the trade barrier, possibly due to the aforementioned destruction in value, but find that Chinese firms increasingly reorganised both their domestic operations – perhaps in an effort to increase scale economies, so as to overcome the costs implied by the barrier – and their international operations – perhaps in an attempt to circumvent the barrier. We conclude therefore, that the trade barrier appears both to be inefficient and ineffective, in that it both hurt the companies it aimed to protect, while those it sought to punish may have started to simply circumvent it.

### **Introduction**

The Chinese solar panel industry quadrupled in size between 2009 and 2014, and China is now the world's largest producer of solar panels. The Government has played a significant role in this process by, for example, subsidising Chinese solar-panel manufacturers, often in the form of low-cost loans through the Chinese Development Bank (CDB) (Lacey, 2011). Notably, in 2010, the five largest Chinese producers received low-cost loans of USD 30 billion from the government sponsored by the Chinese Development Bank. This has had two effects on the wider industry. Firstly, the subsidy has enabled Chinese producers to survive where others would not. Haley & Haley (2013) reports that the six biggest Chinese solar panel producers had debt ratios of over 80% in 2012, and concludes that without government support, all of these would have done bankrupt. Secondly, the subsidy has enabled Chinese producers to operate below cost, and therefore to drive competitors from the market. Chinese manufacturers now

sell solar panels at a cost of €0.47/Wp (watt peak power) (EU ProSun, n.d.), while European manufacturers, who cannot receive governmental support according to both European law, produce solar panels at a cost of €1.10/Wp.

In July 2013, European legislators declared the Chinese subsidy unfair, and imposed restrictions to protect European manufacturers from what was said to be state-sponsored dumping. Since then, Chinese firms have been restricted to exporting a maximum of 7 GW (gigawatts) per year, at a minimum of €0.56/Wp, or face of anti-subsidy tariffs of 3.5-11.5%, and anti-dumping rates of 27.3-64.9% (European Commission, 2013). But how efficient and effective has that solution been? European producers have suggested that Chinese firms are dumping at a price about the level of the minimum price set by the European Union, making them inefficient. And international business scholars suggest that firms subjected to trade tariffs can often reorganise their international operations to avoid them, in what is termed tariff-jumping (Motta, 1992; Belderbos, 1997; Blonigen (2002) through, for example, international acquisitions (Neary, 2009).

To consider the impact of the trade barrier on the solar panel producing industry, we build a sample of 454 solar-panel producing firms, from 58 countries, active in the industry in the period 1980-2015. We then consider two questions. Firstly, we consider how the announcement of the trade barrier impacted the value of these 454 firms. Using an event study methodology, we estimate the way in which the market value of these firms changed after the announcement of the trade barrier. We expect that European firms – as the intended beneficiaries – will have reacted positively to the announcement, and Chinese firms – as the intended targets – will have reacted negatively. Secondly, we consider how the announcement impacted the behaviour of these firms. Looking at a sample of 1,396 acquisitions, within the solar-panel producing industry, in the period 1980-2013, we consider if the announcement of the trade barrier caused any statistically significant change in the level of consolidation.

We expect that the industry as a whole will not have changed its behaviour, but that Chinese firms, in particular, will have sought to reorganise their operations, internationally, in an effort to circumvent the trade barrier. We find that while the trade barrier impacted the industry, it appears not to have had the impact that European regulators had hoped for. Our results suggest, firstly, that the trade barrier led to a widespread destruction of value. We find that the announcement of the trade barrier saw US\$ 8.19 million erased off the value of the average European solar-panel producing firm – possibly due to the fact that, at €0.56/Wp, the barrier did not offer European manufacturers sufficient protection – and erased US\$ 247.03 million off the value of the average Chinese solar-panel producer – probably because of the extra cost that the barrier implied. Thus, the barrier hurt all manufacturers, albeit for different reasons.

Secondly, we report that fewer acquisitions, in general, were done after the introduction of the trade barrier than had been forecast to occur before the barrier. Why, precisely, remains unclear. It could be, however, linked to the destruction in value. We observe that Chinese acquirers were the exception to that rule, in that Chinese firms increasingly reorganised both their domestic and international operations after the barrier. Domestic reorganisations may signal that Chinese firms have, for example, looked to improve production efficiencies, through scale economies, so as to overcome the additional costs implied by the barrier, but international reorganisation may signal that Chinese acquirers are also looking to increasingly internationalise their operations, perhaps in an attempt to circumvent the trade barrier. In other words, it appears that the barrier discouraged, or perhaps even disabled European manufacturers from reorganising, but stimulated Chinese manufacturers to reorganise. We conclude, therefore, that the trade barrier appears both to be inefficient and ineffective, in that it both hurt the companies it aimed to protect, while those it sought to punish may have started to simply circumvent it.

## Methods

We use the *Thomson SDC (Security Data Company) Platinum Database* to build a sample of firms. We refine this to include only those firms active in the solar panel manufacturing industry, using the firm's 4-digit *Standard Industrial Classification (SIC 3433)* code. Doing so creates a sample of 454 firms, from 58 countries, active in the industry, in the period 1980-2015.

We estimate the impact of the announcement of the trade barrier on the firms using a market-adjusted event study (e.g., Fama and French, 1993). The event study posits that the impact of an 'event' – in this case, the announcement of the trade barrier on July 27<sup>th</sup> 2013 – can be estimated by comparing the firms 'actual' performance, after the announcement, with its 'expected' performance, before the announcement, controlling for wider economic effects, such as terrorist attacks. We estimate performance as:

$$R_{ijt} - R_{ft} = \alpha_{ij} + \beta_{1ij}(R_{jt}^m - R_{ft}) + \varepsilon_{ijt}$$

where  $t$  is time,  $i$  is the index for the announcement, and  $j$  is the firm index.  $R_{ijt}$  represents the return of the respective stock of firm  $j$  for announcement  $i$ ;  $R_{jt}^m$  denotes the return on the portfolio representing a market  $m$  (for example, the AEX, CAC, DAX, FTSE or the S&P500) for firm  $j$  on day  $t$ ;  $R_{ft}$  indicates the return on an investment with zero risk on day  $t$ .

We estimate our equation for each firm, and calculate the firms 'normal' performance using a 1-month estimation period; in other words, we forecast the firms normal performance based on its performance in the period March 27 to April 27. Then, we compare the firm's actual and normal performance to calculate the 'abnormal' returns ( $AR_{ijt}$ ) to the firm. We calculate  $AR_{ijt}$  as:

$$AR_{ijt} = R_{ijt} - E[R_{ijt}]$$
$$AR_{ijt} = R_{ijt} - R_{ft} - [(\hat{\alpha}_{ij} + \hat{\beta}_{1ij}(R_{jt}^m - R_{ft}))]$$

where  $R_{ijt}$  is the actual return, and  $E(R_{ijt})$  is the expected or forecast return. Finally, we calculate cumulative abnormal returns ( $CAR_{ij}$ ) as:

$$CAR_{ij} = \sum_{t=t1}^{t=t2} AR_{ijt}$$

where  $t1$  is the beginning of the event window, and  $t2$  is its end. We calculate cumulative abnormal returns to the firm in the five days around the announcement. In other words, we estimate how much the firm under- or over- performed its expectation, five days around the announcement. To turn the impact of dollar terms, we retrieve data on each firm's market capitalization from *Datastream*. Multiplying the firm's market capitalisation by the CAR turns the percentage change in value (CAR) into a dollar value.

To consider the impact of the trade barrier we construct an indicator variable, *Trade Barrier*, which we set equal to 1 if the acquisition was announced after the trade barrier, and equal to 0 if it was before the barrier.

## Results

The sample includes 454 stock listed companies, 26 of which are Chinese. Looking at the impact of the *Trade Barrier* on the value of these firms, we report that the *Trade Barrier* negatively and significantly impacted the stock market value of the average firm in our sample. We report that the value of the average stock listed company in our company dropped by 0.09% on the announcement. The average European firm – the intended beneficiaries of the barrier – suffered a loss of 0.08% on the announcement. The average Chinese firm – the intended target of the barrier – suffered a loss of -1.6%. This, although the barrier had a negative impact on both Chinese companies and European companies, the negative impact for Chinese companies was 30 times bigger than for the European companies. See also *Table 1*.



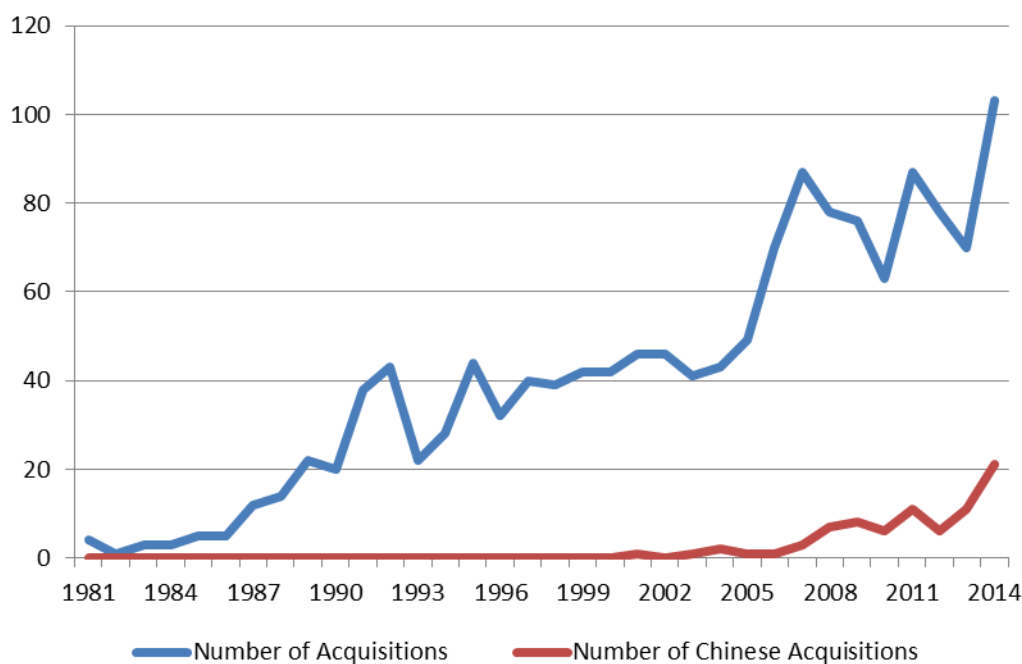
*Table 1 – The Impact of the Barrier on Value of the Industry*

Sample	N	Mean	StDev	Average Loss in US\$	Total Loss in US\$
All	454	-0.0009	0.04327	102.47 mln	4,6524.54 mln
China	26	-0.01601	0.03881	247.18 mln	6,426.84 mln
Europe	231	-0.00086	0.02692	8.19 mln	1,892.90 mln

The average firm in our sample has a market capitalisation of USD 113 billion. A loss of 0.09% implies that the average firm lost USD 102 million on the announcement of the trade barrier. For European firms -- market capitalization = USD 9.5 billion – and Chinese firms -- market capitalization of USD 15.4 billion -- the negative effect of the barrier translates into an average loss of USD 8.19 million and USD 247.03 million per company over the five day window of our analysis. In total, we estimate that the industry (n=454) lost USD 46.5 billion on the announcement, European firms (n=231) lost USD 1.8 billion and Chinese firms (n=26) lost USD 6.4 billion. From this we can conclude that the impact of the trade barrier was a wide-spread destruction of market value, by stock listed firms in all regions.

The full sample reports on 1,396 acquisitions in the period 1980-2013. *Figure 1* illustrates the growth on the number acquisitions in the period.

*Figure 2 – Acquisitions in the Solar Panel Industry*



We report that most (44%) of the acquisitions in within the industry in the period were within industry consolidations. US acquirers were the most active (18,6%), followed by the UK (10,1%) and Germany (8,95%), and most targets were European (58,8%), followed by North American (22,3%) and Asia (7,6%). The sample includes 79 deals involving Chinese companies; in 56 of these, both the target and the acquirer were Chinese. In the full sample, the average deal was concluded for \$65.19 million (US).

Table 2 – The Impact of the Barrier on the Number of Acquisitions in the Industry

VARIABLES	(1) Total Number of Acquisitions	(2) Total Number of Chinese Acquisi- tions	(3) Total Number of Chinese Out- bound Acquisiti- ons	(4) Total Number of Chinese Acquisi- tions	(5) Total Number of Chinese Out- bound Acquisiti- ons
Trade Barrier	-23.45** (0.0324)	5.817** (0.0134)	1.555*** (0.000252)	9.555*** (1.29e-06)	2.110*** (1.37e-07)
Number of Acquisitions				0.159*** (4.34e-07)	0.0237*** (3.35e-05)
Year	2.584*** (3.67e-10)	0.212*** (0.00160)	0.00458 (0.665)	-0.200** (0.0140)	-0.0566*** (0.000666)
Constant	-5,122*** (4.35e-10)	-422.3*** (0.00165)	-9.110 (0.666)	394.4** (0.0145)	112.1*** (0.000684)
Observations	35	35	35	35	35
Adjusted R-squared	0.709	0.500	0.400	0.776	0.648

pval in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2 above presents results on the effect of the trade barrier on the merger market. In *Model 1*, we consider the impact of the *Trade Barrier* on the total number of acquisitions in the solar panel industry, in *Model 2* we consider the impact of the *Trade Barrier* variable on the total number of acquisitions in the solar panel industry involving Chinese firms, and in *Model 3* we consider the impact of the *Trade Barrier* variable on the total number of international, outbound acquisitions in the solar panel industry, involving Chinese acquirers. In each of these three cases we control for the year specific effects (Year). In *Models 4* and *5* we re-run *Models 2* and *3*, but control this time too for the total numbers of acquisitions (the dependent in *Model 1*), to account for the overall rise in deal making in the period.

The results of *Model 1* suggest that the *Trade Barrier* had a significantly negative impact on the number of mergers and acquisitions in the wider solar panel industry. It suggests that fewer acquisitions were completed after the trade barrier than had been forecasted to occur in the absence of the barrier. The positive and significant coefficient for the *Trade Barrier* variable in *Model 2* suggests, however, that the *Trade Barrier* did have a positive and significant effect on the number of acquisitions involving Chinese firms. Similarly, the positive and significant coefficient for the *Trade Barrier* variable in *Model 3* suggests that the *Trade Barrier* also had a positive and significant effect on the number of outbound acquisitions involving Chinese acquirers. *Models 4* and *5* show that these conclusions remain robust once we control for the overall rise in acquisitions. In each case, the coefficient can be read as the number of additional or fewer deals. From this we can conclude that the *Trade Barrier* negatively impacted the wider market, and did not lead the average firm to reorganise, but it did lead Chinese firms to reorganise both domestically and internationally.

### Discussion and conclusion

The purpose of the trade barriers, introduced in 2013, was to protect European firms from the alleged dumping of solar panels by Chinese manufacturers. We report that while the barrier impacted the industry, it appears not to have had the impact that the European regulators had hoped for. Our results suggest, firstly, that the trade barrier led to was a wide-spread destruction of value in the industry: manufacturers, in all regions, suffered a loss in market value. Secondly, and as a response to this, we report that fewer acquisitions were done after the introduction of

the barrier. We observe, however, that Chinese acquirers were the exception to that rule, and that Chinese acquirers have begun to reorganise their domestic and international operations in 2013. Domestic reorganisations may signal that Chinese firms are, for example, looking to improve production efficiencies through scale economies, so as to overcome the costs implied by the barrier. International reorganisation may signal, however, that Chinese acquirers are also looking to internationalise their operations, perhaps in an attempt to circumvent the trade barrier. If so, then our results suggest that the trade barrier was both inefficient and ineffective, in that it both hurt the companies it aimed to protect, while those it sought to punish may have started to simply circumvent it.

As with all empirical research, our findings are subject to a number of limitations. Two are particularly noteworthy in this case. Firstly, we cannot perfectly identify solar panel producing firms; the SIC code 3433, which we employ to identify the firms in the solar panel manufacturing industry, includes solar panel producing firms but also a number of non-solar panel producing firms. It is likely, therefore, that we include a number of firms in our analysis, which should not have been included. We hope that future researchers will pick up on this limitation, and devise a less noisy way of identifying the firms in this industry. Secondly, and in measuring the impact of the trade barrier on the value of the firm, we only include stock listed firms. We do so because non-stock listed firms do not provide the information necessary for us to complete our analysis. In doing so, however, we note that our results describe only a sub-set of the full solar panel producing industry. We hope that future researchers will pick up on this point too, and will look to build a more complete set of firms in future.

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