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Electricity and The Economy

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Electricity and The Economy

Bui Trinh ^α, Bui Vu ^σ & Pham Le Hoa ^ρ

Abstract - Producing and consuming electricity are strongly related to macro-economic such as growth, employment and price. However, this relationship in many circumstances, places, times are not in a direction. The relationship of processing electricity and the economy depends on the structure between production and consumption, the cost of structure of sectors in the economy, the use of electricity by the producer, the consumer and internal structure of electricity industry of each country in each time.

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I. INTRODUCTION

Producing and consuming electricity are strongly related to macro – economic such as growth, employment and price. However, this relationship in many circumstances, places, times are not in a direction. The relationship of processing electricity and the economy depend on the structure between production and consumption, the cost of structure of sectors in the economy, the use of electricity by the producer, the consumer and internal structure of electricity industry of each country in each time. The process of forming the purchase price of electricity is the same with the price operation of other physical products from production, transport (transmission), to distribution (trade). In Vietnam today, the main power sources is thermal power and hydro power. Renewable energy sources are currently being tested on a few projects. In planning future of energy supply, renewable energy source is considered to develop, create a new supply source and it will be advanced. In other hand, Vietnam is planning to build the nuclear power factory to meet the requirement of electricity in the future. According to decision of the Prime Minister of 26/2006QD – TTg about the route of removing monopoly in electricity industry consist of 3 periods:

- Period from 2005 – 2014 : Competition of producing electricity is allowed, this will replace monopoly.
- Period from 2015 – 2022 : Competition of trading electricity is allowed.
- After 2022 : Competition of retail sell is allowed, electricity industry according to the market mechanism.

Recently, (December, 2012), The International Atomic Energy Agency (IAEA) invited 11 leading experts of economic models with researcher of IAEA to study and research for an IAEA standard model, to evaluate the impact of electricity and especially the impact of Atomic power project to the economy. Many models were presented then 2 models were presented for final decision are Input – Output analysis model and CGE model. I/O model was chosen to be an IAEA standard model that aims to recommend countries which has an Atomic energy's factory.

II. METHODOLOGY

The input – output table of Leontief (1941) aim to describe the economic' structure of a country⁽¹⁾ in form:

$$X = (I - A^d)^{-1} \cdot Y^d \quad (1)$$

Which X is a vector of production value, I is a unit matrix, A^d is a matrix of domestic coefficient of technique and Y is a final use matrix, matrix $(I - A)^{-1}$ is called Leontief's inverse matrix. From (1) can be growth to:

$$GVA = v \cdot (I - A^d)^{-1} \cdot Y^d \quad (2)$$

In which: GVA is total income from production, v is a coefficient of income.

Electricity affects the economy, for both production and final use. When electricity price changes, it will lead to changes in product prices. This mean the cost of production will change:

$$P^m = (I - A^d)^{-1} \cdot (GVA)' \quad (3)$$

A^d and $(GVA)'$ is the displacement of the matrix A^d and GVA. Matrix $(I - A^d)^{-1}$ is called Ghosh matrix (1958).

When prices increase in the economy, the pushing cost of the economy increase during the next production period and the direct coefficient matrix will be changed and determined as:

$A^m = p^m \wedge A$ ($p^m \wedge$ is a diagonal matrix with elements on the diagonal are elements of vector P^m)

And then coefficient matrix of income changes from $v \rightarrow v^m$

And $Y = Y(C, I, E)$

And:

$C = c \cdot T$ (T is total income and c is consumption coefficient)

$I = s \cdot S$ (S is saving)

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$E = E(A^*, \sigma)$, with A^* and σ is variables of foreign market and rate.

On the other hand, to evaluate other sectors in the economy can be spread by electricity. Matrix A^d can be divided to 4 sub-matrix, we have A^{cc} is the matrix of direct cost of sectors in the economy except industry of electricity, and A^{kk} is activities about electricity (such as hydropower, thermal power, atomic power and other power), the relation is implemented:

$$A = \begin{pmatrix} A_{cc} & A_{ck} \\ A_{kc} & A_{kk} \end{pmatrix} \quad \begin{pmatrix} X_c \\ X_k \end{pmatrix} = B \cdot \begin{pmatrix} Y_c \\ Y_k \end{pmatrix}$$

$$X_c = (I - A_{cc})^{-1} \cdot A_{ck} \cdot X_k \quad (5)$$

Similar:

$$X_k = (I - A_{kk})^{-1} \cdot A_{kc} \cdot X_c \quad (6)$$

In which:

$(I - A_{cc})^{-1} \cdot A_{ck}$ show the level of the power of dispersion of other sectors (excluding the industry of electricity) are spread by the electricity industry.

III. EXPERIMENTAL STUDY

Consider the relationship between the growth in electricity production and GDP growth in the period 2001 - 2012, we can see this relationship is not in the same direction but the growth rate of electricity production is always higher than the growth rate of GDP, however, the distance of 2 growth rates is getting quite far, from 2008 and especially the year 2012 when the growth rate of electricity production got over 12%, GDP rate was only 5.03%. The power source of our country is not only from production of thermal power, hydropower but also imported a big amount from China. So the relationship between processing electricity and GDP growth just only showed a path of it, but the distance between electric growth and GDP growth showed that the coordination and the efficiency of electricity sector is not high.

Using the method of input - output analysis base on input - output table of Vietnam in 2000 and 2007³, we can see that if 1 unit of GDP is increased, so the requirement of electric product is 1.19. Until 2007, if 1 unit of GDP is increased, the amount of electricity from approximately 1.3% increased to 8%. Other interesting thing is also according to the input - output table that the requirement of electricity increase strongly because of electricity cost of electricity sector itself, while the requirement of other sectors reduce for 1 unit. Is this why more energy is lost daily?

Demand for electricity can also increase due to changes in process of technology, but other studies showed that the productivity's target of total factor of Vietnam is increasing seriously. If in 2000- 2005, this

target contributed to growth over 22%, to period of 2006-2011, this target could only contribute to growth approximately 7%, replacing is the capital factor that is basic contribution of GDP growth. So the effect of this sector or the economic structure needs to be revised? Because if we look closely at the structure of final demand (including final consumption, investment and export), demand of electricity increased by 13% for an increased unit in export. So we can see the error here is not all because electricity sector but also because of the economic structure, inefficiency in electricity use also cannot be encouraged at any cost to export, and the overall restructuring of the economy is becoming more urgent than ever, from the structure of production to final use; sectors that should be encouraged are sectors that have high index of power of dispersion to domestic economy, low to import and efficient use of energy resources (Appendix 4). The year 2012 just showed export (export surplus) of Vietnam essentially belonging to the FDI. Is this just export natural resource, labor (because it's basic processing, added value content in export that is very low) and cheap energy? Whereas what we expect in this region is the flow of money, so if Gross National income (GNI) get smaller and money flow out, it increased more than 13 times for current price, and it increases approximately 8 times for the price of 94. To increase the electric price to be equal to the world's price without distinction, only domestic industry and the people will suffer! Due to the efficiency of the electricity sector and distorted economic structured for sectors, for export, and for region of ownership (The Government, not Government's region and FDI). So people and the economy suffer from increasing electricity cost from 2006 to 2010 (Appendix 2) with an argument that "to increase electricity cost to be equaled to the world's cost, whereas income of the people is far from income of other countries in the world and in the region. Besides, to increase electricity price will affect to the price index and the growth that the price index get higher and the income of people get lower (Appendix 3). As calculated from the model on the impact of increasing electricity price, it's a multi periods impact. However, this impact gets smaller after each period, and to a point of time it's almost fixed. But if electricity price constantly increases for many time, the impact of this period will spread by the multiplier to previous period. This impact is not small for people's life and production of sectors in the economy.

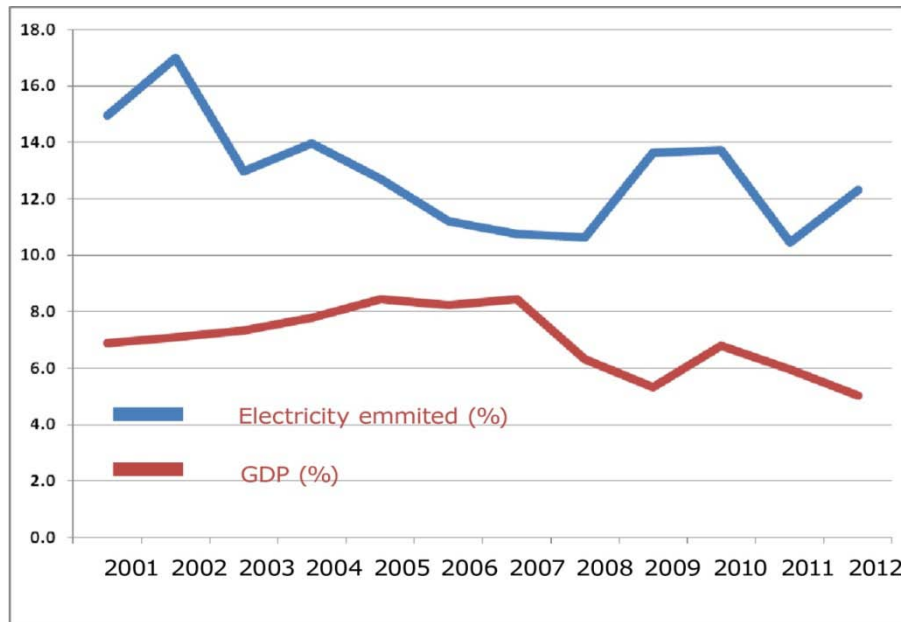
IV. ACKNOWLEDGMENTS

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REFERENCES RÉFÉRENCES REFERENCIAS

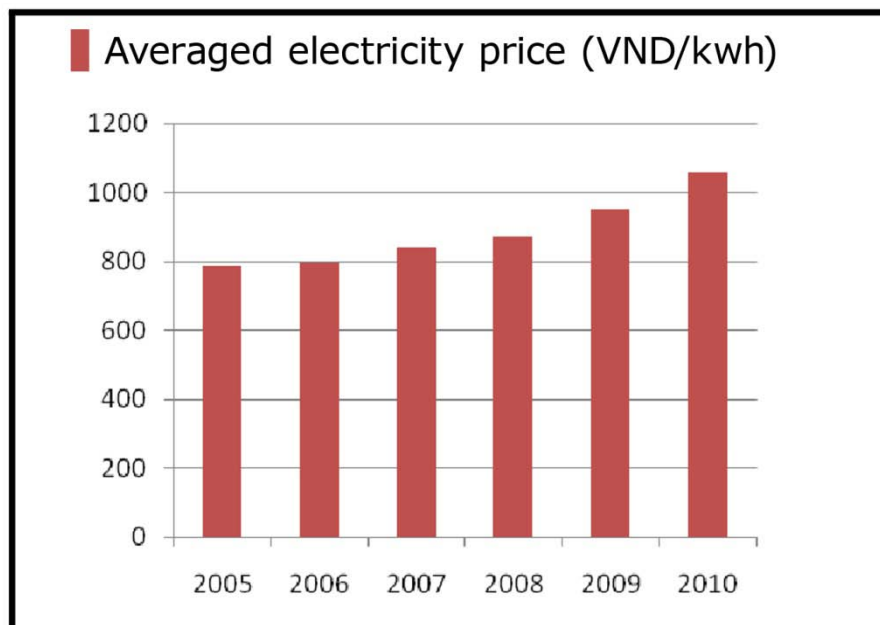
1. Manki Lee "Atomic power and national economy" A report to IAEA, 2012.
2. David Solan "Input-Output Analysis and Economic Models for Small Modular Reactors: Model Construction, Development Options and Future Considerations" report to IAEA, 2012.
3. Bùi Trinh " Estimate on Electricity impacts based on Input-output analysis" report to IAEA.
4. Ferenc L. Toth "Macroeconomic Impacts of Nuclear Power Programmes" report to IAEA.
5. Leontief, W. (1941) The Structure of the American Economy, 1919±1939 (Oxford, UK, Oxford University Press).
6. Ghosh, A. 1958. "Input-Output approach in an allocation system". *Economica*, Vol. 25, pp 58-64.

Appendix 1 : The Growth Rate of Electricity and the Growth Rate of GDP



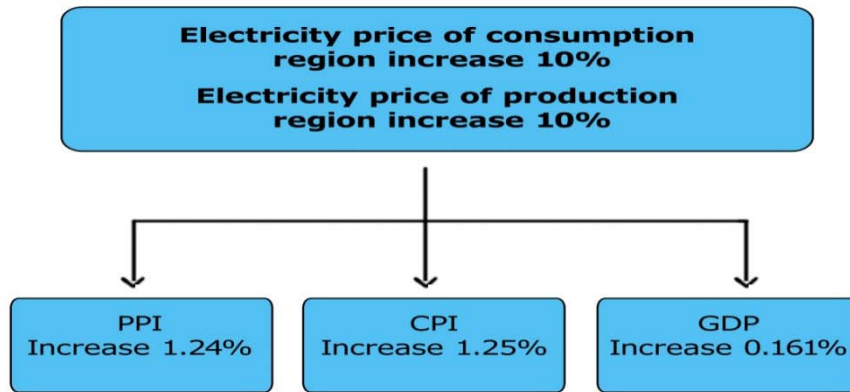
Source : GSO and calculation of Nguyen Viet Phong, Nguyen Van Hiep.

Appendix 2 : Averaged electricity price (VND/kwh)



Source : GSO and calculation of Nguyen Viet Phong, Nguyen Van Hiep.

Appendix 3 : The impact of increasing electricity price



Source : GSO and study of Nguyen Duc Thanh, Bui Trinh.

Appendix 4 : Elemental Coefficients

		The Index of the Power of Dispersion of the Economy.	The Index of the Power of Dispersion of Import.	The Index of the Power of Dispersion of Energy.	The Rate of Added Value/ Production Value.
1	Paddy (all kinds).	0.901	0.880	0.3397	56.9%
2	Sugarcane.	0.945	0.946	0.4268	47.5%
3	Other crops.	0.987	0.977	0.4792	41.1%
4	Raw rubber.	0.769	0.929	0.3037	64.8%
5	Coffee beans.	0.872	1.080	0.5012	41.9%
6	Tea, processed (all kinds).	0.779	0.944	0.3258	62.2%
7	Other perennial plants.	0.859	1.061	0.4762	44.8%
8	Buffaloes, cows.	1.149	0.724	0.3231	60.4%
9	Pigs.	1.794	0.752	0.7022	13.7%
10	Poultry.	1.616	0.748	0.6016	26.3%
11	Other livestock and poultry, n.e.c.	1.591	0.747	0.5870	28.1%
12	Agricultural services and other agricultural products.	1.484	0.796	1.1657	23.3%
13	Round timber.	0.932	0.974	0.2140	42.8%
14	Other forestry products; forestry service, planting tree.	0.853	0.858	0.2683	60.3%
15	Fishery.	0.764	1.665	0.5467	34.0%
16	Fish farming.	1.694	0.771	0.7104	21.6%
17	Exploitation of coal (clean coal).	1.042	1.058	0.9432	26.7%
18	Crude oil.	0.660	0.770	0.1365	89.7%
19	Natural gas.	0.692	1.218	0.2073	57.2%
20	Stone, sand, gravel, clay.	0.849	1.062	0.8223	49.4%
21	The remaining other mineral exploitation.	0.873	0.930	1.3423	56.1%
22	Support service for mining and ore.	1.377	0.789	0.7561	14.7%
23	Processed and preserved meat, products from meat.	2.034	0.743	0.7112	8.3%
24	Processed and preserved seafood, products from seafood.	1.713	0.782	0.9155	7.8%

25	Processed and preserved vegetables.	1.516	0.848	0.7551	14.4%
26	Animal, vegetable oil.	1.102	1.276	0.2982	2.9%
27	Milk and products from milk.	1.191	0.885	0.7297	23.6%
28	Rice	1.535	0.733	0.5527	1.6%
29	Powder (all kinds).	1.480	0.805	0.5451	1.5%
30	Sugar.	1.265	0.854	0.8225	22.4%
31	Cocoa, chocolate, candy and products from flour.	1.430	0.911	0.9927	11.0%
32	Processed coffee.	1.013	0.802	0.5118	54.1%
33	The remaining of foods (pasta, noodles and similar products, processed food, spices, sauce, vinegar, beer yeast,etc...	1.421	0.904	0.9782	12.3%
34	Animal feed.	1.636	0.828	0.6683	1.1%
35	Wine.	1.129	0.958	0.7432	22.9%
36	Beer.	1.151	0.969	0.7707	20.1%
37	Non – alcohol drinks, mineral water.	1.132	0.959	0.7466	22.6%
38	Cigarettes.	1.229	0.921	0.6015	9.3%
39	Fiber (all kind).	1.213	1.076	1.1910	9.6%
40	Products of textile (all kind).	1.203	1.070	1.1747	10.8%
41	Costumes (all kind).	0.875	1.123	0.7022	19.2%
42	Leather, fur, prepared; luggage, handbags, cushions and similar products.	0.945	1.176	0.6368	21.9%
43	Food wears (all kind).	0.860	1.055	0.8253	37.2%
44	Wood (processed), and products from wood.	1.100	0.901	0.7245	32.1%
45	Paper (processed), and products from paper.	1.132	1.021	1.7795	17.5%
46	Product of printing, reproduction, record... (All kind).	1.070	0.982	0.9365	26.6%
47	Coke and other products from coke furnace.	0.809	1.039	0.2202	43.7%
48	Gasoline, oil (all kind).	0.766	2.010	0.1515	8.4%
49	Other products extracting from oil gas	0.795	2.065	0.5002	4.5%
50	Basic chemicals	0.982	1.434	1.8239	9.1%
51	Fertilizers and nitrogen compounds.	0.993	1.455	2.0667	7.1%
52	Plastic and synthetic rubber in primary form.	0.934	1.338	1.7008	18.5%
53	Other chemical products; artificial fibers.	1.030	1.201	0.9472	12.6%
54	Medicine, chemicals and pharmaceuticals.	0.984	1.065	0.6790	24.8%
55	Products from rubber.	0.735	1.003	0.1279	51.7%
56	Products from plastic.	0.811	1.165	0.3393	37.7%
57	Glass; products from glass.	0.777	1.255	0.9345	37.5%
58	Cement (all kind)	1.152	0.939	0.8952	30.4%
59	Non - metallic products and not arranged.	1.074	0.880	0.5935	32.2%
60	Iron, steel, cast iron.	0.921	1.480	0.6030	9.6%
61	The remaining metallic products.	0.873	1.379	0.4207	16.9%

62	Electronic components; Computer and computer's equipments.	1.327	1.024	0.5149	4.2%
63	Communication devices (telephone, fax machine, antennas, modems, etc...	1.055	1.025	0.3628	33.5%
64	Consumer electronic products.	1.684	0.967	0.5264	9.2%
65	The remaining electronic products and optical products.	0.757	1.015	0.5251	54.9%
66	Motors, generators, transformers, electric distribution and control equipment.	0.770	0.895	0.1817	64.3%
67	Batteries and accumulators.	0.790	0.901	0.2025	60.0%
68	Wire and wire's device.	0.787	0.868	0.1815	59.6%
69	Optical electric products.	1.009	1.117	0.6502	20.2%
70	Consumer electric products (refrigerator, dishwasher, washing machine, vacuum cleaner, etc...)	1.376	0.968	0.7279	8.3%
71	Other electric devices.	1.120	1.065	1.1173	13.1%
72	Common machines.	0.855	1.087	0.9940	36.7%
73	Dedicated machines.	0.980	1.302	0.7803	14.4%
74	Car (all kind)	0.885	1.362	0.5473	11.7%
75	Vehicle with the hook (except for car)	0.864	1.311	0.5114	17.5%
76	Ships and boats.	0.951	1.291	0.5623	18.2%
77	Motorcycle.	0.898	1.216	0.5646	22.6%
78	The remaining transports.	0.914	1.245	0.6003	17.7%
79	Beds, cabinets, tables, chairs.	1.023	0.862	0.6155	44.4%
80	Jewelry, fake jewelry and related details; Musical instruments, fitness and sport's instrument, toy, games.	0.768	1.118	0.4837	44.4%
81	Medical equipment, dental, orthopedic and rehabilitation.	0.723	1.012	0.6532	51.8%
82	Other manufacturing products are not arranged.	0.791	0.969	0.3282	60.7%
83	Electricity and transmission service.	0.885	0.795	27.8516	59.8%
84	Gas, distribution of gaseous fuels by pipe.	0.844	0.807	3.4650	64.1%
85	Distribution of steam, hot water, air conditioned and ice manufacturing.	0.912	0.776	7.3088	59.1%
86	Exploit, process and supply water.	0.835	0.820	4.3636	64.3%
87	Waste water treatment, waste.	0.823	0.881	0.8280	63.5%
88	Building (all kind)	1.048	0.957	0.3656	37.1%
89	Construction of railways and roads, public work, other civil engineering's.	1.052	1.131	0.5086	22.6%
90	Dedicated construction	1.140	0.992	0.6024	24.2%
91	Sale and repair cars and other motor vehicles; Sale, maintenance motor vehicle, motorbike; parts and accessories of motorbike, motor vehicle.	0.818	0.889	0.7329	55.3%
93	Railway's passenger transported.	0.817	1.213	0.4634	42.2%
94	Railway's goods transported.	0.799	1.167	0.4233	47.2%
95	Transport by bus; Other passenger transported on road.	0.746	1.646	0.1850	33.9%
96	Freight transported on road, pipeline transported.	0.743	1.621	0.1802	35.7%

97	Waterway's passenger transported.	0.760	1.542	0.1945	36.4%
98	Waterway's goods transported	0.765	1.573	0.2015	34.1%
99	Airline's passenger transported.	1.004	1.377	0.3789	13.6%
100	Airline's goods transported.	1.004	1.377	0.3789	13.6%
101	Warehousing and transport's support services.	0.798	0.873	0.5491	61.8%
102	Postal and courier services.	1.099	0.821	1.8503	36.2%
103	Residential service.	0.873	0.763	3.7114	58.7%
104	Food Service.	1.043	0.737	0.5390	64.1%
105	Publishing services.	1.109	0.890	0.7479	33.0%
106	Film, television, recording and music publishing.	1.069	0.779	1.1685	40.7%
107	Radio, television.	0.930	0.743	1.0195	53.2%
108	Telecommunication services.	0.975	0.772	0.3540	57.3%
109	programming computer service, consulting services and other information services .	0.983	0.757	1.5919	54.9%
110	Financial services (except insurance and social insurance).	0.763	0.832	0.0664	51.8%
111	Non-life insurance and re-insurance.	0.875	0.838	0.6727	61.6%
112	Life insurance, social insurance.	1.139	0.933	1.2629	28.7%
113	Other financial services.	0.923	0.814	1.2724	59.9%
114	Real estate business service.	0.819	0.791	1.9894	69.9%
115	Legal services, accounting and audit.	0.824	0.771	0.4180	64.4%
116	Headquarters office service; consulting services for management.	0.843	0.753	0.3797	65.3%
117	Architectural , testing and analysis technique service.	0.871	0.811	0.4483	61.8%
118	Research and development.	0.767	0.787	0.3814	76.6%
119	Advertising and market research service.	0.922	0.759	0.3502	62.3%
120	Other professional, scientific and technological service.	0.980	0.970	1.1115	38.5%
121		0.758	0.986	0.1207	63.4%
122	rent machinery and equipment (no operator), personal household appliance for rent	0.811	0.892	0.5227	60.8%
123	work and job service	0.917	0.805	0.9017	48.0%
124	travel agency services, tour business ; supporting services of promoting and organizing tour	0.843	0.999	0.4864	52.3%
125	Investigation services and security.	0.750	0.791	0.7620	76.0%
126	Sanitation services for house and landscape.	0.908	1.082	1.2494	42.2%
127	Administrative services, office support and other business supporting activities.	0.896	0.832	0.8077	58.5%
128	Service of communist Party activities, political and social organization, state management, defense and compulsory social security.	0.890	0.802	0.7087	63.8%
129	Education and training (except college, university and postgraduate).	0.874	0.784	0.8959	64.7%



130	College, university and post-graduate service.	0.821	0.790	0.6794	67.9%
131	Healthcare services.	0.884	0.979	0.7053	44.2%
132	Care services, centralized nurse and non-centralized social supporting services.	0.762	0.748	0.4958	79.9%
133	Creation, arts and entertainment, library services, archives, museums and other cultural services.	0.958	0.821	1.1012	52.0%
134	Lottery, Bet and gamble.	1.223	0.711	0.5225	37.3%
135	Sports; entertainment.	0.934	0.799	1.9843	56.1%
136	Other services of organizations and foundations.	0.970	0.849	0.8294	52.2%
137	Repair service for computer, other personal household appliances.	0.894	0.839	1.2584	59.7%
138	Household service; self-consumption products of household, service of organizations and international offices.	0.692	1.253	0.1626	61.7%