Review of Business and Economics Studies

REVIEW OF BUSINESS AND ECONOMICS STUDIES (ROBES) is the quarterly peer-reviewed scholarly journal published by the Financial University under the Government of Russian Federation, Moscow. Journal's mission is to provide scientific perspective on wide range of topical economic and business subjects.

CONTACT INFORMATION
Financial University
Leningradskiy Av. 51 Building 3,
125993 Moscow
Russian Federation
Telephone: +7(499) 943-95-23
Website: www.robes.fa.ru

AUTHOR INQUIRIES
Inquiries relating to the submission of articles can be sent by electronic mail to robes@fa.ru.

ISSN 2308-944X

Вестник исследований бизнеса и экономики

Издательство Финансового университета
125993, Москва, ГСП-3,
Ленинградский проспект, 51,
корп. 3, к. 104.
Тел. 8 (499) 943-95-23.
Интернет: www.robes.fa.ru.

Журнал «Review of Business and Economics Studies» («Вестник исследований бизнеса и экономики») зарегистрирован в Федеральной службе по надзору в сфере связи, информационных технологий и массовых коммуникаций 9 июля 2013 г. Свидетельство о регистрации ПИ № ФС77-54658.

Подписано в печать: 26.06.2014.
Формат 60 × 84 1/8.
Заказ № 82 от 27.06.2014.
Отпечатано в ООП Издательства Финуниверситета (Настасьинский пер., д. 3, стр. 1).
16+

Review of Business and Economics Studies

Volume 2, Number 2, 2014

CONTENTS

Вестник исследований бизнеса и экономики

№ 2, 2014

СОДЕРЖАНИЕ

Effect of Income on Political Preferences of Russian Voters*

Rustem NUREEV, Doctor of economics, Professor
Head of Macroeconomics Department, Financial University; Professor at National Research University – Higher School of Economics, Moscow
nureev50@gmail.com

Sergey SHULGIN, Ph.D. in economics
Russian Academy for National Economy and Public Administration (RANEPA), Moscow
sergey@shulgin.ru

Abstract. There was direct correlation between the voters' income and electoral support for incumbent in Russia during the 1990-s and early 2000-s. The results of election to the State Duma (the parliament) in 2011 and Russia's presidential elections in 2012 show the opposite. Using income data and electoral results in the Russian regions for each candidate (G. Zyuganov, S. Mironov, V. Zhirinovsky, M. Prokhorov, V. Putin) we defined the level of electoral support in different income groups. Results show the substantial changes in last 8 years in voting behavior. There is the effect of Putin's inversed threshold and the greatest proportion of votes negatively correlated (–1.58), with a group of people with incomes of 14,250 to 21,250 rub/month. Such inverse correlation may be due to a protest voting. Putin's electoral support has a positive correlation in low-income group. In this paper we analyze the determinants of voting behavior and show how the income distribution affects the voters' political preferences (based on the results of the presidential elections in 2012). For each candidate we defined the level of electoral support in different income groups. Also we analyzed income distribution of absent voters.

Аннотация. В статье анализируются детерминанты электорального поведения и показывается, каким образом распределение населения по доходам влияет на политические предпочтения избирателей (по итогам федеральных выборов 2012 г.) Определен пороговый уровень доходов, при достижении которого люди начинают проявлять социальную активность и заинтересованность в участии в электоральной системе (демократии). Показано влияние распределения доходов в российских регионах на политические предпочтения избирателей.

Key words: Political preferences, regional studies, electoral behavior, income distribution.

1. REVIEW

S. Kuznets was the one of the first who showed the importance of the distribution of income inequality for economic growth and social and economic progress (Kuznets, 1955; 1971; 1979). However, the focus of his research was not the problem of electoral behavior of voters. Almost ten years later, it becomes the subject of a special study (Lewis-Beck, 1988). Analyzing the Western democracies, the author suggested indirect, but reliable way to assess the economic factors on the electoral process. The book summarizes and complements the classical set of economic factors to explain the behavior of voters. M. Lewis-Beck believes that the majority of voters rarely appeal to the main macroeconomic indicators in assessing the economic situation and prospects of the economy.

According to M. Lewis-Beck, changes in voters' disposable income also have minor effects on electoral behavior. This paradox can be partly explained by the weak faith of the population in the government's ability to influence the personal financial situation (by arguments like: "The economic policy of the government matters, but does not affect me"). According to sociological researches in 1980-s, influence of government policy on personal well-being was felt by only 45% of population in UK, 44% in France, 40% in Germany, 34% in Italy, 49% in Spain, and only 20% in USA. Lewis-Beck uses his survey to show that in almost all the developed capitalist countries, the economic

* Влияние уровня доходов на политические предпочтения российских избирателей.

reasons are the most important in the vote. The motives of party self-identification (right/left in Europe, the Republicans/Democrats in the U.S.), appear much stronger than the motives of social or religious identity. The following factors strengthen the economic value of vote: the openness of the national economy, economic growth or its expectation, the presence of the ruling coalition or single party government. Among the developed countries studied by Lewis-Beck, the economic motives of the electoral behavior are mostly significant in the United States. In any case, the economic motive affects voting through the personal assessment of the economic development of the country's voters.

For assessment Lewis-Beck suggests three components: "Retrospective" (evaluation of the past compared to the present), "Prospective" (assessment of the future) and "Affective" (unexplained irritation, etc.). According to his study, the most important is "Prospective" evaluation of public policies, the second — "affective" component and the last — "retrospective" component of assessment.

Respondents were asked to rate the influence of the government on unemployment, inflation, personal well-being, balance of trade, economic growth, public debt and a number of other parameters. Unemployment was the most important parameter in all countries (UK, France, Germany, Italy, Spain) and inflation was on the second place. Other parameters (such as personal well-being, balance of trade, economic growth, public debt, etc.) were significantly less important than unemployment and inflation. We can see from Lewis-Beck that voters in Western democracies assess their economic situation and current trends primarily through their assessment of the future.

According to R. Kiewiet and D. Rivers (1984) voters are not inclined to attach great importance to the current macroeconomic situation. Authors believed that voters were rather farsighted than myopic, and votes do not tend to react with enthusiasm for the short-time economic improvement. Voters do not live by one day and are able to assess the dynamics of the economic situation. The authors in their studies used "Eurobarometer" data by George Gallup Institute. The authors suggested that economic motives of voting were particularly strong in the case of deterioration of the situation. Growth of economic indicators, as it turned out, did not lead to a significant increase of electoral support for incumbent. Economic growth matters only in case of a sharp change of direction in economic development (the typical example — Ronald Reagan's victory in the presidential election in 1984).

A. Sobyanin and B. Suhovolskiy (1995) studied the electoral process in Russia and demonstrated numerous examples of electoral frauds using electoral statistics. According to A. Lavrov (1997) social structure affects voters' political preferences. Lavrov argued that the higher share of urban population and share of population employed by the government (in public administration and state industry) and the share of people with tertiary education lead to the stronger electoral support for centrist and democratic candidates. And *vice versa*, support for the left politicians in 1990-s increased with a higher share of rural and agrarian population and with higher share of pensioners.

L. Smirnayagin (1999) studied the stability of political preferences and proposed a "degradation index", to explain the shifts in voters' political preferences. He estimated degradation index for Russia in 1990-s as 0.54. This means that 54% of the voters were ready to change their political preferences in the next election. This high percentage of voters who were ready to switch their preference means that formation of civil society in Russia is uncompleted.

V. Mau, O. Kochetkova, K. Yanovsky, S. Zhavoronkov, Yu. Lomakina (2000) studied the impact of different economics indications on electoral behavior. They argued that in late 90-s (1995–2000) the most important for electoral behavior were income and wages, tax payments, share of urban population. At that period the higher was the voters' income (wages etc.) the higher was support for ruling party. The similar findings were in later studies by O. Kochetkova (2004), according to which the support for incumbent politicians positively correlated with incomes and negatively correlated with unemployment and wage arrears.

U. Seresova (2005) agued that economic indicators were significant for the electoral process but were not the most important ones. She suggested that electoral behavior was better explained by the level of regional modernization and the role of traditional culture.

However, most of studies analyzed the situation of the electoral behavior of the 1990-s and early twenty-first century. In this paper we deal with a new political reality. In this article we further develop the approach suggested by S. Shulgin (2005) who examined how income distribution in different countries affected democratic institutions. Author used income distribution to analyze the levels of freedom of press measured by Freedom House.

2. DATA

In this paper we use official Russia's electoral statistics for presidential election 2012. All our findings consequently contain errors associated with reliability of official electoral statistics. There is an extensive literature that indicated the frauds during Russian elections. We discussed this problem in several articles (*Economic Sub-*

jects, 2010, etc.). The article (Enikolopov *et al*., 2013) discusses the results of the parliamentary elections in 2011. Authors compared election results in Moscow precincts attended by independent observers, with the election results in precinct where observers were not allowed.

The second part of our data describes income levels and income distributions in Russian regions. This statistics come from Russian Statistical Agency (RusStat). RusStat estimates income distribution based on data from the Household Budget Survey (HBS). Household Budget Survey was carried out by state statistics on a regular basis in all regions of the Russian Federation. The unit of observation in this survey is the household and its members.

3. DATA ANALYSIS

Using statistics on income level and income distribution, for each region we construct income distribution function. Income distribution function for given level of income evaluates the share of people within region who have such level of income.

RusStat's statistical yearbook "Regions of Russia" (*Regiony Rossii*, 2011) in Table 5.9 gives the distribution of population by per capita income (as a share of regional population). Table 5.8 (from yearbook) gives the share of total income by 20 per cent population groups (from the poorest 20% of population to the richest 20% of population).

We use data on income distribution and per capita income level to construct cumulative function that shows how many people has income below a certain value. For example, in the Belgorod region 4.2% of people have incomes of up to 3,500 rubles, 6.3% from 3 500 to 5 000 rubles, 10.6% from 5 000 to 7 000 rubles, 16.2% from 7 000 to 10000, 21.4% from 10 000 to 15 000, 23.0% from 15 000 to 25 000, 9.5% from 25 000 to 35 000 and 8.8% of disposable income — over 35 000 rubles per month (see Table 1).

Then, in the Belgorod region cumulative function of income shows that 4.2% of people have incomes of up to 3 500 rubles, 10.5% to 5 000 rubles, 21.1% up to 7 000 rubles, 37.3% to 10 000, 58.7% to 15 000, 81.7% to 25 000, 91.2% to 35 000, and the remaining 8.8% — of disposable income over 35 000 rubles a month.

For each region we build a linear approximation of the distribution function of per capita income (see the example in Figure 1). To determine how many people in the Belgorod region have income less than 6 000 rubles, we find average on intervals of distribution function 5 000 (10.5%) and 7.000 (21.1%), and the resulting 15.8%.

Income distribution data exist for 82 Russia's regions (for all 83 regions in Russia, with exception of Republic of Chechnya).

We use income distribution functions for each region to construct the variable "*share of population with incomes below X*". Figure 2 shows the distribution of Russia's regions by this variable ("*share of population with incomes below X*") on 4 different *X* (*Fig. 2a X=5000 rubles per month, Fig. 2b X=10 000 rubles per month, Fig. 2c X=20 000 rubles per month, Fig. 2d X=30 000 rubles per month).*

We use electoral statistics to construct electoral variable *"the share of votes for candidate N"*. We estimated *"the share of votes for candidate N"* as a share of voters participated in president election. We constructed electoral variables for all five candidates (*Zhirinovsky, Zyuganov, Mironov, Prokhorov, Putin).* Also we constructed electoral variable for *non-voters* — as a share of voters who were registered but did not participate.

Next, we looked for correlations between income variables "*share of population with incomes below X*" and electoral variables *"the share of votes for candidate N"*.

On Figure 3 presented scatterplots for electoral variable "*share of votes for Zhirinovsky*" and income variable "*share of population with incomes below X*" for different *X* (*Fig. 3a X=5000 rubles per month, Fig. 3b X=10 000 rubles per month, Fig. 3c X=20 000 rubles per month, Fig. 3d X=30 000 rubles per month).* On each scatterplot on Figure 3, vertical axis represents the same electoral variable ("*share of votes for Zhirinovsky*") and horizontal axis — income variable "*share of population with incomes below X"* for different income levels (5000, 10000, 20000, 30000 rubles per month)

Figures 4, 5, 6, 7, 8 present scatterplots ("income variable" vs "electoral variable") for other candidates (Fig. 4: for Zyuganov, Fig. 5: for Mironov, Fig. 6: for Prokhorov, Fig. 7 for Putin, Fig. 8: for non-voters.)

Table 1. Distribution of population by per capita income (as a percentage of the total for the Belgorod Region, 2010).

	Per capita income, rub. per month							
	to 3500,0	**from 3500,1 to 5000,0**	**from 5000,1 to 7000,0**	**from 7000,1 to 10000,0**	**from 10000,1 to 15000,0**	**from 15000,1 to 25000,0**	**from 25000,1 to 35000,0**	**more 35000,0**
Belgorod region	4,2	6,3	10,6	16,2	21,4	23,0	9,5	8,8

Source: Regiony Rossii, 2011.

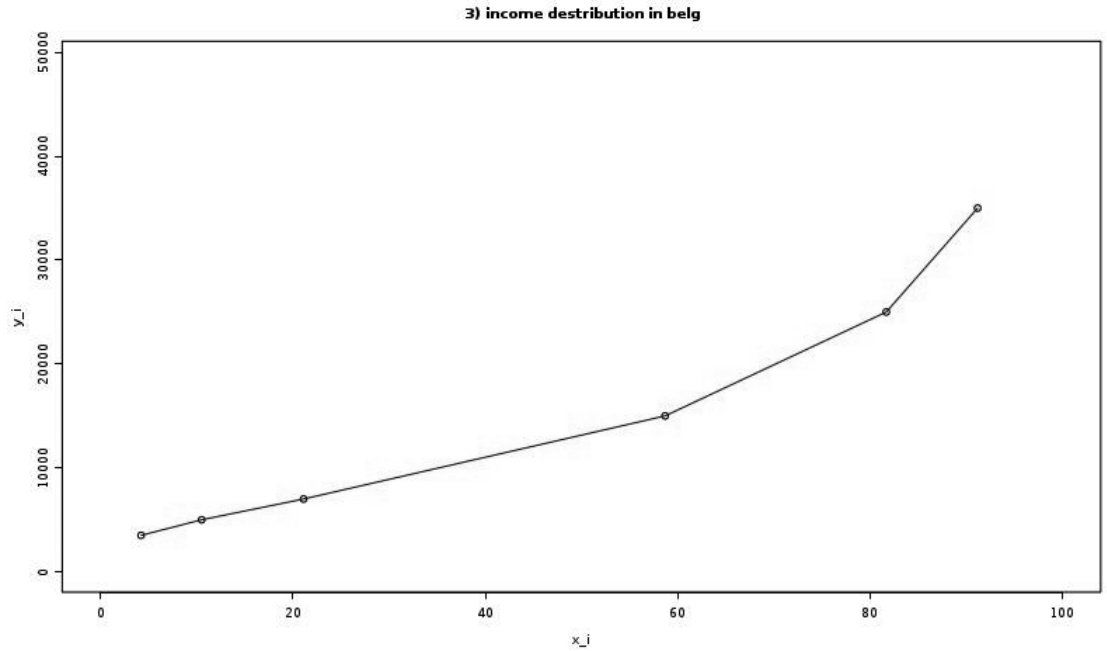


Figure 1. Example of cumulative distribution function approximation of average monthly income (for the Belgorod region, 2010).

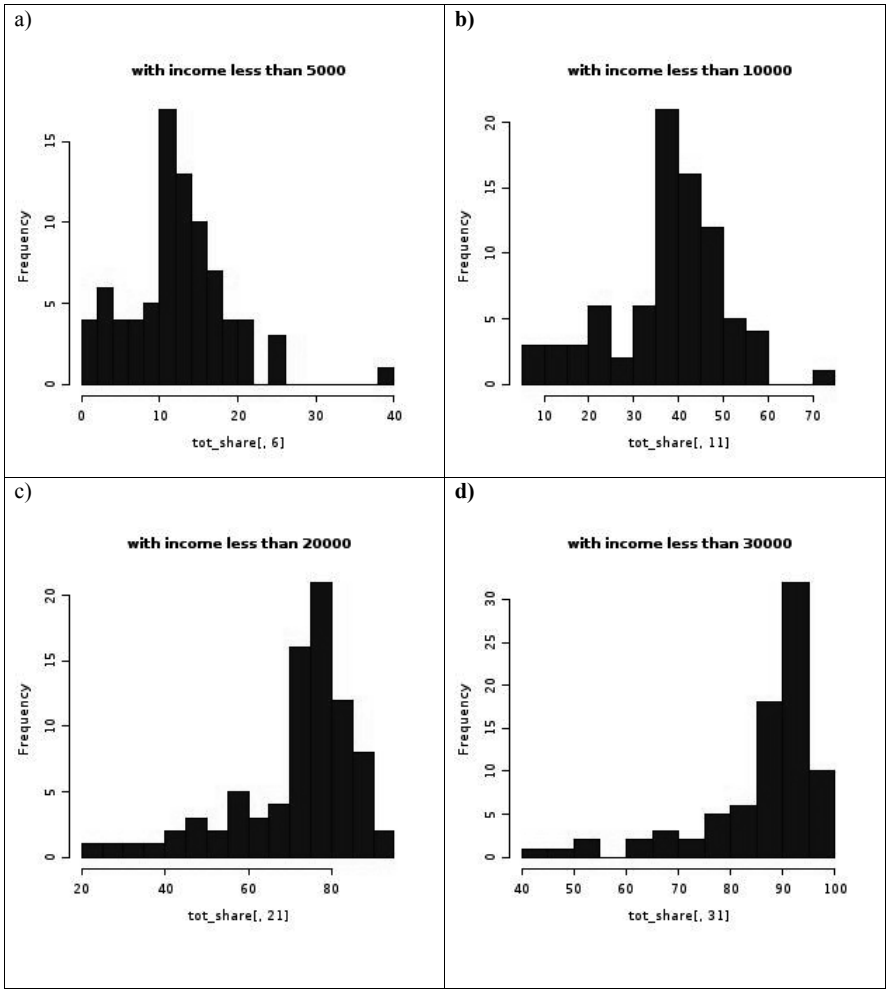


Figure 2. Distribution of Russian regions by the share of people with incomes less then:
a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

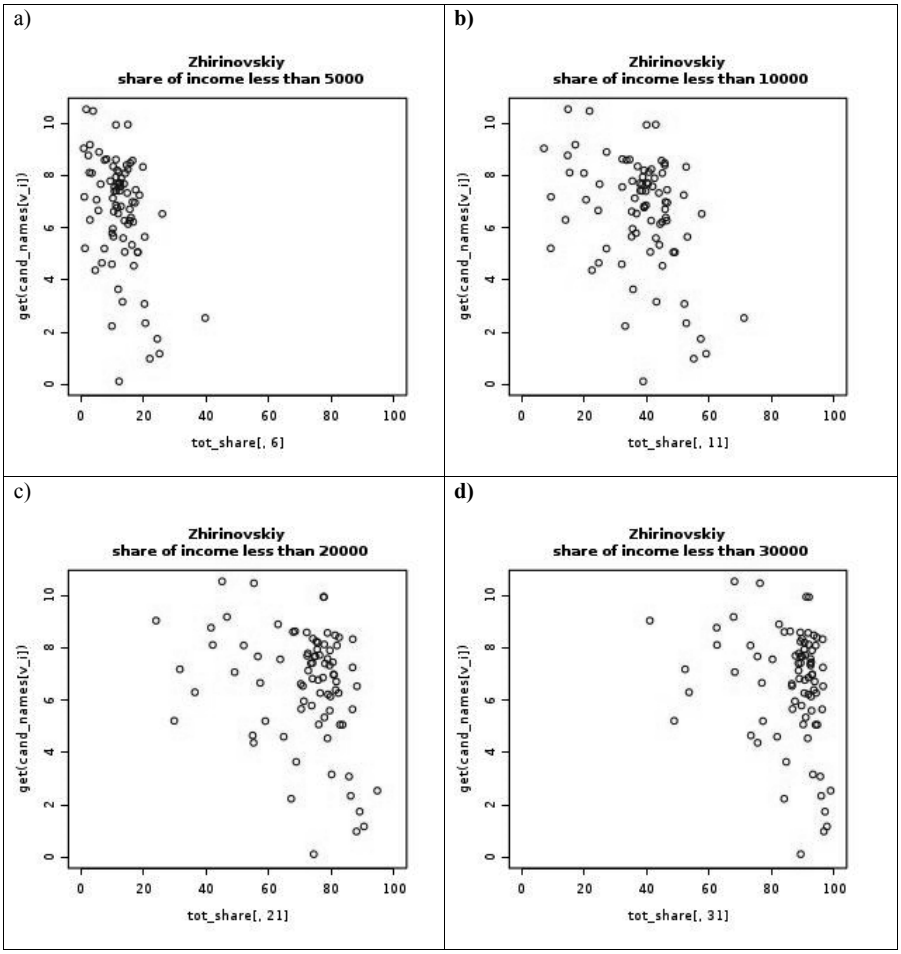


Figure 3. The share of votes for Zhirinovsky (vertical axis) vs. "share of people with incomes less then": a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

4. MODEL: ELECTORAL BEHAVIOR AND INCOME DISTRIBUTION

Previously we defined electoral variables as *"the share of votes for candidate N"* and income variables as "*share of population with incomes below X*". In our analysis we are looking for correlations between electoral variables and income variables. We analyze such correlations on all possible income levels (up to 100 000 rubles per month).

To analyze correlation between electoral and income variables we used model of simple pair regression (1):

$$Share\_of\_votes = a_0 + a_1 \times \times Share\_of\_population\_with\_income\_less\_than\_X + e. \quad (1)$$

The advantage of this approach is simplicity (since we use a large number of such pairs of simple regression to assess the most relevant interval). At the same time, simple regression leaves many possible interpretations in addition to correlation between the independent and the dependent variables. For example, we can expect that income depends on other variables, which also affect the electoral preferences (level of urbanization, education level, gender, age, etc.). Realizing that this approach can be criticized, we nonetheless underscore its advantage. It reveals the link between income and electoral support for the candidate. Many other important variables (education, urbanization, gender, age) are correlated with income, but we are interested in correlation between electoral behaviors of different income groups.

Figure 9 shows the distribution parameter estimation of the set of regressions where the dependent variable is the share of the vote for Zhirinovsky, and the explanatory variable is the "*share of population with incomes below X*". Figure 9a shows the distribution of F-statistics, and Figure 9b — the distribution of t-statistics of the coefficient of the explanatory variable.

In simple regression F-statistics coincides with the absolute value of t-statistics, we use t-statistics when the sign is important. Sign in the t-statistics is the sign of correlation between dependent and independent variables. The negative sign indicates the negative correlation between the share of votes for a candidate and a share of people with certain level of income.

In Figure 9b points 1–4 correspond to the results of the regression estimates, based on data that are dis-

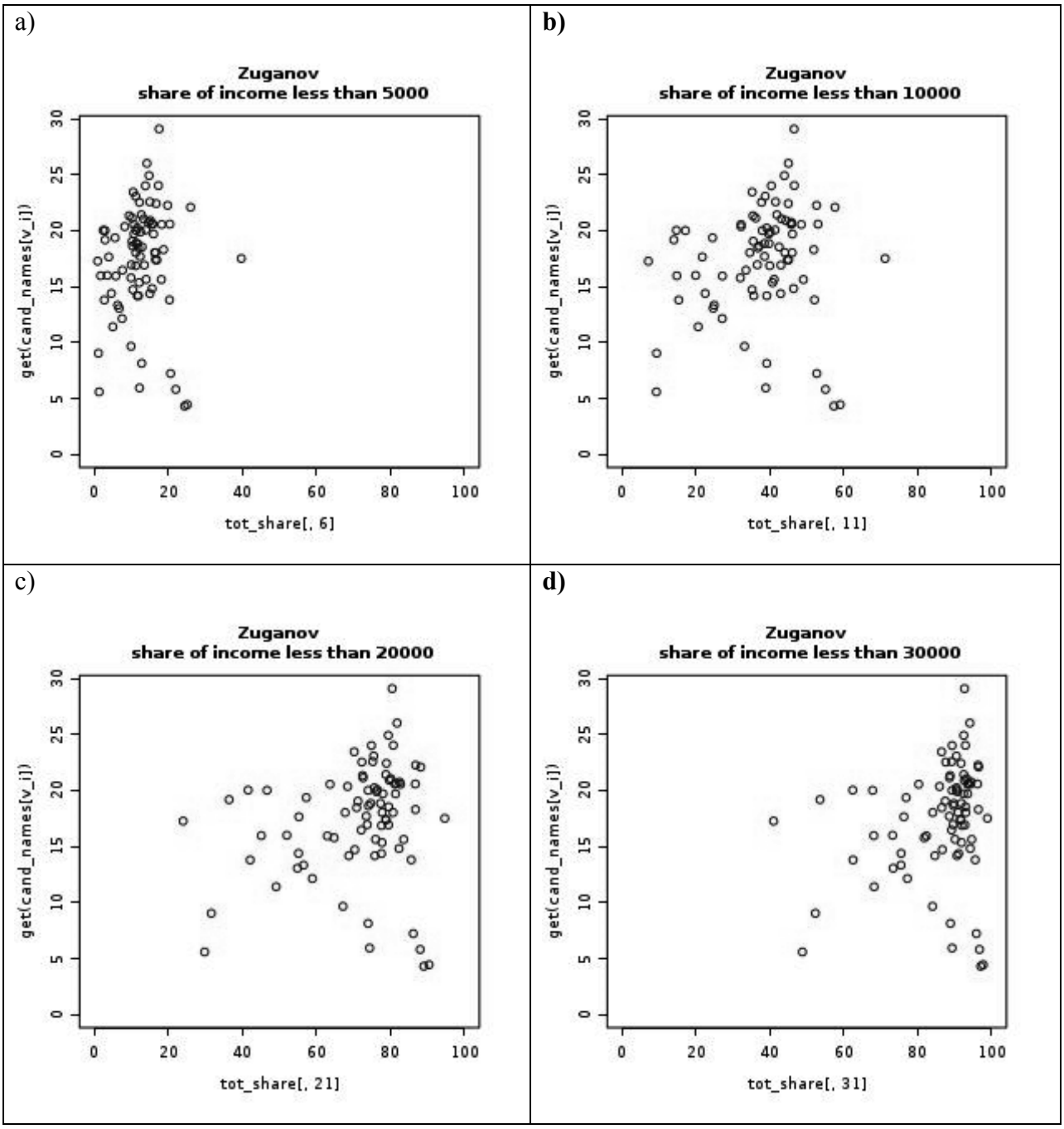


Figure 4. The share of votes for Zyuganov (vertical axis) vs. "share of people with incomes less then":
a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

played in Fig. 3a — 3d. Point 1 in Fig. 9b corresponds to the t-statistic (–4.60) for the coefficient of the explanatory variable b (–0.155) regression, based on data in Fig. 3a (for the income share of less than 5 thousand rubles). Point 2 in Fig. 9b corresponds to the t-statistic (–3.75) for the coefficient of the explanatory variable b (–0.0687) regression, constructed from data in Figure 3b (for revenue share is less than 10 thousand rubles.). Point 3 in Fig. 9b corresponds to the t-statistic (–2.818) for the coefficient of the explanatory variable b (–0.045) regression, based on data in Fig. 3c (for revenue share is less than 20 thousand rubles.). Point 4 in Fig. 9b corresponds to the t-statistic (–2.198) for the coefficient of the explanatory variable b (–0.045) regression, based on data in Fig. 3c (for revenue share is less than 30 thousand rubles.)

In addition to the four points (1–4), for which we have provided examples of the distribution of votes and the percentage of people with a certain level of income (in Fig. 3a-3d), the graph 9b contains coefficients of t-statistics for the income groups built around a set of distributed income from 0 to 100 thousand rubles. Five percent significance level t-statistics (for 82 observations)

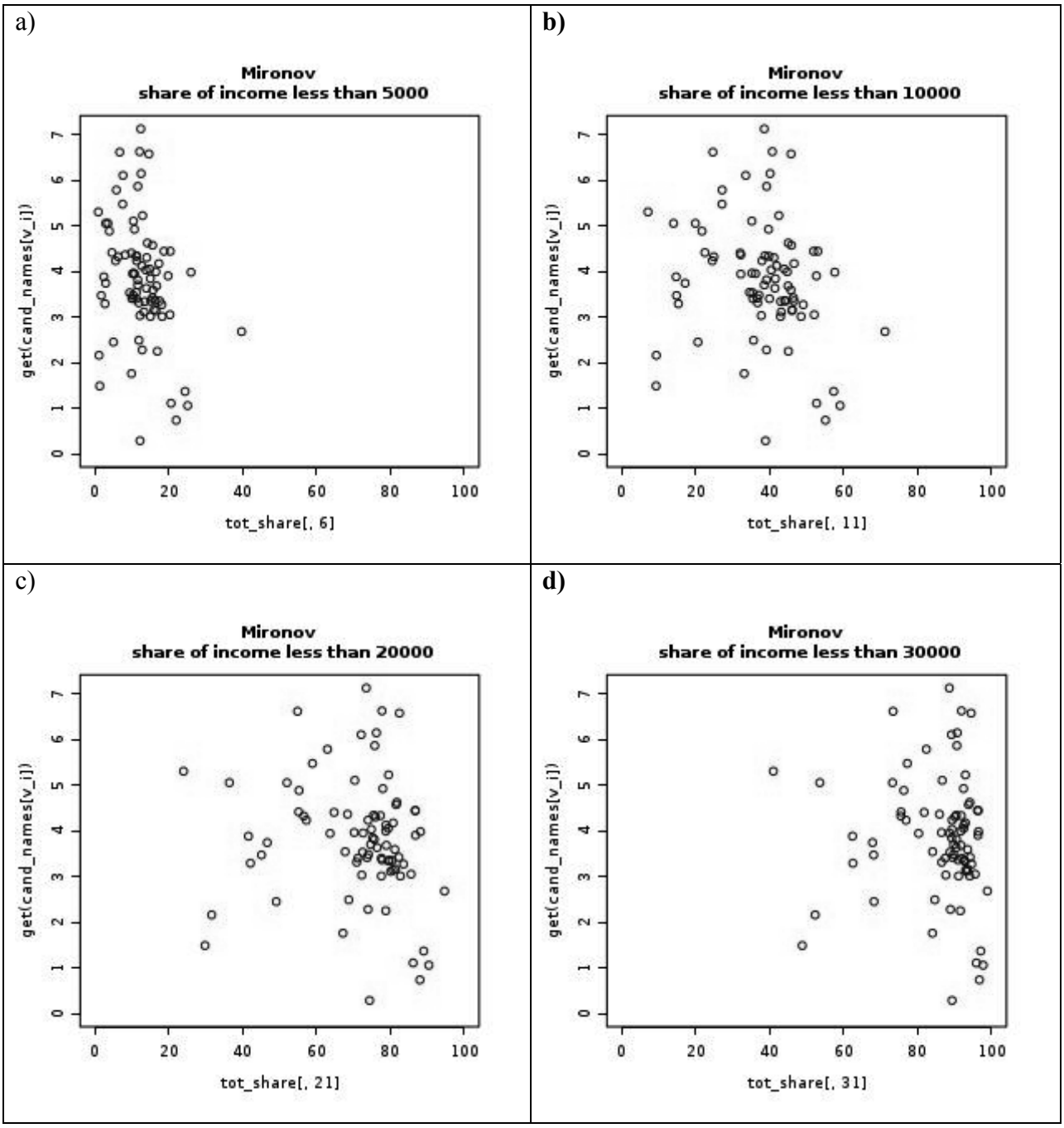


Figure 5. The share of votes for Mironov (vertical axis) vs. "share of people with incomes less then":
a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

corresponds to the level of 1.99 (5%), which on the Fig. 9b reaches a level of income 35 thousand rub. The coefficient of the variable "proportion of people with incomes below the X" is no longer statistically significant when x is greater than 35 thousand rubles per month, in regressions explaining the share of votes cast for Zhirinovsky.

Similarly graphs 9a, 9b present the results of regressions explaining the share of votes for Zhirinovsky's presidential election in 2012, if the schedule 9a contains the results of regression in which the share of votes for Zhirinovsky explained by the percentage of people with incomes from 0 to X, and a deferred variable on the horizontal axis, then the graph 9c shows the results that explain the voting share for Zhirinovsky in the proportion of people with income from Y to X. The curves shown in the graph 9a, a special case of the reduced dependence in graph 9c (at Y = 0).

In the graph 9c we consider all possible income groups, for example, not only income group from 0 to 5000 (point 1 on the chart 9a and Figure 3a), but also of income from 1000 to 5000, from 2000 to 5000, from 3000 to 5000, from 4000 to 5000, not only income group

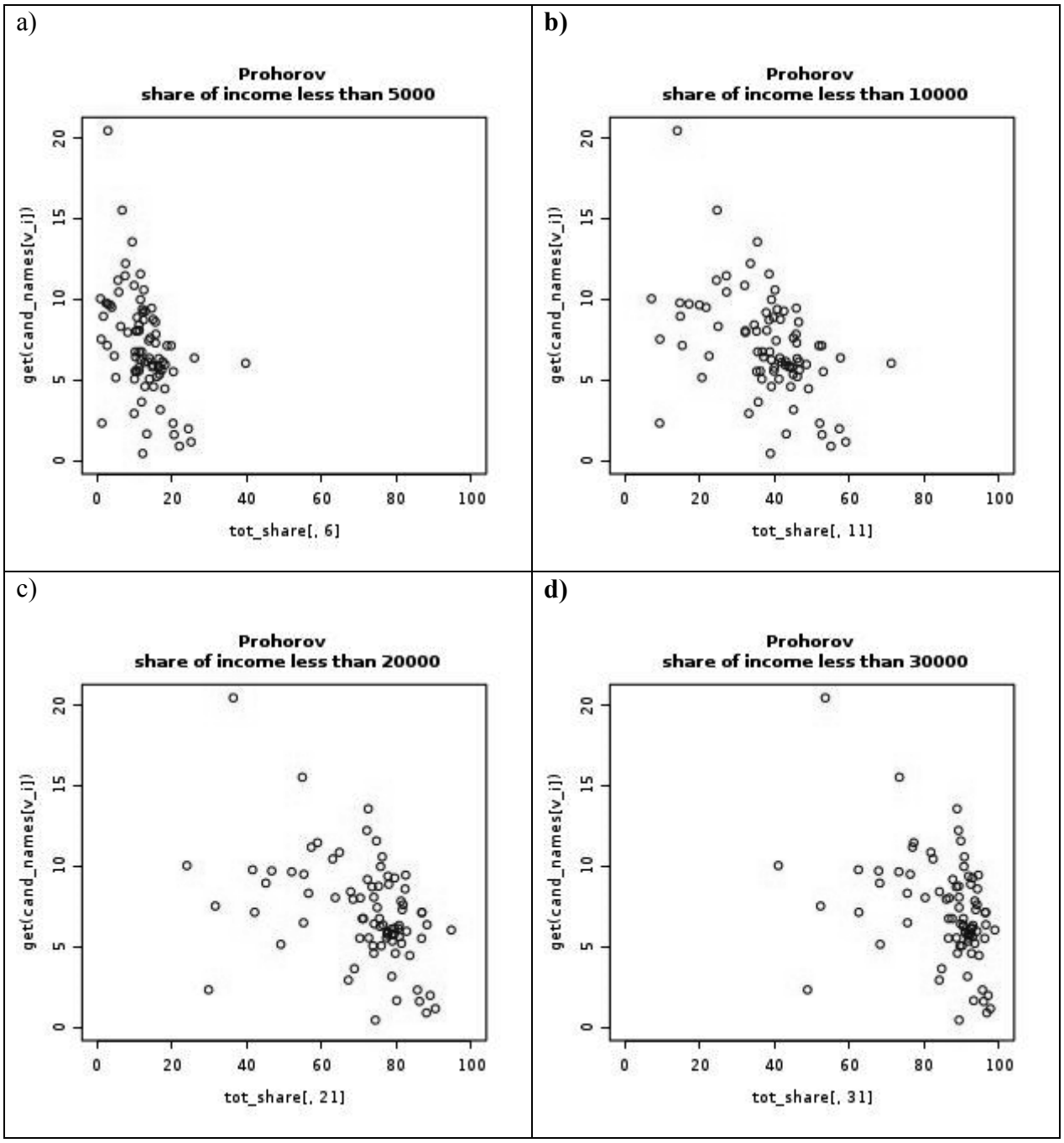


Figure 6. The share of votes for Prokhorov (vertical axis) vs. "share of people with incomes less then":
a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

0 to 20,000 (as a point on the graph 39a and Figure 3c), but also of income from 5000 to 20000, 10000 to 20000, 15000 to 20000.

Zhirinovsky remains relevant in high-income areas, which suggests that a certain number of supporters of Zhirinovsky are present among middle-income voters, and among the richest of the voters.

Fig. 10 shows examples of the distribution of population groups with income from Y to X for the Belgorod region (Fig. 10a) and in Moscow (Figure 10b). Each point on this graph represents the percentage of people (axis Z) in the region with an income in the range from Y to X. For example, a group of people with incomes between 20 and 60 thousand rubles (X = 60000, Y = 20000), in the Belgorod region corresponds to the value of Z = 24.38 (i.e. the number of 24.38% of the total population), while in Moscow Z = 34.13 (i.e. 34.13% of the total Moscow's population has income of 20 to 60 million).

Thus, the graph 9c coordinate Z (height above the plane XY) has the value of F-score statistics regression, in which the share of votes for Zhirinovsky explained by the proportion of people with income from Y to X.

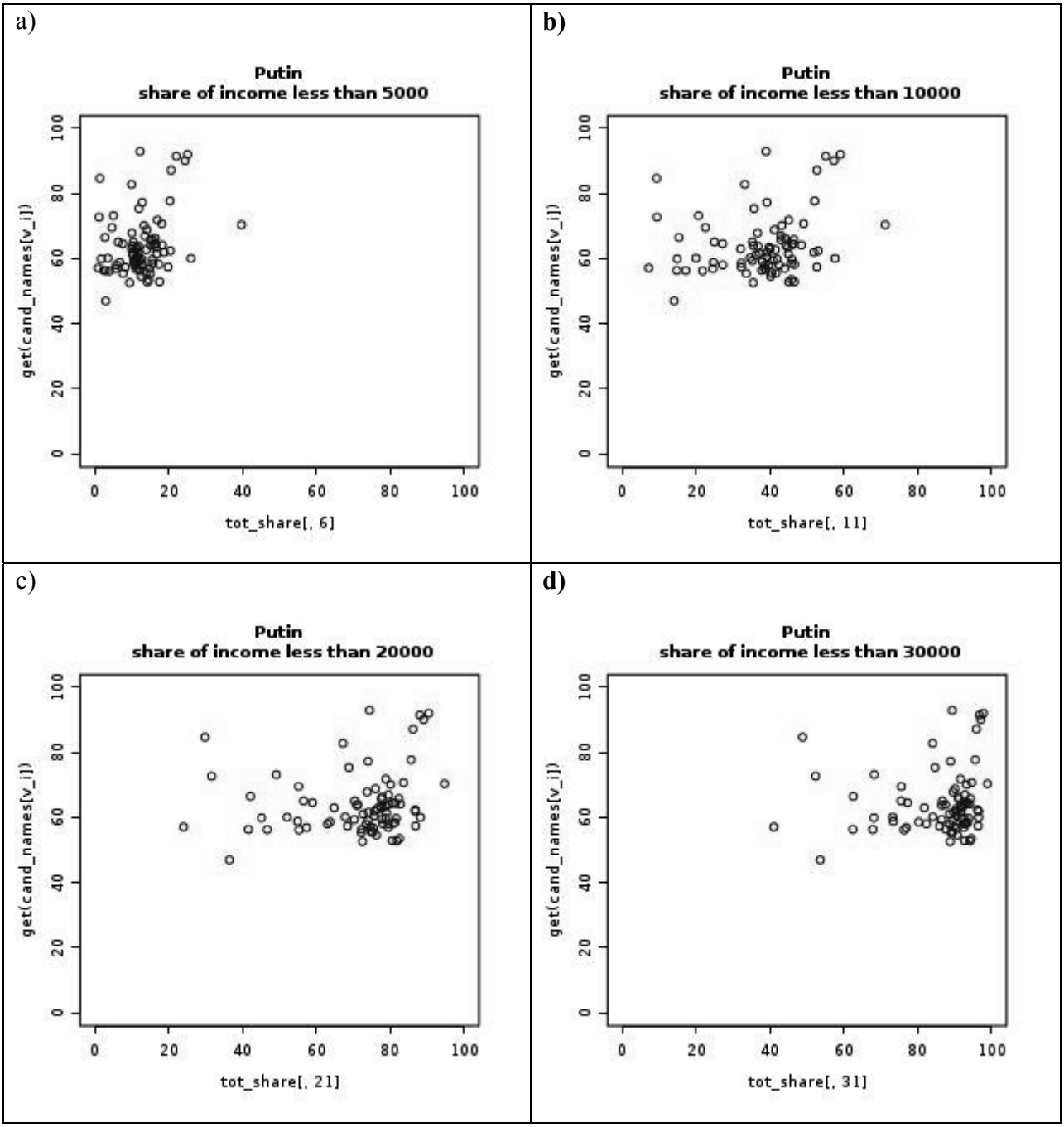


Figure 7. The share of votes for Putin (vertical axis) vs. "share of people with incomes less then":
a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

Analysis of the results shown in the graph 9c shows that there is a hump with a lower limit of 7000 rubles. Grey-black color on chart 9d shows the coefficient of the independent variable positive (b = 0.15). Simplified interpretation of this threshold can be illustrated by a hypothetical example. If the region of 1000 voters passed a group of people with incomes up to 7000 rubles a month in a group of people with incomes above 7,000 rubles, then 150 of them will vote for Zhirinovsky.

Similar to Fig. 9, we construct the graphs for the other candidates for president of Russia. Figure 11 shows the distribution parameter estimation of the set of regressions in which the share of the vote for Zyuganov, due to "percentage of the population living below the X rubles."

The analysis of results (see Figure 11a-11d) estimates regressions on the entire set of groups and their ability to explain votes received by Zyuganov in the presidential election of 2012. Graphs 11a and 11b show that the groups with the boundaries from 0 to 28000 are insignificant (at the 5% level). The importance of communication with the vote for Zyuganov groups having certain income shows an increase in the lower limit of the group

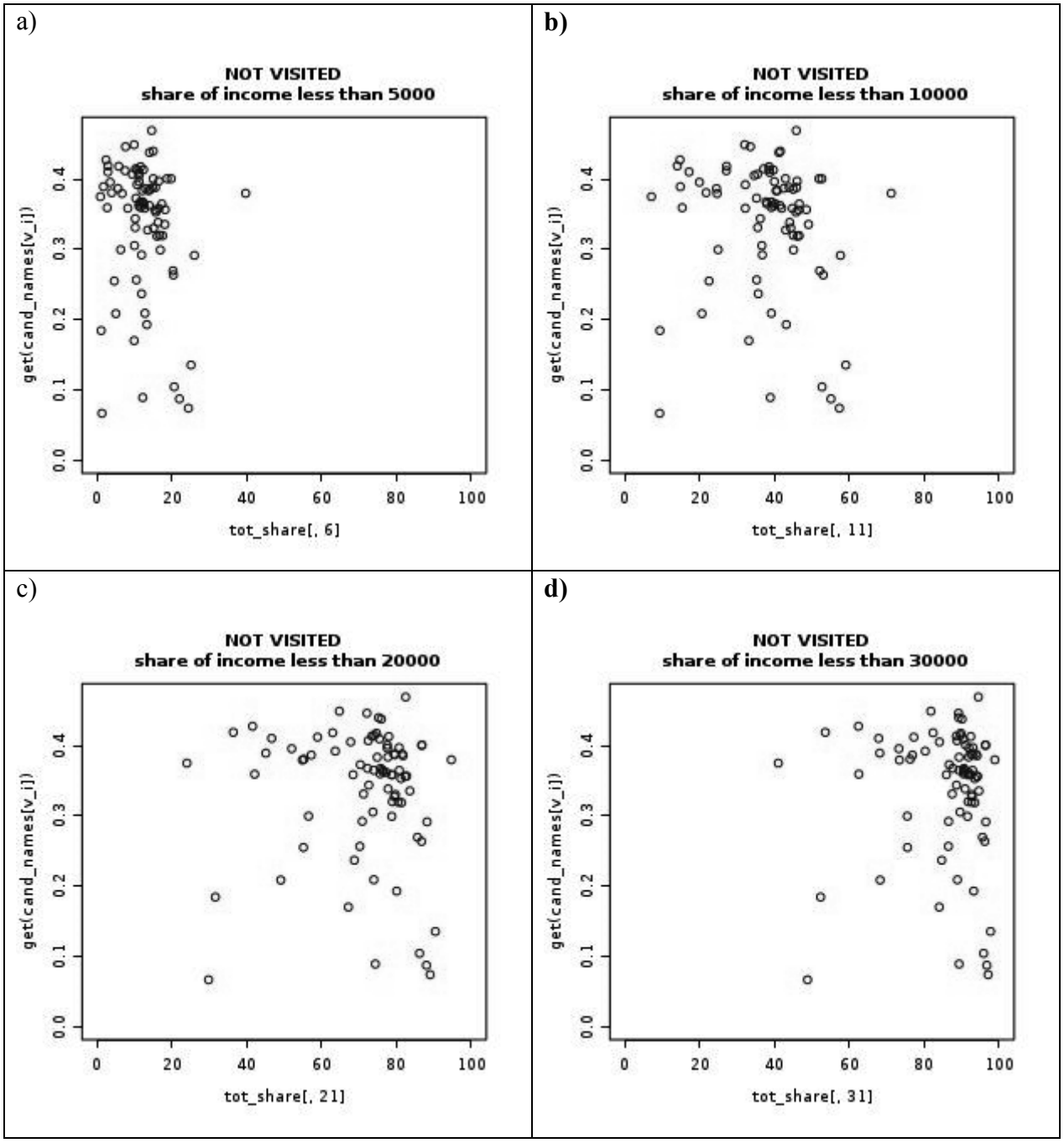
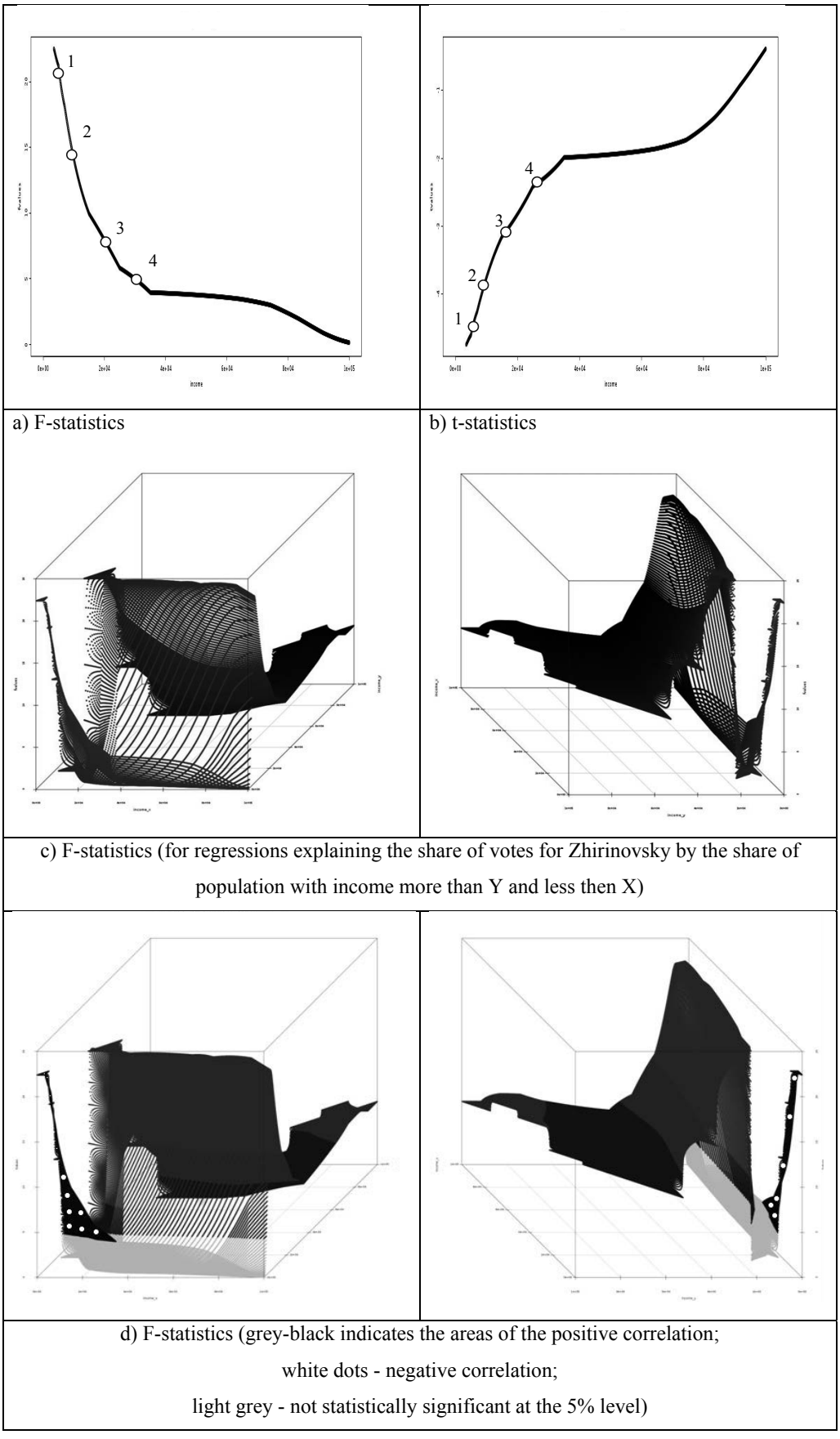


Figure 8. The share of non-votes (vertical axis) vs. "share of people with incomes less then":
a) 5000 rubles per month, b) 10 000 rubles per month, c) 20 000 rubles per month, d) 30 000 rubles per month.

and reaches a maximum for the group with income from 9250 to 21,750, an increase in the upper limits of income, the importance of a vote for Zyuganov again disappears (height "hill" decreases with increasing upper limit). Grey-black (see Fig. 11d) shows that, for this group of the population with income from 9250 to 21,750, the coefficient of the independent variable is positive (0.35). This means an increase in the group for the 1000 population, increases the vote for Zyuganov at 350. For Zyuganov, we can also select a group of high-income (ranging from 40 thousand to 60 thousand), the size of which is negatively related to the share of Zyuganov votes (the white dots area in the graph 9d). Apparently the presence of this group explained the significance of the positive impact of falling after reaching a maximum in the range of 9250 to 21,750 rubles per month.

Fig. 12 shows parameters distribution of estimation of set of regressions in which the share of votes for Mironov is determined by "percentage of the population living below the X rubles."



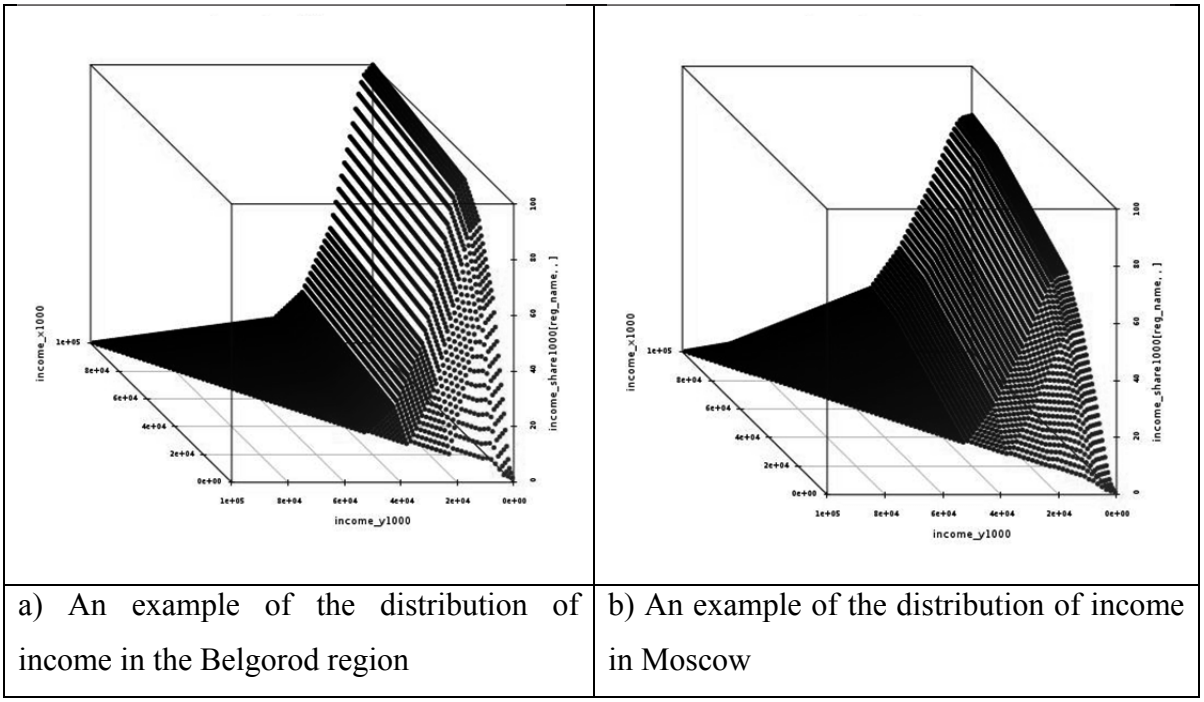
a) F-statistics

b) t-statistics

c) F-statistics (for regressions explaining the share of votes for Zhirinovsky by the share of population with income more than Y and less then X)

d) F-statistics (grey-black indicates the areas of the positive correlation;
white dots - negative correlation;
light grey - not statistically significant at the 5% level)

Figure 9. Distribution of the parameters estimation of the set of regressions: vote for Zhirinovsky as a function of the proportion of people living below X rubles.



a) An example of the distribution of income in the Belgorod region

b) An example of the distribution of income in Moscow

Figure 10. Examples of the distribution of population groups with income from Y to X.

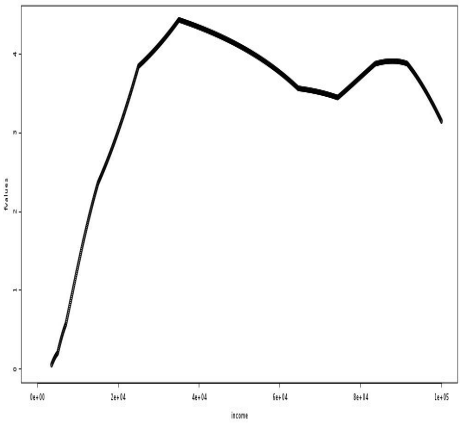
Analysis of the influence of the size of the set of different income groups for votes received by Mironov in the presidential election shows a general pattern similar to one, which can be observed in the data for Zhirinovsky. While with the increase of the lower limit of the size of a significant association of the wealthy with the number of votes for Mironov disappears, unlike for Zhirinovsky. This suggests a narrower area in which the electorate is concentrated. The maximum is reached in the range of 13,250 to 24,250, and with the growth of the upper boundary, the relationship to the number of votes for Mironov is falling faster than for Zhirinovsky, i.e. within this population (with incomes greater than 13,000 rubles a month) voters with increasingly higher incomes are less likely to support Mironov.

Fig. 13 shows the parameters distribution of estimation of set of regressions in which the share of votes for Prokhorov is determined by "percentage of the population living below the X rubles." Analysis of the results of the evaluation of the set of regressions explaining the vote received Prokhorov shows that he has a certain threshold value (15000 rubles a month), above which the voters are beginning to support Prokhorov. However, a more important feature of the Prokhorov's electorate is that it belongs to the highest income group. Increase of the lower limit does not reduce the significance, and a group with a very high lower bound (more than 40 thousand rubles a month) also has a positive effect on the share of the vote for Prokhorov.

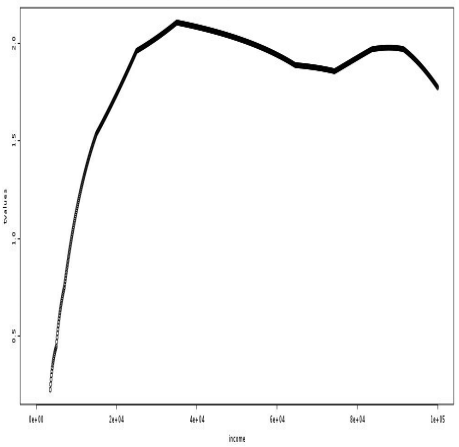
Fig. 14 shows the parameters distribution of estimation of set of regressions in which the share of votes for Putin is determined by "percentage of the population living below the X rubles." Analysis of the results of the evaluation of the vote for Putin showed no significant relationship for almost the entire set. The observed significant dependence is similar to patterns seen for Mironov and Zhirinovsky, but the coefficients of the explanatory variables b is minimal (b = 0.01), although statistically significant. For Putin, as well as for Zhirinovsky and Mironov, there is an income threshold (14,250) less obvious than for Zyuganov, the upper limit of the population (at 21,250). However, the white dots area on the chart 14d shows that the correlation coefficient of this group with the votes cast for Putin is negative (–1.58), the area of positive correlation vote for Putin is in the area with low incomes. Thus, there is an opposite threshold effect — after reaching the income threshold (14,000) voters reduce support for Putin.

Fig. 15 shows the parameters distribution of estimation of set of regressions in which the share of voters who do not come to the polls is determined by "percentage of the population living below the X rubles."

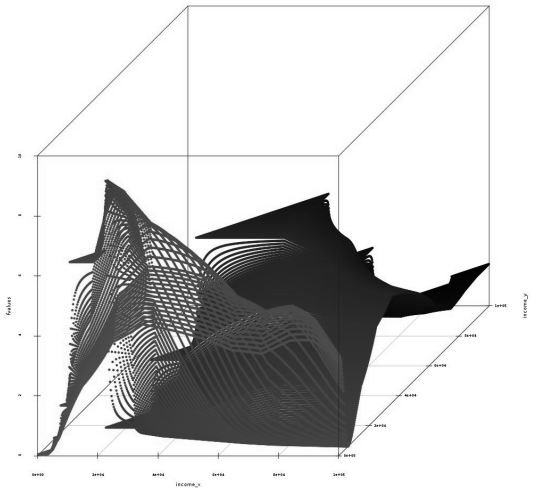
The analysis of the proportion of voters who did not participate in the presidential elections shows that, unlike shares cast for candidates, there are no incomes negatively affecting the proportion of people who took part in the vote. We see that the greatest proportion of the electorate who voted is not associated with a group of people with incomes of 13,100 to 22,400, with the upper boundary of the growth, this relationship becomes less significant, but another local maximum is achieved for the group from 4000 to 90000.

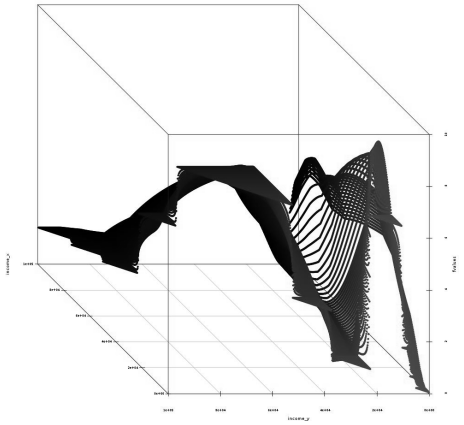


a) F- statisticcs

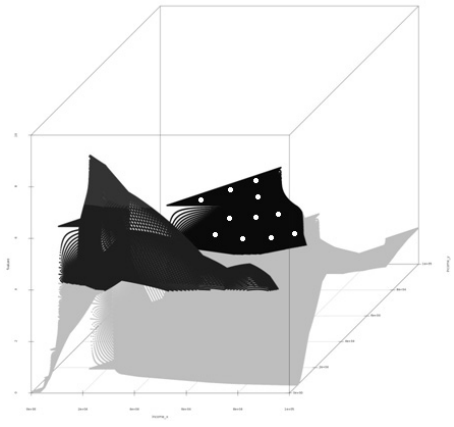


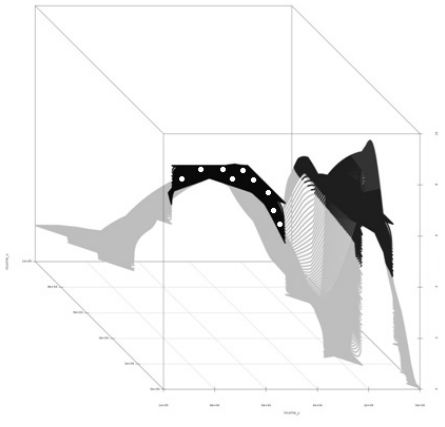
b) t- statistics





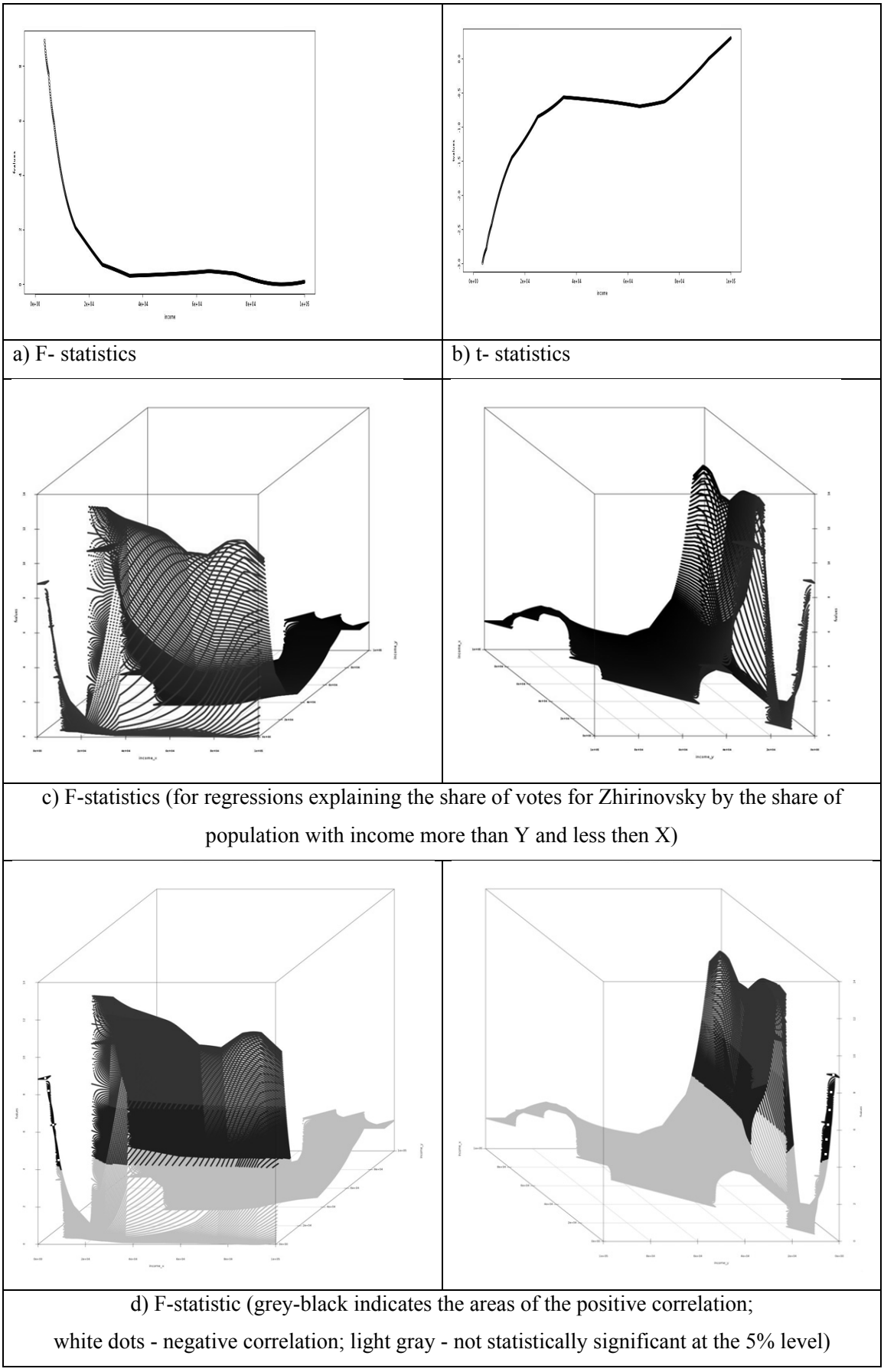
c) F-statistics (for regressions explaining the share of votes for Zhirinovsky by the share of population with income more than Y and less then X)





d) F-statistics (grey-black indicates the areas of the positive correlation; white dots - negative correlation; light gray - not statistically significant at the 5% level)

Figure 11. Distribution of the parameters estimation of the set of regressions: vote for Zyuganov as a function of the proportion of people living below the X rubles.



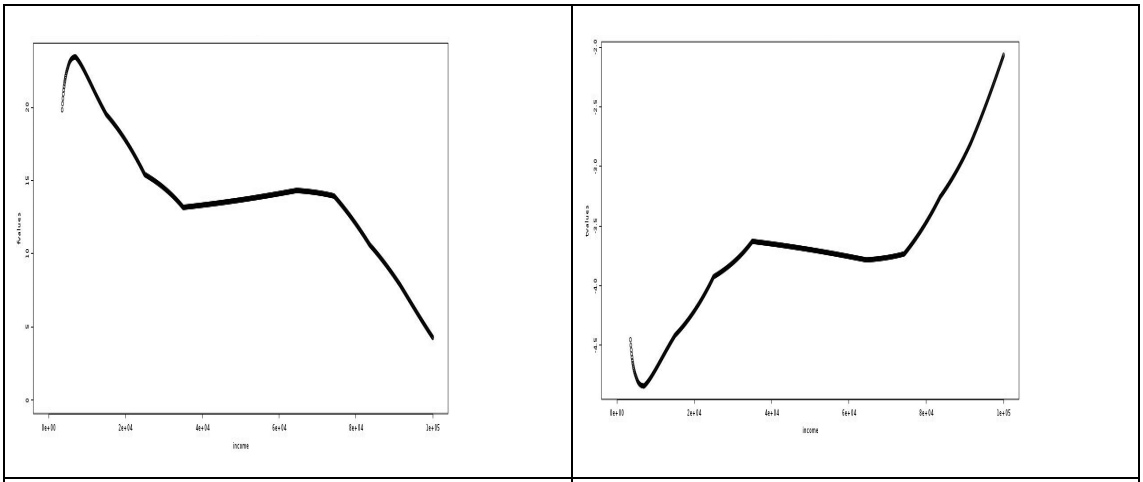
a) F- statistics

b) t- statistics

c) F-statistics (for regressions explaining the share of votes for Zhirinovsky by the share of population with income more than Y and less then X)

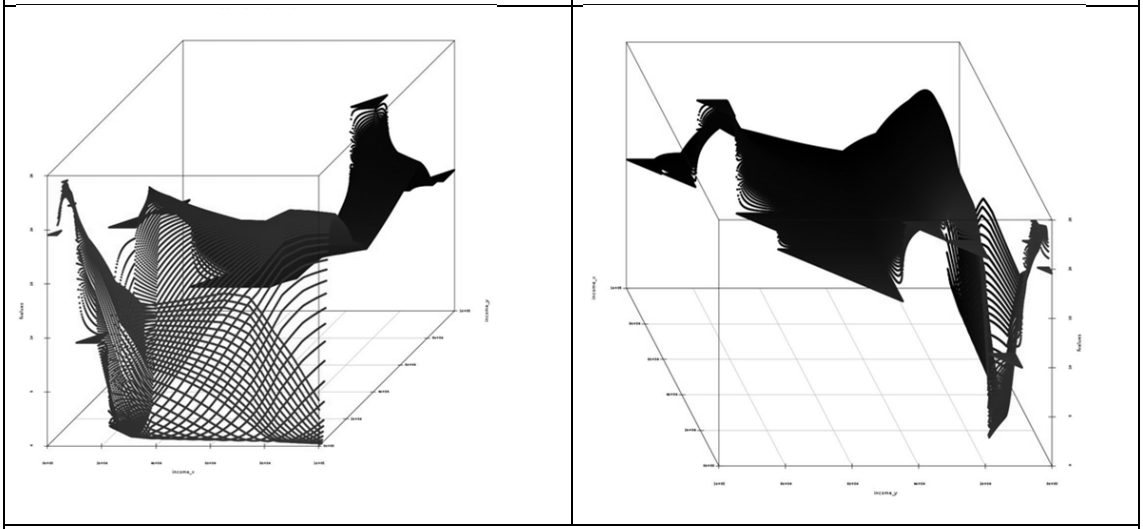
d) F-statistic (grey-black indicates the areas of the positive correlation; white dots - negative correlation; light gray - not statistically significant at the 5% level)

Figure 12. Distribution of the parameters estimation of the set of regressions: vote for Mironov as a function of the proportion of people living below the X rubles.

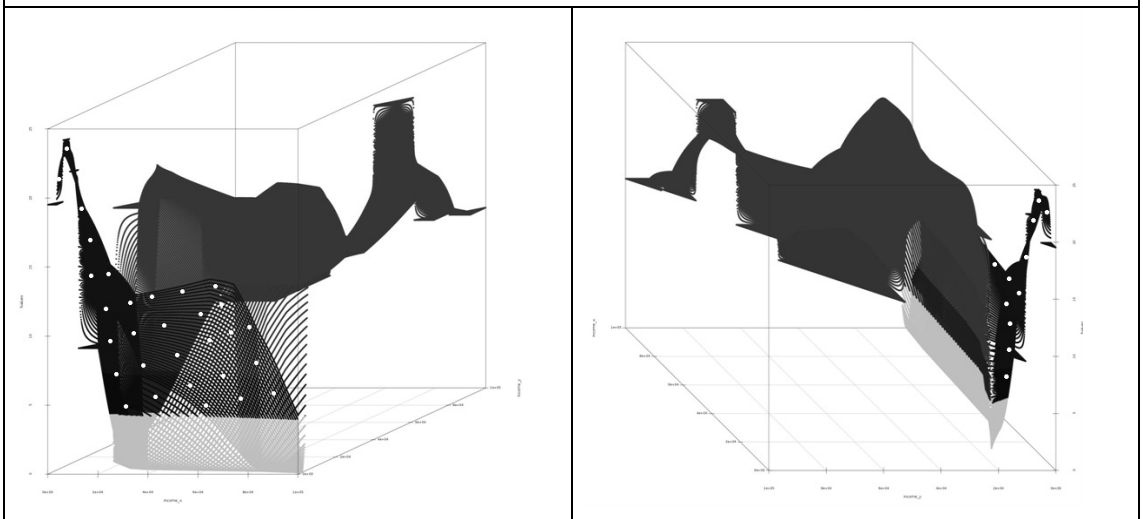


a) F- statistics

b) t- statistics

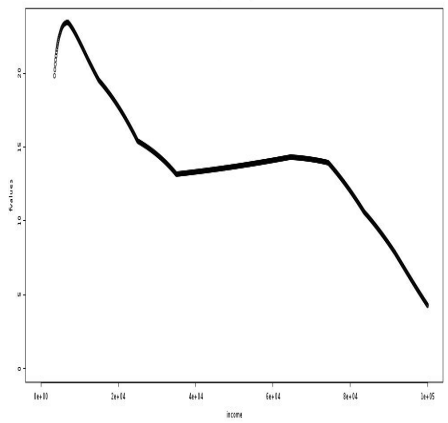


c) F-statistics (for regressions explaining the share of votes for Zhirinovsky by the share of population with income more than Y and less then X)

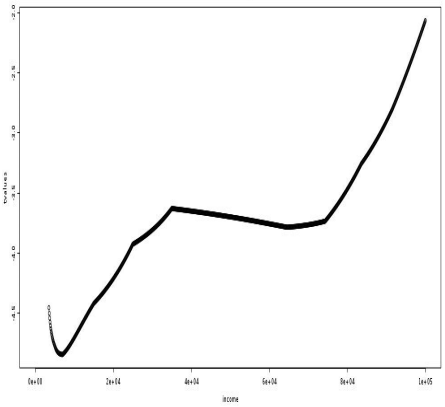


d) F-statistic (grey-black indicates the areas of the positive correlation; white dots - negative correlation; light gray - not statistically significant at the 5% level)

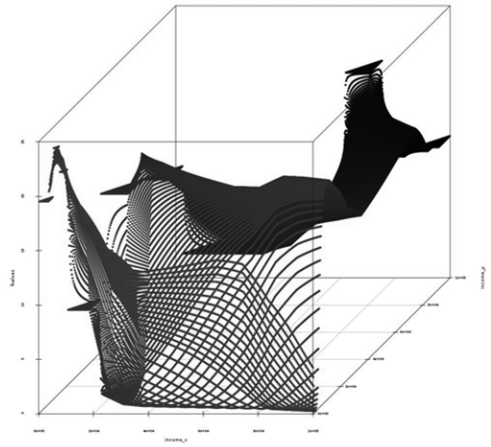
Figure 13. Distribution of the parameters estimation of the set of regressions: vote for Prokhorov as a function of the proportion of people living below the X rubles.

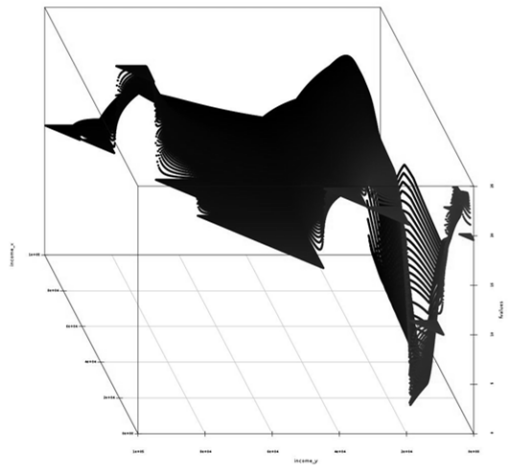


a) F- statistics

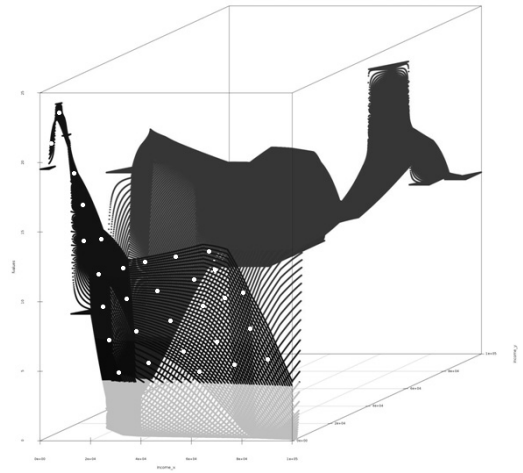


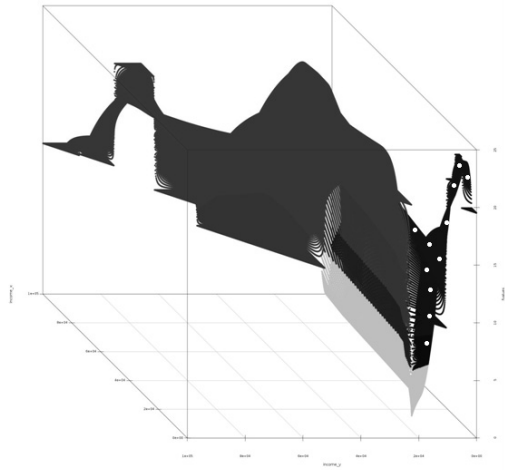
b) t- statistics





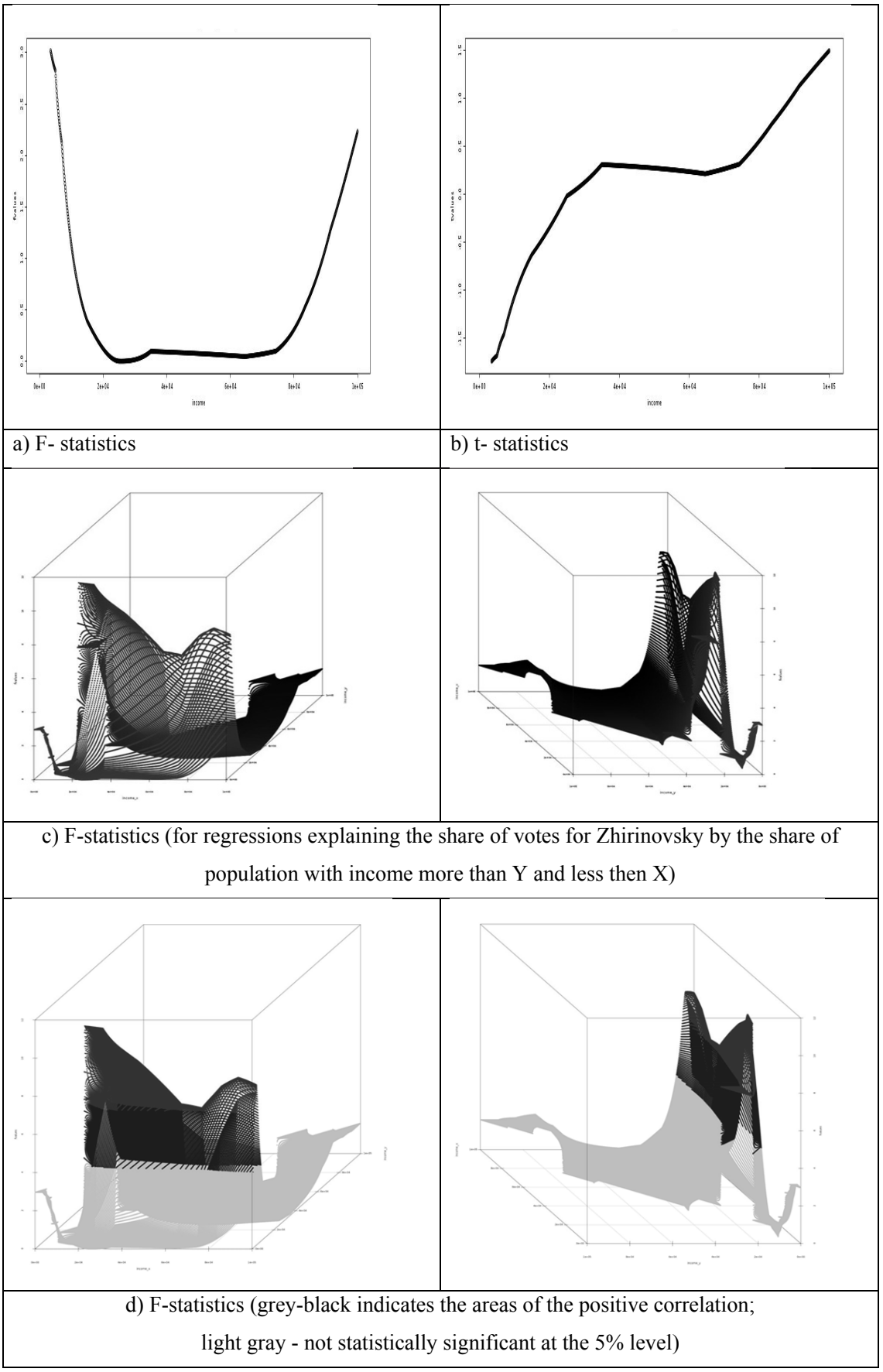
c) F-statistics (for regressions explaining the share of votes for Zhirinovsky by the share of population with income more than Y and less then X)





d) F-statistic (grey-black indicates the areas of the positive correlation; white dots - negative correlation; light gray - not statistically significant at the 5% level)

Figure 14. Distribution of the parameters estimation of the set of regressions: vote for Putin as a function of the proportion of people living below the X rubles.



a) F- statistics

b) t- statistics

c) F-statistics (for regressions explaining the share of votes for Zhirinovsky by the share of population with income more than Y and less then X)

d) F-statistics (grey-black indicates the areas of the positive correlation; light gray - not statistically significant at the 5% level)

Figure 15. Distribution of the parameters estimation of the set of regressions: the proportion of voters who did not vote as a function of the proportion of people living below the X rubles.

A possible explanation for this is the presence of a closer relationship between the share of non-voters and the population with low or high incomes, while at the intermediate level this relationship is somewhat weaker.

5. PRELIMINARY RESULTS

According to the previous research (Mau, Kochetkova, Yanovsky, Zhavoronkov, Lomakina, 2000; Kochetkova, 2004; others) there was direct correlation between voters' income and electoral support for incumbent in Russia during the 1990-s and early 2000-s. The results of Russian presidential elections in 2012 show the opposite trend. For each candidate we defined the level of electoral support in different income groups.

Firstly, the effect of the income threshold of votes for certain candidates (Zhirinovsky: 7000 rubles per month, Mironov: 13,000 rubles per month): people change their behavior when it reaches the threshold. At the same time Mironov's electorate concentrated in a narrower range of income, while Zhirinovsky has a significant proportion of voters among the citizens with a high level of income.

Secondly, a special case represents the electorate of Zyuganov, whose electorate is formed by a group of people with "average" income, for which the lower and upper limits are defined (from 9250 to 21750 rubles per month). Thirdly, the high-income groups of population (with incomes of 40 thousand rubles a month) are mostly associated with the electorate of Prokhorov. This suggests that the growth of income potentially increases the electoral support of the candidates of this type.

Fourthly, there is the effect of Putin's return threshold and the greatest proportion of his votes negatively correlated (−1.58) with a group of people with incomes of 14,250 to 21,250. Inverse correlation may be due to a protest vote against the representative of the party in power. The zone of positive correlation of votes for Putin is in the low-income area. In the future, we plan to look more closely at regional differentiation factors that more accurately compare data from different regions to refine the preliminary results of our research.

REFERENCES

Eggertsson T. (1990). Economic Behavior and Institutions: Principles of Neoinstitutional Economics. Cambridge: Cambridge University Press.

Enikolopov R., Korovkin V., Petrova M., Sonin K., Zakharov A. (2013). Field experiment estimate of electoral fraud in Russian parliamentary elections. *Proceedings of the National Academy of Sciences of the United States of America*, 110, 2, 448–452.

Furubotn E.G., Richter R. (1997). Institutions and Economic Theory. The Contribution of the New Institutional Economics. Ann Arbor, MI: University of Michigan Press.

Goldman M. (2003). The Piratization of Russia: Russian Reform Goes Awry. L., N.Y.: Routledge.

Gregory P. (1998): Russian and Soviet Economic Performance and Structure. P. Gregory, R. Stuart (eds.). N.Y.: Addison-Wesley.

Herschenkron A. (1962): The Approach to European Industrialization: a Postscript. *Economic Backwardness in Historical Perspective*: A Book of Essays. Cambridge: Harvard University Press.

Kahkonen S., Olson M. (eds.) 2001. A New Institutional Approach to Economic Development. New Delhi: Vistaar Publications.

Kiewiet D.R., Rivers R.D. (1984). A Retrospective on Retrospective Voting. *Political Behavior,* 6, 1–26.

Kochetkova O. (2004) Economic factors in voting behavior. Ph.D. thesis, Moscow.

Kuznets S. (1955). Economic Growth and Income Inequality. *American Economic Review*, 45, 1, 1–28.

Kuznets S. (1971). Lecture to the Memory of Alfred Nobel, December 11.

Kuznets S. (1979). Growth, Population, and Income Distribution: Selected Essays. N.Y.: Norton.

Laranjaa M., Uyarrab E., Flanagan K. (2008). Policies for Science, Technology and Innovation: Translating Rationales into Regional Policies in a Multi-Level Setting. *Research Policy,* 37, 823–835.

Lewis-Beck, M.S. (1988). Economics and Elections: The Major Western Democracies. Ann Arbor, MI: University of Michigan Press.

Long-Term Social and Economic Development of Russian Federation (2008). M.: Ministry for economic development of the Russian Federation.

Mau V., Kochetkova O., Yanovskiy K., Zhavoronkov S., Lomakina Yu. (2001). Economic Factors of Electoral Behavior and Social Consciousness (the Experience of Russia 1995–2000). M.: IEPP

Mueller D.C. (2003). Public Choice III. A Revisited Edition of Public Choice. Cambridge: Cambridge University Press.

North D. (1991). Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.

Olson M. (1982). Rise and Decline of Nations. New Haven: Yale University Press.

Olson M. (1993). Why is Economic Performance even Worse after Communism is Abandoned. *Virginia political economy lecture series*. Fairfax. Virginia. March 17.

Olson M. (2000). Power and Prosperity: Outgrowing Communist and Capitalist Dictatorships. N.Y.: Basic Books.

Ordeshook P.C., Shvetsova O. (1999). If Hamilton and Madison were Merely Lucky? What Hope is there for Russian Federalism? *Constitutional Political Economy*, 6 (2), 107–127.

Persson T., Tabellini G. (2000). Political Economics. Explaining Economic Policy. Cambridge, MA: MIT Press.

Seresova W. (2005) Social factors of the electoral process in the regions of Russia or Who voted poor. Logos 1 (46).

Shulgin S. (2005). Income Inequality and the Demand for the Independent Mass Media. Public Choice Society Conference paper.

Solow R. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70, 65–94.

The Institutional Economics (2005). The Institutional Economics of Russia's Transformation. Burlington: Ashgate.

Tullock G. (1994). The New Federalist. Vancouver: The Fraser Institute.

Appendix 1

Population, by per capita income in 2010
(as a percentage of the total population of the subject of Russian Federation)

	Per capita income, rub. per month							
	to 3500,0	from 3500,1 to 5000,0	from 5000,1 to 7000,0	from 7000,1 to 10000,0	from 10000,1 to 15000,0	from 15000,1 to 25000,0	from 25000,1 to 35000,0	over 35000,0
The Russian Federation	**3,9**	**5,6**	**9,4**	**14,7**	**20,2**	**23,5**	**10,8**	**11,9**
Central Federal District								
Belgorod region	4,2	6,3	10,6	16,2	21,4	23,0	9,5	8,8
Bryansk region	6,2	8,9	13,8	19,1	22,0	19,4	6,4	4,2
Vladimir region	5,5	9,1	14,8	20,6	23,1	18,7	5,3	2,9
Voronezh region	7,4	9,3	13,6	18,2	20,9	19,0	6,6	5,0
Ivanovo region	7,5	11,2	16,9	21,6	21,8	15,5	3,8	1,7
Kaluga region	4,4	6,9	11,7	17,5	22,3	22,3	8,4	6,5
Kostroma region	5,4	8,8	14,5	20,4	23,1	19,1	5,6	3,1
Kursk region	4,4	7,2	12,2	18,2	22,7	21,9	7,8	5,6
Lipetsk region	3,8	6,4	11,1	17,2	22,5	23,2	8,8	7,0
Moscow region	2,0	3,6	7,0	12,3	19,4	25,9	13,3	16,5
Orel region	7,8	9,7	14,2	18,7	20,9	18,3	6,1	4,3
Ryazan region	4,8	7,9	13,3	19,3	23,1	20,7	6,7	4,2
Smolensk region	4,2	7,0	12,1	18,2	22,9	22,1	7,9	5,6
Tambov region	7,6	9,3	13,6	18,1	20,7	18,9	6,7	5,1
Tver region	3,7	7,0	12,6	19,5	24,2	21,9	7,0	4,1
Tula region	3,6	6,4	11,3	17,7	23,1	23,2	8,5	6,2
Yaroslavl region	4,9	7,6	12,4	18,2	22,4	21,4	7,6	5,5
Moscow	1,0	1,9	3,8	7,1	12,4	20,4	13,9	39,5
North-Western Federal District								
Karelia Republic	2,4	5,2	10,3	17,5	24,2	25,0	9,1	6,3
Komi Republic	2,4	3,9	7,1	12,1	18,6	24,8	13,1	18,0
Arkhangelsk Region	1,9	3,9	7,9	14,2	21,7	26,7	12,1	11,6
including the Nenets Autonomous District	0,3	0,6	1,6	3,8	8,5	18,4	15,6	51,2
Vologda Region	4,5	7,6	12,8	19,0	23,2	21,2	7,1	4,6
Kaliningrad Region	3,4	6,0	10,9	17,3	23,0	23,7	8,9	6,8
Leningrad Region	4,4	7,2	12,2	18,2	22,8	21,9	7,8	5,5
Murmansk region	1,1	2,4	5,4	10,7	18,7	27,4	15,0	19,3
Novgorod region	5,1	7,3	11,7	17,1	21,4	21,7	8,5	7,2
Pskov region	6,3	9,3	14,5	19,8	22,3	18,7	5,7	3,4
St. Petersburg	2,7	4,0	7,0	11,6	17,6	23,9	13,1	20,1
Southern Federal District								
Republic of Adygea	7,9	10,3	15,0	19,6	21,2	17,4	5,3	3,3
Republic of Kalmykia	21,7	18,0	19,5	18,3	13,6	7,1	1,3	0,5
Krasnodar Territory	5,0	6,9	11,0	16,1	20,8	22,1	9,2	8,9
Astrakhan region	5,9	8,1	12,5	17,7	21,4	20,7	7,6	6,1
Volgograd region	4,0	7,2	12,6	19,0	23,6	21,8	7,2	4,6
Rostov region	5,8	8,1	12,7	17,9	21,6	20,6	7,5	5,8

	Per capita income, rub. per month							
	to 3500,0	from 3500,1 to 5000,0	from 5000,1 to 7000,0	from 7000,1 to 10000,0	from 10000,1 to 15000,0	from 15000,1 to 25000,0	from 25000,1 to 35000,0	over 35000,0
North-Caucasian Federal District								
Dagestan Republic	4,9	7,3	11,9	17,5	21,9	21,7	8,2	6,6
Ingush Republic	11,2	13,9	18,7	21,4	19,2	12,0	2,6	1,0
Kabardino-Balkar Republic	8,9	11,4	16,3	20,4	20,8	15,6	4,3	2,3
Karachay-Cherkessia Republic	9,5	12,5	17,5	21,1	20,4	14,0	3,4	1,6
Republic of North Ossetia — Alania	5,0	8,3	13,7	19,8	23,2	20,1	6,2	3,7
Chechen Republic	…	…	…	…	…	…	…	…
Stavropol Territory	7,0	9,5	14,3	19,1	21,5	18,6	6,0	4,0

	Per capita income, rub. per month							
	to 3500,0	from 3500,1 to 5000,0	from 5000,1 to 7000,0	from 7000,1 to 10000,0	from 10000,1 to 15000,0	from 15000,1 to 25000,0	from 25000,1 to 35000,0	over 35000,0
Volga Federal District								
Bashkortostan Republic	5,2	6,7	10,5	15,3	20,0	22,1	9,7	10,5
Mari El Republic	12,6	13,4	17,2	19,7	18,7	13,1	3,5	1,8
Mordovia Republic	9,0	11,6	16,6	20,5	20,8	15,3	4,1	2,1
Tatarstan Republic	4,0	5,9	9,8	15,2	20,6	23,3	10,4	10,8
Udmurt Republic	6,2	9,4	14,8	20,2	22,5	18,4	5,4	3,1
Chuvashia Republic	8,7	11,7	16,9	21,0	20,9	15,0	3,9	1,9
Perm Territory	4,2	5,7	9,4	14,3	19,6	23,1	10,9	12,8
Kirov region	4,8	8,1	13,5	19,6	23,3	20,4	6,4	3,9
Nizhny Novgorod region	3,9	6,3	10,8	16,6	22,0	23,2	9,3	7,9
Orenburg region	6,0	8,8	13,7	19,0	22,1	19,6	6,5	4,3
Penza region	6,6	9,4	14,5	19,6	22,0	18,5	5,8	3,6
Samara Region	4,8	5,9	9,3	13,8	18,7	22,3	10,9	14,3
Saratov region	7,7	10,4	15,4	20,0	21,5	17,1	5,0	2,9
Ulyanovsk region	7,6	9,7	14,3	18,9	21,1	18,3	6,0	4,1
Urals Federal District								
Kurgan region	7,3	9,2	13,6	18,2	20,9	19,1	6,7	5,0
Sverdlovsk region	3,0	4,5	7,8	12,7	18,8	24,2	12,4	16,6
Tyumen Region	1,9	3,1	5,7	10,1	16,3	24,0	14,2	24,7
including:								
Khanty-Mansi Autonomous Area — Yugra	0,9	1,8	4,0	8,1	14,9	24,8	16,0	29,5
Yamal-Nenets Autonomous District	0,4	0,9	2,1	5,0	10,7	21,4	16,6	42,9
Chelyabinsk region	4,1	6,3	10,6	16,3	21,5	23,1	9,5	8,6
Siberian Federal District								
Altai Republic	5,2	8,3	13,6	19,4	22,9	20,1	6,5	4,0
Buryatia Republic	7,3	9,0	13,3	17,8	20,7	19,3	7,0	5,6
Tuva Republic	11,1	13,3	17,8	20,8	19,5	13,0	3,1	1,4
Khakassia Republic	6,4	9,3	14,4	19,6	22,1	18,8	5,8	3,6
Altai Territory	8,3	11,5	16,9	21,2	21,3	15,2	3,8	1,8
Trans-Baikal Territory	6,4	8,6	13,1	18,1	21,4	19,9	7,1	5,4
Krasnoyarsk Territory	4,8	6,4	10,2	15,1	20,0	22,5	10,1	10,9

	Per capita income, rub. per month							
	to 3500,0	from 3500,1 to 5000,0	from 5000,1 to 7000,0	from 7000,1 to 10000,0	from 10000,1 to 15000,0	from 15000,1 to 25000,0	from 25000,1 to 35000,0	over 35000,0
Irkutsk Region	6,7	8,3	12,4	17,1	20,6	20,2	7,8	6,9
Kemerovo Region	5,3	7,5	11,9	17,1	21,4	21,5	8,3	7,0
Novosibirsk Region	5,1	7,1	11,4	16,6	21,1	21,9	8,8	8,0
Omsk Region	5,9	7,9	12,2	17,3	21,1	20,9	8,0	6,7
Tomsk Region	4,5	7,1	11,9	17,7	22,4	22,1	8,1	6,2
Far Eastern Federal District								
Sakha Republic (Yakutia)	1,5	3,1	6,3	11,7	19,2	26,7	14,0	17,5
Kamchatka	0,4	1,3	3,6	8,4	17,0	28,8	17,2	23,3
Primorye	2,9	5,3	9,7	15,9	22,2	24,8	10,2	9,0
Khabarovsk Territory	1,2	2,7	6,0	11,7	19,8	27,7	14,3	16,6
Amur Region	4,0	7,2	12,7	19,1	23,7	21,7	7,1	4,5
Magadan region	0,9	2,0	4,5	9,2	16,8	26,5	15,8	24,3
Sakhalin Region	0,7	1,7	3,8	7,8	14,9	25,3	16,4	29,4
Jewish Autonomous Region	3,8	6,5	11,5	17,8	23,0	22,9	8,4	6,1
Chukotka Autonomous District	0,3	0,8	2,0	5,1	11,6	23,6	17,8	38,8

Source: Regions of Russia. Socio-economic indicators. 2011: Stat. Sat / Rosstat. M., 2011, p. 164–165.

Appendix 2

The results of the presidential elections in 2012

	Zhirinovsky		**Zyuganov**		**Mironov**		**Prokhorov**		**Putin**	
Belgorod region	59561	6.62%	211079	23.45%	35601	3.96%	49807	5.53%	533716	59.30%
Bryansk region	42974	6.14%	146340	20.91%	23453	3.35%	32141	4.59%	448018	64.02%
Vladimir region	53615	8.40%	132400	20.75%	41895	6.57%	60315	9.45%	341301	53.49%
Voronezh region	81081	6.22%	292379	22.42%	47974	3.68%	69813	5.35%	800024	61.34%
Ivanovo region	37650	7.25%	95005	18.30%	23060	4.44%	37016	7.13%	321170	61.85%
Kaluga region	37634	7.42%	101459	20.01%	21427	4.23%	40911	8.07%	299175	59.02%
Kostroma region	28204	8.09%	90714	26.02%	16094	4.62%	26517	7.61%	183984	52.78%
Kursk region	49744	8.20%	122775	20.24%	23101	3.81%	38002	6.26%	366745	60.45%
Lipetsk region	44697	7.13%	132408	21.13%	24722	3.95%	34778	5.55%	382179	60.99%
Moscow region	236028	6.66%	686449	19.36%	149801	4.23%	396379	11.18%	2015379	56.85%
Orel region	33549	7.45%	130934	29.09%	15066	3.35%	27632	6.14%	237868	52.84%
Ryazan region	47068	7.58%	132981	21.42%	25562	4.12%	37903	6.10%	370945	59.74%
Smolensk region	38246	7.94%	111182	23.07%	20930	4.34%	32516	6.75%	273232	56.69%
Tambov region	28179	4.54%	107797	17.38%	13973	2.25%	19594	3.16%	444978	71.76%
Tver region	49384	7.40%	131591	19.71%	32835	4.92%	59302	8.88%	387308	58.02%
Tula region	50218	5.79%	147019	16.95%	29601	3.41%	43917	5.06%	587952	67.77%
Yaroslavl region	51816	7.72%	133476	19.89%	41212	6.14%	71007	10.58%	365892	54.53%

	Zhirinovsky		**Zyuganov**		**Mironov**		**Prokhorov**		**Putin**	
Moscow	267418	6.30%	814573	19.18%	214703	5.05%	868736	20.45%	1994310	46.95%
The Republic of Karelia	26579	8.59%	50957	16.47%	18886	6.10%	37798	12.22%	171380	55.38%
Komi Republic	40314	7.67%	70135	13.34%	22738	4.32%	43759	8.32%	341864	65.02%
Arkhangelsk Region	51169	8.90%	91648	15.94%	33223	5.78%	60108	10.45%	333344	57.97%
Nenets Autonomous District	2114	9.04%	4040	17.27%	1239	5.30%	2349	10.04%	13346	57.05%
Vologda Region	49492	8.13%	93417	15.35%	40306	6.62%	57064	9.38%	361720	59.44%
Kaliningrad	35625	7.79%	97570	21.33%	16139	3.53%	62016	13.56%	240421	52.55%
Leningrad Region	54857	6.77%	114951	14.18%	47518	5.86%	80874	9.98%	501893	61.90%
Murmansk region	32933	8.09%	65190	16.00%	20566	5.05%	39291	9.65%	244579	60.05%
Novgorod region	22955	7.41%	54875	17.70%	22066	7.12%	27017	8.72%	179501	57.91%
Pskov region	23760	6.71%	73073	20.64%	16164	4.57%	25824	7.30%	211265	59.69%
St. Petersburg	110979	4.65%	311937	13.06%	157768	6.61%	370799	15.52%	1403753	58.77%
Republic of Adygea	11164	5.06%	45311	20.55%	6637	3.01%	13145	5.96%	141257	64.07%
Republic of Kalmykia	3374	2.54%	23295	17.51%	3562	2.68%	8029	6.04%	93500	70.30%
Krasnodar	176119	6.54%	496909	18.46%	88976	3.31%	181844	6.75%	1715349	63.72%
Astrakhan region	21918	5.07%	67662	15.64%	18595	4.30%	21873	5.06%	297448	68.76%
Volgograd region	87657	6.86%	240998	18.85%	55325	4.33%	71142	5.56%	810598	63.41%
Rostov region	132418	6.27%	423884	20.06%	76633	3.63%	134461	6.36%	1324042	62.66%
Republic of Dagestan	1523	0.11%	84669	5.94%	4163	0.29%	6427	0.45%	1322567	92.84%
Republic of Ingushetia	1944	1.17%	7422	4.45%	1761	1.06%	1934	1.16%	153274	91.91%
Kabardino-Balkaria	11888	3.08%	53261	13.81%	11753	3.05%	8937	2.32%	299529	77.64%
Karachay-Cherkessia	2851	0.98%	16937	5.81%	2162	0.74%	2629	0.90%	266410	91.36%
Republic of North Ossetia — Alania	13063	3.16%	87017	21.05%	12864	3.11%	6848	1.66%	289643	70.06%
The Chechen Republic	140	0.02%	182	0.03%	165	0.03%	129	0.02%	611578	99.76%
Stavropol Territory	83543	6.99%	215600	18.03%	37551	3.14%	75724	6.33%	770874	64.47%
Republic of Bashkortostan	83704	3.64%	326250	14.18%	57329	2.49%	83667	3.64%	1731716	75.28%
Mari El Republic	24895	6.53%	84200	22.09%	15175	3.98%	24282	6.37%	228612	59.98%
Republic of Mordovia	13635	2.34%	42060	7.23%	6448	1.11%	9353	1.61%	506415	87.06%
The Republic of Tatarstan	52994	2.23%	229711	9.66%	41878	1.76%	69708	2.93%	1967291	82.70%
Udmurt Republic	49160	6.27%	116277	14.82%	26803	3.42%	67362	8.59%	515755	65.75%
Republic of Chuvashia	39707	5.65%	144676	20.58%	31201	4.44%	38838	5.52%	438070	62.32%
Perm	53879	4.60%	184639	15.78%	51535	4.40%	127098	10.86%	736496	62.94%
Kirov region	54531	7.90%	127982	18.54%	36005	5.22%	63993	9.27%	399810	57.93%
Nizhny Novgorod region	110808	5.96%	353964	19.05%	63189	3.40%	125432	6.75%	1187194	63.90%

	Zhirinovsky		**Zyuganov**		**Mironov**		**Prokhorov**		**Putin**	
Orenburg region	74414	7.33%	252947	24.92%	41104	4.05%	58849	5.80%	577411	56.89%
Penza region	48915	6.39%	150786	19.70%	24213	3.16%	39908	5.21%	492031	64.27%
Samara Region	117828	7.56%	320128	20.55%	61361	3.94%	125423	8.05%	912099	58.56%
Saratov region	66985	5.06%	206818	15.63%	43267	3.27%	59006	4.46%	934685	70.64%
Ulyanovsk region	46384	6.96%	160089	24.03%	27783	4.17%	37437	5.62%	387540	58.18%
Kurgan region	41340	8.57%	83955	17.40%	19280	3.99%	27725	5.75%	305777	63.39%
Sverdlovsk region	107819	5.20%	251690	12.14%	113353	5.47%	237780	11.46%	1337781	64.50%
Tyumen Region	59083	7.07%	95398	11.41%	20455	2.45%	43047	5.15%	611281	73.10%
Khanty-Mansi Autonomous Area — Yugra	57400	8.11%	97651	13.80%	23276	3.29%	50526	7.14%	469822	66.41%
Yamal-Nenets Autonomous District	17456	5.21%	18738	5.59%	4979	1.49%	7807	2.33%	283313	84.58%
Chelyabinsk region	97869	5.66%	254542	14.72%	88177	5.10%	138907	8.03%	1124538	65.02%
Altai Republic	5704	5.60%	17229	16.92%	3406	3.34%	6265	6.15%	68110	66.87%
Republic of Buryatia	22211	5.34%	75082	18.04%	13994	3.36%	24430	5.87%	275466	66.20%
Republic of Tyva	2574	1.74%	6370	4.32%	2023	1.37%	2925	1.98%	132828	90.00%
Republic of Khakassia	20991	8.48%	50872	20.56%	8878	3.59%	19400	7.84%	144519	58.40%
Altay	97961	8.33%	261665	22.26%	45883	3.90%	83778	7.13%	674139	57.35%
Trans-Baikal Territory	49612	9.95%	71636	14.37%	15015	3.01%	29466	5.91%	327407	65.69%
Krasnoyarsk Territory	112222	8.61%	235058	18.03%	46123	3.54%	109827	8.42%	784337	60.16%
Irkutsk Region	88419	8.24%	242097	22.57%	41152	3.84%	94008	8.76%	594861	55.45%
Kemerovo Region	112067	6.82%	133705	8.14%	37450	2.28%	75519	4.60%	1267837	77.19%
Novosibirsk Region	104223	7.70%	304761	22.53%	41001	3.03%	124205	9.18%	762126	56.34%
Omsk Region	74857	7.68%	234035	24.01%	39284	4.03%	72540	7.44%	541469	55.55%
Tomsk Region	35139	7.67%	86403	18.85%	16966	3.70%	53028	11.57%	261581	57.07%
The Republic of Sakha (Yakutia)	20010	4.37%	65871	14.39%	20193	4.41%	29712	6.49%	317933	69.46%
Kamchatka	16504	10.54%	25009	15.97%	5430	3.47%	14015	8.95%	93738	59.84%
Primorye	85396	8.63%	201493	20.36%	43168	4.36%	78639	7.95%	567177	57.31%
Khabarovsk Krai	68500	10.47%	115436	17.65%	31944	4.88%	62145	9.50%	367239	56.15%
Amur Region	39717	9.94%	67433	16.87%	13594	3.40%	23070	5.77%	251182	62.84%
Magadan	6399	9.18%	13946	20.01%	2607	3.74%	6769	9.71%	39196	56.25%
Sakhalin Region	20016	8.77%	45730	20.03%	8856	3.88%	22337	9.78%	128565	56.30%
Jewish Autonomous Region	6632	8.35%	14796	18.63%	2763	3.48%	5102	6.42%	48912	61.59%
Chukotka	2106	7.18%	2651	9.04%	633	2.16%	2209	7.53%	21310	72.64%

Source: http://www.cikrf.ru/

The Lessons from the Insistence of the U.S.A. in Nuclear Energy Policy*

Wen-Hsiang KUNG, S.J.D.
Maurer School of Law, Indiana University, Bloomington; Assistant Professor, Law Department, Aletheia University, Taiwan
wkung@umail.iu.edu

Abstract. Taiwan would like to pursue energy policies based on the three main principles of "*no power rationing, maintaining reasonable power prices, and fulfilling the nation's pledges to the international community to reduce carbon emissions*." However, can we be sure the policy under the decision-making processes could be accountable and transparent in Taiwan? Especially the use of nuclear power seems to be dilemmatic in the modern society. Even though people pursue deregulation and free market, regarding the economic competition and environmental protection, can regulators ensure that a competitive electricity industry does not abuse our air, land, or water, or prematurely deplete our supply of non-renewable resources? From the perspective of the U.S. legal system, Obama Administration has announced its pro-nuclear energy policy. Although environmentalists seriously criticize his insistence on nuclear policy as the major solution to the issues of climate change, and people in Taiwan cannot totally agree with the pro-nuclear policy as well, the U.S. basic legal infrastructures, the approach of regulatory analysis, and the fundamental procedural requirements, which are solid grounds of its justification and legitimacy, are the lessons people should learn for improving the current energy legal system in Taiwan.

Аннотация. Тайвань в своей энергетической политике намерен следовать трем главным принципам: не нормировать энергопотребление; поддерживать разумные цены; выполнять обязательства страны перед международным сообществом по снижению выбросов углекислого газа. В статье рассматривается американский опыт законотворчества и правового регулирования вопросов энергетики с точки зрения применимости к ситуации в Тайване. Хотя экологи критикуют политику США в энергетической области за приверженность к атомной энергетике, для Тайваня американский опыт является очень ценным, и его необходимо использовать для улучшения энергетического регулирования в Тайване.

Key words: Risk assessment, risk management, risk communication, nuclear energy policy, environmental impact assessment, administrative procedural values.

I. INTRODUCTION

Energy law sits at the intersection of environmental law, natural resource law, and regulated industries. Energy issues are too important to be left to the vagaries of a free market. Energy issues must be considered and planned in light of the inextricable linkage between energy independence, national security, global economic competitiveness, and environmental quality.[1] Learning from the U.S. experience could be a good starting point.

a. SHORT HISTORY

For the U.S. Congress enacted the Atomic Energy Act (AEA) in 1946, one of the reasons was the evidence — the significance of the atomic bomb for military purposes in 1945. The U.S. dropped the first atomic bombs on Hiroshima and Nagasaki, Japan.[2] However, the question

* Использование опыта США при формировании политики в области атомной энергетики.

[1] Larry R. Foulke, *A Perspective: Status and Future of Nuclear Power in the United States*, 3 (Remarks at Americas Nuclear Energy Symposium, 10/16/2002).

[2] In August 1945, television sets and radios blared news that the Japanese cities of Hiroshima and Nagasaki were flattened by a new kind of weapon, the one that leaves cities devastated and ends wars without ground troops (J. Samuel Walker & Thomas R. Wellock, U.S. Nuclear Regulatory Commission, A Short History Of Nuclear Regulation 1946–2009 1, 2010). Since then, nuclear power made its powerful and horrific entrance on the international scene. *See* Jessica Riester and Kirsten Verclas, *Nuclear Energy in the U.S. and Germany: Weighing the Risks*, 2 (April, 2012). As a result, six months after the bombing of Hiroshima and Nagasaki, President Harry Truman signed the Atomic Energy Act of 1946 (also known as the MacMahon Act), the first U.S. law outlaying precisely how the federal government would control this new and powerful resource.

how nuclear energy could be harnessed for peaceful means was not yet resolved; technological know-how to make this a viable energy source was still in its infancy.

Under President Dwight D. Eisenhower, the "Atoms for Peace" program increased funding and resources to continue to expand research into the use of nuclear power as an energy source. The military was the first to use nuclear energy as fuel and launched the first nuclear-powered submarine in 1954. The first commercial nuclear power plant was opened in 1958 in Pennsylvania and the use of nuclear energy continued to grow in the U.S. throughout the 1960s and 1970s.[3]

But, during the 1970s, environmentalism had raised consequently a more critical view of nuclear power. The accident at the Three Mile Island (TMI) nuclear plant near Harrisburg, Pennsylvania, underlined this dramatically. On March 28, 1979, the power plant suffered a partial core meltdown and a small amount of radiation was released. Following the worst nuclear accident in U.S. history, already planned nuclear power plants were cancelled and no plans for new nuclear power plants were developed. Furthermore, the 1986 nuclear accident in Chernobyl, although not affecting the U.S. directly, also made the public get more concerned and hesitate for the nuclear policies.[4]

In short, today, the United States has 104 nuclear power plants connected to the grid. They generate 803.0 terawatt hours (net TWh), which represents about 20.3 percent of the country's electricity supply (figures from 2010).[5]

b. BASIC STRUCTURE OF LEGAL SETTING

The vast majority of U.S. energy production, transportation, and distribution resources are privately owned, including nuclear power plants. Hence, for realizing the basic structure of energy legal system, as the emphasis of free market and its competition, the relevant legal issues in the New Deal can be good examples. The New Deal marked the dawn of the era of contemporary federal energy regulation and reflected the growth of economic regulation more generally. Congress has continued to address major energy issues in a complex array of environmental and economic statutes.[6] The concept of de-regulation even prevailed in 1980s, revived by the Regan Administration.

Basically, the AEA has two fundamental purposes: to facilitate the use of atomic energy for domestic purpose and to assign to the federal government responsibility for the health and safety risks associated with the nuclear fuel cycle (42 U.S.C. § § 2011 *et. seq.)* However, these two are conflicting goals — on the one hand, the AEA promotes nuclear development, and on the other it imposes regulatory limitations — and the tension between them seriously influences the regulation of radiation hazards under the Act.[7]

Also, in U.S., the regulation of energy resources takes place within a legislative tangle of state and federal statutes, and for the judicial review, in addition to using administrative law principles, courts would address energy issues under common law rules of property and contracts, even in the global arena where private companies contract with government entities for the right to develop state-owned resources.[8]

Further, for government regulation, the overlapping jurisdiction of a wide variety of regulatory agencies has its own advantages and disadvantages. Taking the federal agencies as an instance, the agencies that most directly affect the energy industries are the Department of Energy (DOE), the Department of Interior (DOI), the Federal Energy Regulatory Commission (FERC), the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA).[9]

The DOE sponsors energy research and plays a key role in international issues. The DOI controls the federal lands, both onshore and offshore, from which much of coal, oil, and gas resources are extracted, and regulates the surface mining of coal. The FERC regulates the construction of hydroelectric facilities, and oversees the rates of natural gas and electricity to the extent they are transported in interstate commerce. The FERC also articulates policies for the structure of natural gas and electric power markets. The NRC regulates the construction and operation of nuclear power plants. The EPA administers a variety of environmen-

Daniel A. Dorfman, *The Changing Perspectives of U.S. and Japanese Nuclear Energy Policies in the Aftermath of the Fukushima Daiichi Disaster*, 30 Pace Envtl. L. Rev. 255, 258 (2012).

[3] Jessica Riester and Kirsten Verclas, *id*. The first American nuclear power plant came on line in 1957 in Shippingport, Pennsylvania, near Pittsburgh. Fred Bosselman *et al.*, Energy, Economics, and the Environment: Cases and Materials, 1115 (2006).

[4] Throughout the 1990s, the U.S had been shutting down eight reactors permanently and, in fact, until 2012 no new permits for power plants had been granted. Jessica Riester and Kirsten Verclas, *id*.

[5] Id. The 104th plant is TVA's Browns Ferry Unit 1. It is not a new construction reactor. After an extensive recovery effort, Unit 1 became the nation's first nuclear unit to come online in the 21st century when it was restarted on time in May 2007. Operating licenses for Browns Ferry Units 1, 2, and 3 were renewed in May 2006, which will allow continued operation of the units until 2033, 2034, and 2036. Relevant information, available at: http://www.tva.com.

[6] Fred Bosselman, *supra* note 3, at 13–14.

[7] John S. Applegate Al ed., The Regulation of Toxic Substances and Hazardous Wastes 424 (2000).

[8] Fred Bosselman, *supra* note 3, at 14.

[9] Under the AEA, the Atomic Energy Commission (AEC) was the sole agency for the responsibility for the development and production of nuclear weapons as well as the development and safety regulation of the civilian uses of nuclear materials. NRC was established under the Energy Reorganization Act of 1974. The Act of 1974 split these functions into different agencies as presented in the context above.

tal programs that affect energy. For example, the Clean Air Act has a major impact on electric power plants.[10] However, EPA lacks the resources to monitor industries completely. Therefore, environmental enforcement and compliance heavily depends on cooperation. As the result, reflecting current risk regulation, EPA is exploring new avenues to fulfill its legal duty such as technical assistance, public education and outreach, comparative risk analysis, strategic planning, market incentives, voluntary agreements, public-private partnerships, and pollution prevention.[11]

Under the AEA, DOE is responsible for the promotion of nuclear energy, including the production of nuclear fuel and reactor-produced isotopes, and for the development, production and testing of nuclear weapons. Safety regulation is spread across several agencies. NRC has the primary responsibility for regulating nuclear safety and retains control over almost all risks associated with radioactive material. EPA coordinates federal regulation of radiation hazards that impact the ambient environment, such as airborne radiation releases and water-quality effects. For instance, if an NRC licensee adversely affects an EPA water-quality regulation, the NRC must require its licensee to correct the infraction. Also, DOE must comply with the AEA and EPA requirements in its weapons production and environmental remediation activities.[12]

In sum, the main government agency regulating nuclear energy in the U.S. is the NRC. The NRC is a self-funded agency, which means that its revenue is derived solely from the licensing fees it collects. The AEA directs that NRC regulations be in accord with the common defense and security and will provide adequate protection to the health and safety of the public (42 U.S.C. § 2232 (a)) NRC follows a "cradle-to-grave" philosophy: it regulates the possession, storage, use, and manufacture of nuclear materials, and the devices that contain these materials. Further, NRC promulgates technical requirements for the nuclear industry generally and for different categories of nuclear facilities; in addition, it licenses facilities such as hospitals and laboratories.[13] Besides, for other federal departments and agencies, the DOE and the EPA, as well as state and local bodies governing land use planning and economic development, also play different roles concerning the development and regulation of nuclear energy plants.[14] Taking the disposal facility as a more specific example, NRC specifies design and issues license for the disposal facilities, EPA sets the standards for environmental protection, and DOE (or commercial entities) owns and builds the physical facilities.[15]

In addition to the basic legal setting presented above, because of the complexity and burdensome decision-making processes for re-licensing and expansion of existing nuclear plants, applicants now are taking advantage of NRC's more flexible "risk-informed, performance-based" regulatory posture to apply for relief from overly conservative requirements. Further, the agency's new policy considers the probability and consequence of a potential safety problem, together with other factors, such as operating experience, in its "risk-informed regulation."[16] Even regarding new power plant construction, for individual projects, the NRC has established an Early Site Permit (ESP) program that is intended to resolve in advance all on-site environmental issues associated with the licensing of new reactor at a particular site.[17]

Hence, as we can see, coordination, as required and necessitated, is basically among, the DOE, the DOI, the FERC, the NRC, and the EPA.[18]

II. THE USE OF NUCLEAR ENERGY IN U.S.: THE BASIC POLICY AND ITS DEVELOPMENT AFTER FUKUSHIMA DAIICHI DISASTER

a. THE PUBLIC ATTITUDE AND FUNDAMENTAL POLICY FOR NUCLEAR ENERGY

According to the polls, although Americans were in general opposed to nuclear power, they believed it

[10] Further, the Department of Transportation, the U.S. Department of Defense, and the Department of Labor also have some roles to play.
[11] John S. Applegate, *supra* note 7, at 441.
[12] *Id*. at 425.
[13] *Id*. However, people criticize the overlap legal system, especially the role the NRC plays: NRC does not have a strongly adversarial relationship with its regulated industry. Hence, due to the foregoing reason, EPA has took a dramatic step of deciding that it would not adopt NRC radiation standards for its Superfund program because EPA thought that the NRC standards are too lenient. Not to mention the public "common sense," NRC is a *de facto* supporter of nuclear power. *Id*. at 426–26.
[14] Also, the development of nuclear energy in the U.S. would have been impossible without substantial involvement of the military as well as political support and this has ramifications for the use and management of nuclear energy even today. Jessica Riester and Kirsten Verclas, *supra* note 2, at 3.
[15] John S. Applegate, *supra* note 7, at 427.
[16] Fred Bosselman, *supra* note 3, at 1117–18.
[17] *Id*. at 1119.
[18] According to Fred Bosselman, the top ten list of current emerging issues in energy law and policy includes: 1) Land Availability, 2) Renewable Energy, 3) Federalism, 4) Regulatory Transitions (restructuring coming with the stranded cost issue), 5) Network Regulation, 6) International Climate Change, 7) Market Volatility (transmission expansion, reliability of electric power), 8) New Technologies and the Mix of Energy Uses, 9) Merger Policy and Antitrust, and 10) some other emerging environmental issues *Id*. at 2–4. Renewable resources include wind, solar, geothermal, hydroelectric, tidal bio-power, and storage. However, renewable energy policy and the environmental impact assessment will always interact with each other.

would be part of the nation's electricity mix in the future and thus favored keeping open the option of nuclear energy. Further, people thought nuclear power was generally seen to be better for the environment than coal or oil, more economical than oil, and the energy-to-electricity source the nation is least likely to run out of. Not to mention as being the useful method to reduce green house gases the majority of Americans favored.[19] In addition, concerns over U.S. dependence on foreign energy sources and Americans' desire for cheap energy have further gained the weights on the preference of nuclear energy policy in U.S.

Therefore, nuclear energy has profited from political support in terms of subsidies, loan guarantees, and insurance regulation. As the result, the policy of nuclear energy actually is not regarding the issues of environmental protection alone and will never do in U.S.[20] Nuclear energy once again has become touted as a technological solution and energy source that would guarantee energy independence and low CO_2 emissions.[21]

In 2011, President Barack Obama outlined his goal that "by 2035, 80 percent of America's electricity will come from clean energy sources." He explicitly mentioned that this would also include nuclear energy.[22]

Contrary to what matters most to Americans is how much they are paying to heat their homes and fuel their lifestyles. As scholars assert, probably only a serious nuclear accident or terrorist attack, especially after 9/11, on a nuclear power plant in the U.S. could change the basic attitudes of the public toward the nuclear energy policy.[23]

b. THE RESPONSE AND CHANGING PERSPECTIVE IN THE AFTERMATH OF FUKUSHIMA DAIICHI DISASTER

A Gallup poll conducted in March 2011, shortly after the Fukushima accident, found that 58 percent of Americans believe that nuclear energy is safe and 36 percent believe it is not. However, in the same poll Americans were split on the issue of building more nuclear power plants in the U.S. to help solve the country's current energy problem: 46 percent said nuclear power is necessary, 48 percent think that the dangers of nuclear energy are too great.[24] According to other report, 43 percent of those polled after the Fukushima disaster said they would approve building new facilities in the U.S. to generate electricity. Only three years earlier, 57 percent approved of new plants. As in the aftermath of Chernobyl, public perception formed quickly.[25] In other observation by conducting telephone survey of 1,000 U.S. adults in September 2011, 62 percent of respondents said they favor the use of nuclear energy as one of the ways to provide electricity in the United States, with 35 percent opposed.[26]

In sum, as we can also see, numerous surveys conducted over the past decade show that public support for nuclear energy topped 60 percent each year, rising as high as 74 percent of Americans in March 2010.[27] Therefore, " [W]hile there is some evidence of impact of the Fukushima events, support for nuclear energy continues at much higher levels than in earlier decades. Turmoil in oil-rich areas of the world and hikes in oil prices historically have focused opinion even more on nuclear energy, and may have helped to preclude serious impact of events in Japan on public attitudes."[28]

However, as presented above, many license applications filed with the NRC for proposed new reactors have been suspended or cancelled. As of October 2011, plans for about 30 new reactors in the United States have been whittled down to just four, despite the promise of large subsidies and President Barack Obama's support of nuclear power, which he reaffirmed

[19] Jessica Riester and Kirsten Verclas, *supra* note 2, at 3.

[20] As the very first paragraph in his casebook of energy law, Fred Bosselman has already proclaimed "[The] energy sector… Old systems of regulation are being supplanted by policies that emphasizes competition." Fred Bosselman, *supra* note 3, at 1. But he also mentions that environmental concerns and environmental science raise increasingly complex issues, such as climate change and the meaning of sustainable development. *Id*.

[21] *Id.*

[22] *See* President Barack Obama, State of the Union Address, 25 January 2011, available at: http://www.whitehouse.gov/the-press-office/2011/01/25/remarks-president-state-union-address

[23] Jessica Riester and Kirsten Verclas, *supra* note 2, at 3.

[24] Gallup Politics, available at: http://www.gallup.com/poll/146939/majority- americans-say-nuclear-power-plants-safe.asp. *Also see* Frank Newport, *The Majority of Americans Say Nuclear Power Plants in the U.S. Are Safe* (April 4, 2011). Scholars points out it is difficult to assess under what circumstances a majority of the American public would support nuclear energy and it is not easy to tell how Americans value the trade-off between risk and safety. Jessica Riester and Kirsten Verclas, *id*. at 3.

[25] Daniel A. Dorfman, *supra* note 2, at 270–71.

[26] This survey was sponsored by the Nuclear Energy Institute. Details on the new survey are accessible at: http://www.nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/reports/latest-trends-in-us-public-opinion-about-nuclear-energy-sept-2011.

[27] *See* PR Newswire, Americans' Support for Nuclear Energy Holds at Majority Level 6 Months After Japan Accident, available at: http://www.prnewswire.com/news-releases/americans-support-for-nuclear-energy-holds-at-majority-level-6-months-after-japan-accident-130981293.html

[28] *Id*. There are also some other polls presenting different perspectives from the public opinion. Moreover, in those reports not only the majority has be continually against new construction of nuclear power plants, but they also extend their focus to relicensing and expansion of existing nuclear plants.

after Fukushima.[29] Therefore, it is still quite uncertain whether the accident at Fukushima will have significant adverse effects on the continued operation of existing nuclear plants and the level of construction of new nuclear plants, both in the worldwide perspective and in the U.S.

The critics claim that there could be two potentially interdependent forces that would lead the Fukushima accident to affect (negatively) the future of nuclear power. Firstly, the lessons learned from the accident may affect safety criteria and procedures for existing and new nuclear generating units. Secondly, the accident and its consequences may adversely affect public and political support for nuclear power.[30]

Basically, we can point out that, although people might be more concerned about the safety of nuclear plants, in the U.S. the events at Fukushima have not yet had any direct effects on the future of existing nuclear plants. License extensions continue and no plants have been closed due to safety concerns.[31] Further, for all of the 104 operating nuclear units, the NRC had declared that the nuclear units operating in the U.S. are safe.[32]

The NRC also created a task force to identify near term lessons learned from Fukushima. It concluded that the basic NRC regulatory framework is sound and that a sequence of events such as occurred at Fukushima is unlikely at U.S. plants, and could be mitigated.[33] The Task Force also concluded that operation and licensing of nuclear plants could continue without posing a significant risk to public health and safety.[34]

But, the Task Force report did identify a number of general areas for improvement, rationalization and modernization of NRC regulatory procedures that have evolved over many years, and it made recommendations to codify and harmonize a large set of general and specific safety criteria and procedures so that the regulatory process can operate more efficiently. Specific recommendations that could affect some existing plants, if they are adopted by the NRC, include: reevaluating the design basis accident used to account for new data on earthquakes and floods; strengthening station blackout mitigation (loss of station power) for all existing and new units; improvements in hydrogen control and mitigation inside containments and other buildings; enhancing spent fuel water makeup capabilities; and strengthening emergency preparedness programs.[35]

As presented above, the energy policy and law are not solely environmental issues but much more about the questions of economy and national security, therefore, although the nuclear accident in Fukushima has quelled the renewed enthusiasm about nuclear energy to a certain extent, in February 2012 the NRC approved licenses to build two new nuclear reactors, the construction and operating license for additional reactors at a nuclear power plant in Georgia, the first such approval since 1978. The reactors will be built in Georgia at the Vogtle nuclear power plant complex about 170 miles east of Atlanta.[36]

President Obama has argued that clean energy encompasses all energy sources, so, this administration would assess risks and benefits of nuclear energy by taking true societal and governmental costs into account. Therefore, assessing costs, benefits, and risks of nuclear energy and other energy sources as well as developing a robust, comprehensive, and far-sighted energy policy is thus necessary.[37] Nevertheless, President Obama did not back down from his pro-nuclear stance, announcing that he continues to support the expansion of nuclear power in the United States, despite the crisis in Japan, and that nuclear energy is an important part of U.S. energy future.

III. RISK ASSESSMENT FOR NUCLEAR ENERGY POLICY AND ITS SPECIAL CONCERNS

Risk assessment, especially in terms of nuclear energy, is often focused on security assessment. For the nuclear energy regime, risk assessment has played a

[29] *See New York Times,* After Fukushima, Does Nuclear Power Have a Future? available at: http://www.nytimes.com/2011/10/11/business/energy-environment/after-fukushima-does-nuclear-power-have-a-future.html

[30] Paul L. Joskow and John E. Parsons, *The Future of Nuclear Power After Fukushima*, at 4. MIT Center for Energy and Environmental Policy Research (Feb. 2012).

[31] *Id*. at 14.

[32] Of the 104 units inspected, 91 were performing at the highest safety level with no special remedial action or special inspection regime required. Eight more plants needed to take actions to deal with relatively minor safety-related issues. Three other plants were identified as having more significant safety issues requiring remediation. More management attention and NRC inspections were proposed for these plants. Two of the 104 U.S. plants were determined to require a very high level of attention. *See* NRC, *NRC Issues Mid-Cycle Assessment for Nation's Nuclear Plants*, NRC NEWS No. 11–666 (Sept. 2011).

[33] NRC, *Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from The Fukushima Dai-Ichi Accident*, at 18, U.S. NRC (July 2011).

[34] *Id.*

[35] The Task Force's overarching recommendations include: *Clarifying the Regulatory Framework, Ensuring Protection, Enhancing Mitigation, Strengthening Emergency Preparedness, and Improving the Efficiency of NRC Programs*. *Id*.

[36] Daniel A. Dorfman, *supra* note 2, at 271–72. This approval for nuclear plant construction suggests that the Fukushima disaster did less to curb nuclear development in the U.S. than originally predicted. It could also be a solid predictor of the U.S. continuing in a pro-nuclear direction within the next few years. *Id*. at 272.

[37] Fred Bosselman, *supra* note 3, at 7.

significant role whether it is risk of nuclear energy, risk to the environment, or risk to people. In an age of heightened security concerns due to terrorism, the risk of security vulnerability has also become a consideration. Moreover, economic considerations should be considered as factors in the assessment of each of these types of risks, weighing the potential for investment and profit against the risk of economic losses at a time of economic uncertainty.[38] Furthermore, policymakers in the U.S. view nuclear energy as a solution to reduce American energy imports, that might cause the risk of dependence on other nations, and to reduce emissions of greenhouse gases as a green alternative to coal and natural gas plants.[39] However, the uncertain availability of uranium as a necessary resource and the unsolved question of where to store nuclear waste make the case for nuclear energy problematic.[40]

Therefore, if nuclear is too dangerous, fossil fuels are too dirty and renewable energy is too complicated, where are we supposed to get our energy? Also, in addition to the security risk, people might further raise the question, what is the cost of nuclear energy? And, does the risk outweigh the costs?

There are many kinds of risks around the decision-making for the nuclear energy policy. In Part III, I will present the basic recommendations made by the NRC, generally from regulatory aspect, to see what legal system can do for improving and enhancing the safety of nuclear energy policy. Also, I will further focus on the risk regulation from the health and environmental perspectives to see what risk assessment, risk management, and risk communication are supposed to be. Finally, I will also provide some further considerations for the development of nuclear power policy in U.S.

a. THE NRC RECOMMENDATIONS FOR ENHANCING REACTOR SAFETY FROM REGULATORY PERSPECTIVE

Basically, as presented above, the Task Force recommends establishing a logical, systematic, and coherent regulatory framework for adequate protection that appropriately balances defense-in-depth and risk considerations. It even further provides the following steps:

1. Drafting a policy statement that articulates a risk-informed defense-in-depth framework that includes extended design-basis requirements in the NRC's regulations as essential elements for ensuring adequate protection.

2. Initiating rulemaking to implement a risk-informed, defense-in-depth framework consistent with the above recommended policy statement.

3. Modifying the regulatory analysis guidelines to more effectively implement the "defense-in-depth philosophy" in balance with the current emphasis on risk-based guidelines.[41]

The key to the so-called defense-in-depth approach is to create multiple independent and redundant layers of defense to compensate for potential failures and external hazards so that no single layer is exclusively relied on to protect the public and the environment. In its application of the defense-in-depth philosophy, the Task Force has addressed protection from design-basis natural phenomena, mitigation of the consequences of accidents. The elements of the NRC regulatory framework provide protection from "design-basis events" — protection against seismic and flooding events; "beyond-design-basis event" (as reasonable expectations) — protection for loss of all AC power; and mitigation of severe accidents — addressing the core damage and subsequent containment performance from the beyond-design-basis events (as in Fukushima accident).[42]

In a new regulatory framework, risk assessment and defense-in-depth would be combined more formally.[43] For example, the current NRC approach to land contamination relies on preventing the release of radioactive material through the first two levels of defense-in-depth, namely protection and mitigation.[44] In sum, as the NRC provided, the philosophy of "defense-in-depth" is including design-basis re-

[38] For example, even though Germany has made its decision to return to the phase-out plan, without producing its own nuclear energy, German reliance on foreign sources will not only increase, but its energy needs will still be met by nuclear sources provided by its neighbors. This might cause the energy security unstable. Therefore, although anti-nuclear sentiment has swept the EU, weighing the risk of nuclear versus the risk of foreign energy sources or increased CO_2 emissions is an ongoing debate. Jessica Riester and Kirsten Verclas, *supra* note 2, at 5–6.

[39] *Id*. at 3.

[40] While nuclear energy emits almost no CO_2 when plants are running, if we take into account the lifecycle assessments of nuclear power plants, including the building of plants, the procurement of uranium, and the transportation and storage of waste, critics would emphasize the different emissions picture. *Id*. Also, a comparison by the Union of Concerned Scientists of the levelized costs for the proposed Levy nuclear power plant in Florida with alternative energy sources shows that nuclear energy is not necessarily the cheapest option: "the mid-range levelized cost estimate for the Levy reactors, $164 per megawatt-hour (MWh), was higher than that of most other energy solutions, including improved energy efficiency to reduce electricity use, natural gas, biomass, land-based wind, solar photovoltaic, and even coal." Nuclear energy has high up-front and decommissioning costs. *Id*. at 4.

[41] NRC, *supra* note 33, at 122–23.

[42] *Id*. at 15. The last layer of defense-in-depth, mitigation, is an essential element of adequate protection of public health and safety. *Id*. at 20.

[43] *Id*. at 21.

[44] The Task Force concluded that the NRC's current approach to the issue of land contamination from reactor accidents is sound. *Id*.

quirements and additional risk reduction requirements.[45]

The Task Force recommends the safety improvements added from the 1980s to the present to produce a regulatory structure well suited to licensing and overseeing the operation of nuclear power plants for decades to come. Further, as this report asserted, adequate protection should continue to be an evolving safety standard supported by new scientific information, technologies, methods, and operating experience.[46] Therefore, as new information and new analytical techniques are developed, safety standards need to be reviewed, evaluated, and changed, as necessary, to insure that they continue to address the NRC's requirements to provide reasonable assurance of adequate protection of public health and safety.[47]

b. BASIC STRUCTURE OF RISK REGULATION: RISK ASSESSMENT, RISK MANAGEMENT, AND RISK COMMUNICATION

From the foregoing introduction to NRC's recommendations, we should know the general regulatory framework for safety of the current nuclear energy. In this section, I will further focus on the risk regulation from the perspectives of health and environment (toxics regulation and pollution control). I will use the structure of risk regulation to analyze, including risk assessment, risk management, and risk communication, which would be consistent with the requirements of due process for decision-makers: accountability, transparency, and participation, the so-called fundamental procedural values.

As presented above, when new information and new analytical techniques are provided, safety standards need to be reviewed and evaluated. But, before standards are changed, decision-makers must considerably go though decision-making procedures for risk management, based on risk assessment and getting the public involved as supportive foundation for the final action, for ensuring the public health and safety.

Risk regulation (or so-called risk-based standards), as an effective regulatory analysis, depends on the ability and even adaptability of regulators to produce quality regulations well-grounded in sound science, economics, and law.[48] Hence, more flexible statutory language will be needed to produce a more adaptive and dynamic regulatory process that is able to implement sound scientific evidence more easily. And, this approach will also prevent the agency from misallocating resources and missing the need to the regulation of significant risks.[49] Hence, risk assessment is a critical tool for helping the NRC, EPA, and some other relevant agencies to set priorities under the current legal system.

Although legal framework needs to be more flexible, according to the NRC 1983 report (*the Red Book*), for risk regulation, it endorsed a bipartite system by which scientific data was used to assess the risk posed by a given commodity in a process kept separate from a decision-making process based on specific data.[50] In short, this approach is to separate the scientific process, risk assessment, from the political process, risk management, because the latter, as *the Red Book* asserted, unlike risk assessment, explicitly involves political, social, and economic policy questions, such as the acceptable level of risk and the appropriate regulatory response.[51]

The purpose of separation in *the Red Book* is not only to prevent the exercise of policy judgment when evaluating science, but also to prevent risk managers from influencing the type of information that assessors would collect, analyze, or present. Moreover, according to Prof. Applegate's analysis to *the Red Book's* approach, he furthered that even though judgment would be actually required during the phase of risk assessment, the science-policy judgments that EPA (or other agencies) makes in the course of risk assessment would also be improved because decision-makers would be more clearly informed by the agency's priorities and goals in risk management.[52] Therefore,

[45] The concept of design-basis events has been equated to adequate protection, and the concept of beyond-design-basis events has been equated to beyond adequate protection such as safety enhancements. *Id*. at 15.

[46] *Id*. at 18.

[47] *Id*.

[48] Andrew J. Miller, Note, *The Food Quality Protection Act of 1996: Science and Law at A Crossroads*, 7 Duke Envtl. L. & Pol'y F. 393, at 418 (1997).

[49] Of course, regulatory analysis must be performed by well-qualified and multi-disciplinary individuals. *Id*, at 419; also *see*, NRC, Understanding Risk, Informing Decisions in a Democratic Society, at 24 (1996). People even try to use social and behavioral science to analyze how environmental decision could be made effectively and efficiently. And, people also emphasize that decision making should have adaptive ability to change in science and society. *See*, National Research Council, Decision Making for the Environment, social and behavioral science research priorities (2005).

[50] *See*, NRC, Risk Assessment in the Federal Government: Management the Process, at 151 (1983). As a complement to the Red Book, the NRC's 2008 report embeds these concepts within a broader framework for risk-based decision making. This report furthered that risk assessment has become a dominant public policy tool for making choices, based on limited resources and facing a number of significant challenges, to protect public helath and the environment. *See*, NRC, Science and Decision: Advancing Risk Assessment (2008).

[51] *See*, NRC, RISK ASSESSMENT, *id*.

[52] John S Applegate, *Learning From NEPA: Some Guidelines for Response Federal Risk Legislation*, 23 Harv. Envtl. L. Rev. 93, 98 (1999).

protecting the scientific integrity in risk assessment, while building more productive linkages to make risk assessment more accurate and relevant to risk management, will be essential as the agency proceeds to regulate the given risks.[53]

From the perspective of unclear energy policy, the health effects of radiation have been studied in considerable detail, but, even though the mechanism and higher-dose health effects are understood relatively well, compared to chemicals, the effects at very low doses are not free from doubt.[54] Further, how can radiation cause damage? The combined effects of type of radioactivity, chemical stability, biological uptake, dose and dose rate, and dose location make the risk posed by even a simple radiation exposure difficult to estimate.[55] Taking cancer as an example, chronic effects are of greater concern, however, because many human activities release low levels of radiation, including medical x-rays and television viewing, the precise effects of low-level radiation continue to be controversial.[56]

According to the current practice, the average annual effective dose to the U.S. public from all sources is about 360 millirem, of which 200 mrem is from radon and 100 mrem from cosmic, terrestrial, and internal sources. By comparison, NRC's annual limits are 5000 mrem for occupational exposures and 100 mrem for the general public; EPA seeks to achieve a 15 mrem standard for remediation sites, because that level achieves an appropriate level.[57] However, there is a lively debate about low-dose effects of ionizing radiation. Since the low-dose effects of radiation on human are difficult to study directly, whether or not there is a threshold below which the effects disappear also remains contested.[58]

Therefore, under risk regulation (risk-based regulatory approach has been the dominant position for the regulation of environment, health, and safety), because of the characters and limitation of scientific information, in addition to risk assessment and risk management, for risk communication throughout the previous two processes, the general public should have the fundamental right to know critical information. Public perceptions of risk and expert perceptions of risk are divergent and a regulatory process with limited resources cannot accomplish such divergent goals, so risk regulation must include risk communication to produce more synchronistic goals.[59]

Improving risk communication will also depend on the procedural requirements, including transparency, accountability, and public participation, for the decision making process, which will be further discussed below.[60] Although the nature of some of these choices cannot be easily communicated to the public because of expert disagreements and a lack of reliable scientific results,[61] the NRC report concluded that: " [I]t is mistaken to expect improved risk communication to always reduce conflict and smooth risk management ... But even though good risk communication cannot always be expected to improve a situation, poor risk communication will nearly always make it worse."[62] Hence, the public participation for risk communication will improve communication channels between scientists, policy-makers, and the public.[63] Further, it is essential that scientists be able to communicate with the public in a clear and non-technical manner about the tradeoffs associated with alternative health and environmental issues.[64]

Under risk communication, greater stakeholder involvement is necessary to ensure that the process is transparent and that risk-based decision-making would proceed effectively, efficiently, and credibly.[65] As the result, for improving risk communication, we need to ensure that the public has the opportunity to access and the ability to understand the needed information to provide positive input into the decision-making process. Hence, from this point of view, meaningful public participation will be criti-

[53] *Id.*

[54] John S. Applegate, *supra* note 7, at 419.

[55] *Id.* at 420.

[56] *Id.* at 419.

[57] *Id.* at 422.

[58] *Id*. Further, as presented above, NRC does not have a strongly adversarial relationship with its regulated industry and this is the reason why EPA had decided that it would not adopt NRC radiation standards for its Superfund program (just because EPA believed that the NRC standards are too lenient). *Id*. at 426.

[59] Andrew J. Miller, *supra note* 48, at 422.

[60] The establishment of a leader for the regulatory process who will be trusted and can serve as an icon of risk analysis can help guide public perceptions toward creation of a safer society. NRC, Understanding Risk, *supra note* 49, at 24. Also *see*, National Research Council, Public Participation in Environmental Assessment and Decision Making (2008).

[61] Andrew J. Miller, *supra note* 48, at 421.

[62] NRC, Improving Risk Communication, at 3 (1989).

[63] NRC, The Future Role of Pesticides in US Agriculture, at 86–87 (2000).

[64] John S. Applegate, *The Government Role in Scientific Research: Who Should Bridge the Data Gap in Chemical Regulation*, in Rescuing Science From Politics, Regulation and the Distortion of Scientific Research 255, 268. (Wendy Wagner and Rena Steinzor ed., 2006).

[65] Further, stakeholder involvement needs to be an integral part of the risk-based decision-making framework, even beginning with problem formulation and scoping. See NRC, Public Participation, *supra note* 60, at 12. For helping the understanding of true risks, risk comparisons can be a good way in context for standard setting or priority setting. *Id*. According to the NRC report in 1996, coping with a risk situation requires a broad understanding of the relevant losses, harms, or consequences to the interested and affected parties and needs to address social, economic, ecological, and ethical outcomes as well as consequences for human health and safety. NRC, Understanding Risk, *supra* note 49, at 156–57.

cal for helping the agency to make better decisions (such as adequate standards for radiation exposures), which will be also more acceptable for the public.

c. SPECIAL CONCERNS AND RESPONSES IN POLICY AND REGULATIONS

After understanding the general regulatory framework in nuclear power policy and detailed discussion of risk regulation for environmental and health regulations including standards set for radiation exposure for the public safety, the following sections will further observe other factors the agencies might concern for their final decision-making in the nuclear energy policy.

CLIMATE CHANGE

As presented above, nuclear energy is an important part of President Obama's plan to resolve the issues of global warming. Moreover, taking Germany as an example, under its phase-out plan, Germany will need to turn to fossil fuels to replace nuclear which might raise another serious concern. According to some estimates, Germany's policy could add 370 metric tons of greenhouse gas emissions through 2020 — an annual equivalent of Slovakia's emissions. Fossil fuels currently provide about 40 percent of German energy; greater reliance indeed poses an environmental risk of potentially higher likelihood than nuclear risk.[66] Therefore, unless Germany is able to rapidly expand renewable energy, it will continue to require nuclear energy — imported from its neighbors. By the same time, Germans are actually pushing that risk on its neighbors. As critics assert, in some ways, this seems a shortsighted action, because Germany will undoubtedly suffer once a nuclear disaster takes place next door, but it will lack the over-sight controls to try and prevent such a disaster.[67]

In U.S., according to reports, since the mid-1970s, nuclear energy has enabled the United States to avoid emitting over 80 million tons of sulfur dioxide and about 40 million tons of nitrogen oxides.[68] In 2002, a group of environmental analysts argued that nuclear power could play a significant role in mitigating climate change. This position received strong support, and in 2003, a report conducted at MIT entitled *The Future of Nuclear Power* explained that fossil fuels were not the answer. Instead, it concluded that nuclear power was a viable option and called for financial incentives to promote the construction of new nuclear plants.[69]

In President Obama's plan to tackle global warming, announced on June 2013, his administration is instituting stringent mandatory restrictions on greenhouse gas emissions by power plants, factories and other industrial sources. These sources combined account for roughly 40 percent of all greenhouse gas emissions across the U.S. The goal is to reduce overall greenhouse gas emissions nationally by four percent below 1990 levels within the next seven years. However, some other critics asserted that Obama's plan is too modest and will fall short by failing to set a nationwide pollution cap for carbon dioxide. Further, they also criticized that his plan is not big enough and does not move fast enough to match the terrifying magnitude of the climate crisis.[70] But, on the other hand, undeterred by the Fukushima nuclear disaster, Obama pledged just two weeks following the initial explosions at the Daiichi facility that nuclear power should be revived in the U.S., as it provides "electricity without adding carbon dioxide to the atmosphere." Hence, nuclear power, as President Obama insists, might make up for the gap and as the foregoing criticism anticipated, as long as Obama remains in office, nuclear will remain a big part of U.S. near term energy future.[71]

TERRORISM

After the terrorist attacks of September 11, 2001, concerns that terrorist groups might target nuclear plants in the U.S. grew. Also, the nuclear accident in Fukushima has caused increased concern about the impact of natural disasters on nuclear power plants. As the immediate response for Fukushima disaster, the NRC had required nuclear power plant operators to increase safety and security measures after both incidents. Also, the NRC had placed the 103 operating nuclear power plants and other significant licensees on the highest

[66] Jessica Riester and Kirsten Verclas, *supra* note 2, at 6.
[67] *Id*.
[68] Larry R. Foulke, *supra* note 1, at 1. He also furthered that over the past 20 years, the average capacity factor has increased from about 60% to over 90%. This increased capacity translates into an additional 23,000 megawatts of power on the grid — the equivalent of building 23 new plants. *Id*.
[69] Daniel A. Dorfman, *supra* note 2, at 269.
[70] Business Ethic, *Environmentalists Assess Barack Obama's Climate Change Initiative* (June 2013), available at: http://business-ethics.com/2013/06/29/1146-environmentalists-assessbarack-obamas-climate-change-initiative.
[71] However, it also emphasized that nuclear power is counterproductive to efforts to address climate change effectively and in time… funding diverted to new nuclear power plants deprives real climate change solutions, like solar, wind and geothermal energy, of essential resources. Business Ethic, *After Fukushima: Obama's Nuclear Policy* (June 2011), available at: http://business-ethics.com/2011/06/17/2448-after-fukushima-obamas-nuclear-policy.

level of alert immediately after the September 11, 2001 attacks.[72]

The NRC is responsible for assuring protection of the public health and safety in the civilian use of nuclear material. This includes ensuring that commercial nuclear power plant licensees provide a program of physical protection in accordance with the requirements in Title 10 of the Code of Federal Regulations, Section 73.55. Before September 11, 2001, the security measures in place provided reasonable assurance that the health and safety of the public would be protected in the event of an attack within the design basis threat (DBT) of radiological sabotage in 10 CFR 73.1. Since September 11, 2001, the defensive capability of the industry has been significantly enhanced as a result of the actions taken by licensees voluntarily and in response to the advisories issued by the NRC after September 11, 2001, and the orders issued on February 25, 2002. In addition, on April 29, 2003, NRC issued a revised DBT against that licensees must be prepared to defend. The enhancements include security measures against an insider, waterborne attacks, vehicle bombs, and land-based assault threats. Additional measures will be considered in the future as necessary.[73]

The NRC has overseen the implementation of enhanced security measures over since 2011. Licensees throughout the nuclear industry have significantly enhanced security by upgrading security measures and coordinating with local, state, and federal agencies to better prepare for a significant terrorist event. Some of the specific measures implemented by the licensees in response to the NRC advisories and orders included increased patrols, augmented security forces and capabilities, additional security posts, installation of additional physical barriers, vehicle checks at greater stand-off distances, enhanced coordination with law enforcement and military authorities, and more restrictive site access controls for all personnel.[74]

SPENT NUCLEAR WASTE DISPOSAL

Spent nuclear waste disposal is also another important issue for nuclear energy policy, and the Yucca Mountain Nuclear Waste Repository could be a good example, which is an ongoing debate.

This nuclear waste repository was supposed to be a deep geological repository storage facility for spent nuclear reactor fuel and other high level radioactive waste. It was to be located on federal land adjacent to the Nevada Test Site in Nye County, Nevada, about 80 mi (130 km) northwest of the Las Vegas Valley. This proposed repository was within Yucca Mountain, a ridge-line in the south-central part of Nevada near its border with California.

For this repository, EPA established the Yucca Mountain standards, as original ones, in June 2001.[75] The storage standards set a dose limit of 15 millirem per year for the public outside the Yucca Mountain site. The disposal standards consisted of three components: (1) an individual dose standard, (2) a standard evaluating the impacts of human intrusion into the repository, and (3) a groundwater protection standard. The individual-protection and human intrusion standards set a limit of 15 millirem per year to a reasonably maximally exposed individual, who would be among the most highly exposed members of the public. The groundwater protection standard is consistent with EPA's Safe Drinking Water Act standards, which the Agency applies in many situations as a pollution prevention measure. The original disposal standards were set for the application for a period of 10,000 years after the facility is closed. Dose assessments were to continue beyond 10,000 years and be placed in DOE's Environmental Impact Statement. The 10,000 year period for compliance assessment is consistent with EPA's generally applicable standards developed under the Nuclear Waste Policy Act. It also reflects international guidance regarding the level of confidence that can be placed in numerical projections over very long periods of time.

However, shortly after the EPA first established these standards in 2001, the nuclear industry, several environmental and public interest groups, and the State of Nevada challenged the standards in court. In July 2004, the Court of Appeals for the District of Columbia Circuit found in favor of the Agency on all counts, except the 10,000 year regulatory time frame. The court ruled that EPA's 10,000-year compliance period for isolation of radioactive waste was not consistent with National Academy of Sciences (NAS) recommendations and was too short.[76] The NAS report had recommended standards be set for the time of peak risk, which might approach a period of one million years.[77]

Although according to the ruling, in 2009, EPA published in the Federal Register a final rule, limiting radiation doses from Yucca Mountain for up to 1,000,000

[72] Jessica Riester and Kirsten Verclas, *supra* note 2, at 4.

[73] Additional information on this subject can be found in the testimony provided by former Chairman Meserve to the U.S. House of Representatives on April 11, 2002. Further, Frequently Asked Questions About NRC's Response to the 9/11/01 Events, available at: http://www.nrc.gov/security/faq-911.html

[74] *Id*.

[75] EPA, EPA's Proposed Public Health and Environmental Radiation Protection Standards for Yucca Mountain (October 2005).

[76] *Nuclear Energy Institute v. EPA*, 373 F.3d 1251 (D.C. Cir. 2004).

[77] NRC, Committee on Technical Bases for Yucca Mountain Standards (1995).

years after it closes,[78] there were still other environmental concerns against the plan, such as the issues of the environmental impacts of transportation of waste and earthquakes. For the earthquake issue, Nevada ranks fourth in the nation for current seismic activity. Even though DOE has stated that seismic and tectonic effects on the natural systems at Yucca Mountain will not significantly affect repository performance, in September 2007, it was discovered that the ridge fault line ran underneath the facility, which would cause serious safety problems. Also, cities under the routes of the waste transportation are concerned about the transport of radioactive waste on highways and railroads that may pass through heavily populated areas and cause harmful release of radioactive material.[79]

In addition, cultural influence should be weighted under the processes of decision-making as well. Native Americans used the immediate vicinity of Yucca Mountain on a temporary or seasonal basis. Yucca Mountain and surrounding lands were central in the lives of the Southern Paiute, Western Shoshone, Owens Valley Paiute and Shoshone peoples, who shared them for religious ceremonies, resource uses, and social events. They believe that this repository project overlooks traditional accounts of farming that occurred before European contact.[80]

Although the location has been highly contested by environmentalists, Congress had approved it in 2002. However, since debates presented above, under the Obama Administration, funding for development of Yucca Mountain waste site was terminated, in pursuant to the amendment to the Department of Defense and Full-Year Continuing Appropriations Act, passed by Congress on April 14, 2011.

In this case, we can observe what the roles the administrative, legislative and judicial branches play, and see how important risk assessment is. Although, according to the estimate, $12 billion had already been spent to study the project and build it[81] and some experts even asserted that for this project, the NRC has promulgated a modern licensing process including an early site approval process and pre-certification of reactor designs,[82] once the transparency, accountability, and public involvement of the decision-making cannot be fulfilled, because of the requirements of due process, the final action, based on expertise, would still be withdrawn or overturned.

OTHERS

In addition to providing clean energy, a dazzling array of nuclear technologies actually helps to improve medical diagnosis, protect livestock health, develop water resources, preserve food, promote agricultural productivity, cure human illness, enhance human nutrition, advance environmental science, eradicate virulent pests, and strengthen industrial quality control.[83] These might also be the critical factors for the decision-makers to make the final nuclear energy policy.

VI. RECOMMENDATIONS FROM U.S. EXPERIENCE FOR US: TRANSPARENCY, ACCOUNTABILITY, AND PARTICIPATION FOR NUCLEAR ENERGY POLICY

As Americans are less self-conscious about how unattainable a high-energy society is and less aware of its anomaly, the policymakers need to reflect seriously on how the behavior of Americans will change in reaction to legal and economic incentives for dealing with the issues of intersection of environmental protection and nuclear energy policy.[84] This would be the same prerequisite for people in Taiwan to pay attention to for the further development. But, no matter what energy policy would be in Taiwan, the basic legal approach, the U.S. experience, successful or failure, even including the insistence in nuclear energy policy the Administration has, shall be good lessons for us to learn.

As presented above, for the procedures for decision-making, including the regulatory analysis — risk assessment and risk management, the most important thing is to fulfill the fundamental values of due pro-

[78] Within that regulatory time frame, the EPA has two dose standards that would apply based on the number of years from the time the facility is closed. For the first 10,000 years, the EPA would retain the 2001 final rule's dose limit of 15 millirem per year. This is protection at the level of the most stringent radiation regulations in the U.S. today. From 10,000 to one million years, EPA established a dose limit of 100 millirem per year. EPA's rule requires the Department of Energy to show that Yucca Mountain can safely contain wastes, considering the effects of earthquakes, volcanic activity, climate change, and container corrosion, over one million years. The current analysis indicates that the repository will cause less than 1 mrem/year public dose through 1,000,000 years.

[79] For its EIS, *see* "Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada; DOE/EIS-0250". Office of Civilian Radioactive Waste Management, U.S. DOE (February 2002).

[80] For environmental justice study, see "Environmental Justice Case Study: The Yucca Mountain High-Level Nuclear Waste Repository and the Western Shoshone".

[81] As the result, U.S. has no any long-term storage site for high-level radioactive waste, which is currently stored on-site at various nuclear facilities around the country. The Department of Energy is reviewing other options for a high level waste repository. According to its final report, the Blue Ribbon Commission, established by the Secretary of Energy, emphasized urgency to find a consolidated, geological repository. *See* Blue Ribbon Commission on America's Nuclear Future Final Report (Jan. 2012).

[82] Larry R. Foulke, *supra* note 1, at 1.

[83] *Id*. at 1–2. Some people even said that the renaissance of nuclear power in the United States is inevitable. *Id*. at 2.

[84] Fred Bosselman, *supra* note 3, at 11.

cess — accountability, transparency, and participation, through the current legal system of administrative (environmental) law. Moreover, according to Prof. Aman, due processes for the decision-making, including policy or regulatory setting, are not only to protect individuals from inappropriate governmental action, but also to allow for, even to require, input by citizens regarding policy under review.[85] Especially from the perspective of environmental and health laws, due to the expertise and discretion, since the legal system of delegation is unavoidable, the relevant issues will be more complicated and costs for dealing with will be carried more obviously. Therefore, transparent and accountable procedures for the decision-making shall be realized.[86]

For example, for the requirements of procedural due process, the easier it is for the public to discover and understand the political trade-off made by agency personnel, the easier it is to hold agencies politically accountable for the ways in which they choose to exercise their discretion.[87] Further, in order to enhance transparency, Congress would mandate public disclosure of the recommendations or reports of agency scientists. Where Congress has directed agencies to use the best available scientific information in their decisions, the public is entitled to know what agency scientists think of the scientific data, without filtering it by political appointees.[88] In addition, for the agency to enhance its transparency and accountability, public participation is also an important mechanism to fulfill the goals of modern legal system.[89] The NRC report of 1996, dealing with how governmental institutions and procedures should be structured to make decisions better and more broadly acceptable, also emphasized that participation from interested and affected parties and improvement of understanding risk should be enhanced in risk decisions.[90]

In sum, accountability for risk assessment of nuclear energy policy shall take nuclear proliferation, the question of transparency on nuclear accidents and waste storage, and the question of energy production without nuclear energy into account. In addition, the public participation will also be the prerequisite for the decision-making. According to the NRC report in 1996, coping with a risk situation requires a broad understanding of the relevant losses, harms, or consequences to the interested and affected parties and needs to address social, economic, ecological, and ethical outcomes as well as consequences for human health and safety.[91] Therefore, decision-makers must be accountable for the final nuclear energy policy; transparency and public involvement will be essential in whole energy system. In order to answer the questions raised above, it is necessary for the United States to develop a comprehensive energy strategy, which entails a cost-benefit and risk analysis of available energy resources and energy efficiency measures.[92]

V. CONCLUSION — A TWIST: THE LESSONS FOR RENEWABLE RESOURCE POLICY

Of the paper I discussed above regarding the insistence of U.S. in nuclear energy policy, not the pros or cons for the policy, the main focus is to realize the importance of due process for making the final energy policy.[93] Further, risk assessment is a critical stage for the ongoing process. For the application, environmental impact assessment (EIS) for developing project could be another suitable case for the understanding (EIA in Taiwan has been twisted and seriously lacks accountability, transparency, and participation.) Even for the renewable energies, in addition, there are still many environmental impacts we need to concern about, such as the issues of siting and permitting.

For the renewable resources with siting issues, while proponents cite the environmental, economic, and energy security benefits to be gained from these projects, opponents cite the negative impacts, which often include potential damage to local ecosystems, loss of aesthetic value to the natural landscape, and the opportunity cost of land use. Biomass and biofuels, for example, require large amounts of land that could instead be used for agricultural purposes. Hydro-power is becoming increasingly difficult to site; most major

[85] *See*, Alfred C. Aman, Jr., The Democracy Deficit: Taming Globalization through Law reform, at 13–14 (2004). Prof Aman furthers that administrative law is to provide the infrastructure necessary for the exercise of participatory rights by citizens. *Id*, at 14.

[86] Holly Doremus, *Using Science in a Political World: The Importance of Transparency in Nature Resource Regulation*, in Rescuing Science From Politics, Regulation and the Distortion of Scientific Research 143, 144 (Wendy Wagner and Rena Steinzor ed., 2006).

[87] *Id*. at 145.

[88] With this approach, when an agency discloses internal scientific advice counter to its decision, it will face both political and judicial pressure to explain the discrepancy and provide the reason for its final decision.

[89] As the justification of the use of science discussed above, under the democratic approach broad public participation is also viewed as the antidote to abuses of expert testimony. Sheila Jasanoff, The Fifth Branch: Science Advisers as Policymakers, at 1 (1990).

[90] NRC, Understanding Risk, *supra note* 49.

[91] *Id*, at 156–57.

[92] Jessica Riester and Kirsten Verclas, *supra* note 2, at 4.

[93] The primary legal system should be like the following structure. Congress, as the political institution, should provide, at the least, the general kinds of policy guidance for the Agency to engage in rationalist decision-making processes and for the courts to fulfill their competence in judicial review. John S. Applegate, *Worst Thing First: Risk, Information, and Regulatory Structure in Toxic Substances Control*, 9 YALE J. ON REG. 277, at 296–97 (1992).

potential sites are already being used, and ecological considerations are preventing the exploitation of remaining ones. Siting renewable energy projects can also pit environmentalists against one another. In Cape Cod, Massachusetts, local residents who fear harm to aquatic life have fought the construction of 130 wind turbines; in southern California, advocates of solar power face resistance from environmental groups that fear potential disruption to the Mojave Desert ecosystem.[94]

Hence, as the fundamental requirements of risk regulation, including risk assessment, risk management, and risk communication, environmental impact assessment (i.e. environmental assessment, environmental impact statement, or even programmatic environmental impact statement — all are significant processes for the nuclear energy policy to be made) should be conducted on the way of fulfilling the procedural values: transparency, accountability and public participation.

For instance, for the wind power, the most prominent issues of concern are land use and the possible impacts on birds and bats. Also, concerns have been raised about noise, aesthetics, and the use of herbicides to clear and maintain sites, particularly where endangered species are involved. For setting a comprehensive process, the American Wind Energy Association (AWEA) even enacts a siting handbook, covering the components of a typical wind power project: the stages of a wind power project; the federal, state, and local regulatory frameworks relevant for wind power; and the array of environmental and human impacts to consider when siting wind power.[95]

In addition, the purpose of the NRC's serial studies are to develop an analytical framework for impact evaluation to inform siting decisions for wind-energy projects. The study organized impacts assessment into a three-dimensional action space that includes the relevant spatial jurisdictions (local, state/regional, and federal), project stage (pre-project, construction, operational, and post-operational), and environmental and human impacts (NRC, 2007). The NRC (2007) study found that because wind energy is new to many state and local governments, the quality of the permitting process is uneven, and it pointed out that a coordinated and consistent process would greatly aid planning and regulating wind-energy development at smaller scales. The report recommended that representatives of federal, state, and local governments work with wind developers and interested parties to develop guidance and permitting guidelines (NRC, 2007).[96]

As the result, even in the deployment of renewable electricity facilities, significant increase will thus entail concomitant increases in the highly specific, administratively complex, environmental impact and siting review processes. While this situation is not unique to renewable electricity, nevertheless, a significant acceleration of its deployment will require some level of coordination and standardization of siting and impact assessment processes.[97]

Finally, from the insistence of U.S. on nuclear energy policy to the possibility of renewable energy policy, no matter which one we prefer in Taiwan, we must considerably enact our own comprehensive regulatory analytical structure for the decision-making process. Especially for risk regulation, the processes must include risk assessment, risk management, and risk communication. For the procedural requirements, we also need to ensure the realization of accountability, transparency, and participation. Without these basic infrastructures, there will be no justification and legitimacy for whatever we might make for our energy policy and all other relevant regulations.

REFERENCES

Books:

Aman, Alfred C. Jr. (2004), *The Democracy Deficit: Taming Globalization through Law reform*, New York, NY: New York University Press

Applegate, John S. (2000). *The Regulation of Toxic Substances and Hazardous Wastes*, New York, NY: Foundation Press.

Bosselman, Fred (2006), Energy, Economics, and the Environment: Cases and Materials, New York, NY: Foundation Press.

Environmental Protection Agency (2005), EPA's Proposed Public Health and Environmental Radiation Protection Standards for Yucca Mountain. Washington, D.C.

Jasanoff, Sheila (1990). *The Fifth Branch: Science Advisers as Policymakers*, Cambridge, Mass: Harvard University Press.

[94] National Academy of Science, *Electricity from Renewable Resources: Status, Prospects, and Impediments*, 219 (2010).

[95] *Id*. at 220 and 223.

[96] *Id*. at 223–24. In order to better assess possible wildlife impacts of wind power, Secretary of the Interior Dirk Kempthorne in 2007 announced the creation of the Wind Turbine Guidelines Advisory Committee, which will function in accordance with the Federal Advisory Committee Act (FACA). The scope and objective of the committee, as outlined in its charter, is to provide advice and recommendations to the Interior Secretary on developing effective measures to avoid or minimize impacts on wildlife and habitats related to land-based wind energy facilities. The committee members represent the varied interests associated with wind energy development and wildlife management. Another group that will address fauna issues is the recently formed American Wind Wildlife Institute, created through cooperation between members of the environmental community and the wind industry. The institute will focus on efforts to facilitate timely and responsible development of wind energy while protecting wildlife and wildlife habitat. It will do this through research, mapping, mitigation, and public education on best practices in wind farm siting and wildlife-habitat protection. *Id*. at 224.

[97] *Id*. at 228.

National Research Council (2011), *NRC Issues Mid-Cycle Assessment for Nation's Nuclear Plants*, NRC NEWS No. 11–666.

National Research Council (2011), *Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from The Fukushima Dai-Ichi Accident*. Washington, D.C.: National Academy Press.

National Research Council (2008). *Science and Decision: Advancing Risk Assessment*. Washington, D.C.: National Academy Press.

National Research Council (2008). *Public Participation in Environmental Assessment and Decision Making*, Washington D.C.: National Academy Press.

National Research Council (2006). *Safety and Security of Commercial Spent Nuclear Fuel Storage: Public Report*, Washington D.C.: National Academy Press.

National Research Council (2005). *Decision Making for the Environment, social and behavioral science research priorities*, Washington D.C.: National Academy Press.

National Research Council (2000). *The Future Role of Pesticides in US Agriculture*. Washington D.C.: National Academy Press.

National Research Council (1996). Understanding Risk, Informing Decisions in a Democratic Society, Washington D.C.: National Academy Press.

National Research Council (1995), *Committee on Technical Bases for Yucca Mountain Standards*. Washington D.C.: National Academy Press.

National Research Council (1989). Improving Risk Communication, Washington D.C.: National Academy Press.

National Research Council (1983). *Risk Assessment in the Federal Government: Management the Process*. Washington D.C.: National Academy Press.

National Academy of Science (2010), *Electricity from Renewable Resources: Status, Prospects, and Impediments*.

Walker, J. Samuel & Wellock, Thomas R. (2010), U.S. Nuclear Regulatory Commission, A Short History of Unclear Regulation 1946–2009.

Chapters in edited books:

Applegate, John S. (2006). The Government Role in Scientific Research: Who Should Bridge the Data Gap in Chemical Regulation. In: Wendy Wagner and Rena Steinzor (eds.), *Rescuing Science From Politics, Regulation and the Distortion of Scientific Research* (pp. 255–78). Cambridge: Cambridge University Press.

Doremus, Holly (2006). Using Science in a Political World: The Importance of Transparency in Nature Resource Regulation. In: Wendy Wagner and Rena Steinzor (eds.), *Rescuing Science From Politics, Regulation and the Distortion of Scientific Research* (pp. 143–64). Cambridge: Cambridge University Press.

Articles:

Applegate, John S. (1999). Learning From NEPA: Some Guidelines for Response Federal Risk Legislation, *Harvard Environmental Law Review*, 23:93.

Applegate, John S. (1992). Worst Thing First: Risk, Information, and Regulatory Structure in Toxic Substances Control. *Yale Journal On Regulation*, 9:277.

Dorfman, Daniel A. (2012). The Changing Perspectives of U.S. and Japanese Nuclear Energy Policies in the Aftermath of the Fukushima Daiichi Disaster, *Pace Environmental Law Review*, 30:255.

Foulke, Larry R. (2002), *A Perspective: Status and Future of Nuclear Power in the United States* (Remarks at Americas Nuclear Energy Symposium).

Joskow, Paul L. and Parsons, John E. (2012), *The Future of Nuclear Power After Fukushima*, MIT Center for Energy and Environmental Policy Research.

Miller, Andrew J. (1997). The Food Quality Protection Act of 1996: Science and Law at A Crossroads, *Duke Environmental Law and Policy Forum*, 7:393.

Newport, Frank (2011), *The Majority of Americans Say Nuclear Power Plants in the U.S. Are Safe*.

Riester, Jessica and Verclas, Kirsten (2012), *Nuclear Energy in the U.S. and Germany: Weighing the Risks*.

Online Sources:

President Barack Obama (2011), "State of the Union Address", http://www.whitehouse.gov/the-press-office/2011/01/25/remarks-president-state-union-address.

Business Ethic (2013), "Environmentalists Assess Barack Obama's Climate Change Initiative", http://business-ethics.com/2013/06/29/1146-environmentalists-assessbarack-obamas-climate-change-initiative.

Business Ethic (2011), "After Fukushima: Obama's Nuclear Policy", http://business-ethics.com/2011/06/17/2448-after-fukushima-obamas-nuclear-policy.

"Environmental Justice Case Study: The Yucca Mountain High-Level Nuclear Waste Repository and the Western Shoshone", http://www.umich.edu/~snre492/kendziuk.html.

Gallup Politics (2011), http://www.gallup.com/poll/146939/majority-americans-say-nuclear-power-plants-safe.asp.

National Research Council (2001), "Frequently Asked Questions About NRC's Response to the 9/11/01 Events", http://www.nrc.gov/security/faq-911.html.

New York Time (2011), "After Fukushima, Does Nuclear Power Have a Future?", http://www.nytimes.com/2011/10/11/business/energy-environment/after-fukushima-does-nuclear-power-have-a-future.html.

Nuclear Energy Institute (2011), "Latest Trends in U.S. Public Opinion about Nuclear Energy", http://www.nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/reports/latest-trends-in-us-public-opinion-about-nuclear-energy-sept-2011.

Office of Civilian Radioactive Waste Management, U.S. DOE (2002), "Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada; DOE/EIS-0250", http://pbadupws.nrc.gov/docs/ML0817/ML081750212.pdf.

PR Newswire (2010), "Americans" Support for Nuclear Energy", http://www.prnewswire.com/news-releases/americans-support-for-nuclear-energy-holds-at-majority-level-6-months-after-japan-accident-130981293.html.

TVA's Browns Ferry Units, http://www.tva.com.

Recent Development of New Energy Policy and Legislation in Taiwan, with the Focus on Promotion of Biofuel*

Yueh-Hsun TSAI, LL.M., J.D.
Northwestern University School of Law, USA, Tulane University School of Law, USA, Associate Professor of Law, Graduate School of Sci. & Tech. Law, National Yulin University of Sci. & Tech., Taiwan
dennis@yuntech.edu.tw

Abstract. Energy efficiency, environment protection, reducing the dependence on fossil fuels, and securing the autonomy of energy supply are becoming the major concerns in developing new energy policy of many countries. In recent years, biofuel, a much debated and controversial alternative energy, has become a solution or a strategic policy tool, to answer aforementioned concerns in the transportation sector of many countries. A number of countries or regions developed comprehensive regulations in promoting the usage of biofuel, such as mandates or direct/indirect subsidies, etc. In Taiwan, a part of the global village with deep reliance on fossil fuel, the government also carried out several programs/regulations to promote the use of biofuel in accordance with the national policy to promote the alternative energy, such as "Green Bus", "Green County", as well as nationwide mandate for use of B1 biodiesel (mandatory B2 nationwide in 2010). Meanwhile, a legal framework has been developed as the base to carry out those policies, in particular, adoption of the first comprehensive renewable energy law in 2009 and amendments to several energy laws from 2008 to 2009. Although the overall deployment of renewable energy, in particular biofuel, is still in initial stage compared to some leading countries, the current development in Taiwan still shows the government's intention to achieve the sustainable development as well as to create more possibilities for the green economy in Taiwan. This article reviews recent renewable energy policies promulgated in Taiwan, in particular the promotion of biofuel including laws, administrative programs and regulations, and further investigates the effects of such legal/policy frameworks.

Аннотация. Вопросы энергоэффективности, охраны окружающей среды, понижения зависимости от ископаемых видов топлива, а также обеспечения автономии энергоснабжения выходят на первый план при разработке новой энергетической политики многих стран. В ряде стран и регионов разработаны комплексные меры по стимулированию использования биотоплива, включая прямые и косвенные субсидии и т.д. Правительство Тайваня, сильно зависящего от ископаемых видов топлива, также разработало ряд программ по внедрению биотоплива в соответствии с национальной политикой содействия использованию альтернативных источников энергии. Кроме того, разработана нормативно-правовая база для проведения такой политики, в частности в 2009 г. принят первый всеобъемлющий закон о возобновляемых источниках энергии и были внесены изменения в некоторые энергетические законы 2008–2009 гг. Несмотря на то что использование возобновляемых источников энергии, в частности биотоплива, все еще находится в начальной стадии по сравнению с некоторыми ведущими странами, нынешняя ситуация демонстрирует стремление правительства к устойчивому развитию и созданию возможностей для роста зеленой экономики на Тайване. В статье рассматривается политика Тайваня в области возобновляемых источников энергии, и в частности внедрения биотоплива,— законы, правила, административные программы, исследуются практические последствия введения правовых актов.

Key words: Taiwan new energy policy, biofuel, Taiwan renewable energy.

* Новая энергетическая политика и законодательство Тайваня, направленные на внедрение биотоплива.

1. INTRODUCTION

Energy efficiency, reducing the greenhouse gas (GHG) emissions, reducing the dependence on fossil fuels, and securing the autonomy of energy supply are becoming the major concerns in developing new energy policy of many countries. In recent years biofuel, a much debated and controversial alternative energy, has become a solution or a strategic policy tool, to answer aforementioned concerns in the transportation sector of many countries. In comparison to other renewable energies, biofuel is one of the most attractive alternative energy sources, which could be used as the traditional fossil fuel, and has long history of trust by people (Rosegrant, Msangi, 2007). Yet, the large-scale deployment of biofuel also addresses other policy considerations, such as national security, environmental concerns, foreign exchange saving, and socioeconomic issues related to the rural sector (Demirbas, 2006)[1]. Therefore, a number of countries or regions developed comprehensive regulations in promoting the usage of biofuel, such as mandates or direct/indirect subsidies, etc (Nigam, Singh, 2010).

In Taiwan, a part of the global village with deep reliance on fossil fuel[2], the government also carried out several programs/regulations to promote the use of biofuel in accordance with the national policy to promote the alternative energy, such as "Green Bus", "Green County", as well as nationwide mandate use of B1 biodiesel (mandatory B2 nationwide in 2010). Meanwhile, a legal framework has been developed as the base to carry out those policies, in particular, the pass of the first comprehensive renewable energy law in 2009 and amendments to several energy laws from 2008 to 2009. Although the overall deployment of renewable energy, in particular biofuel, is still in initial stage compared to some leading countries, the current development in Taiwan shows the government's intention to achieve the sustainable development as well as to create more possibilities for the green economy in Taiwan.

Aiming to provide a policy and legal framework background review, this article will first introduce the recent development of energy policies directed by national policy/legal framework from 1996, especially on renewable energy policies and the new promulgated renewable energy laws. Next, this article will explore the policies, administrative programs, laws and regulations on the promotion of biofuel deployment in Taiwan.

2. BACKGROUND REVIEW ON THE DEVELOPMENT OF NATIONAL ENERGY POLICY FRAMEWORK IN TAIWAN

2.1. "ENERGY POLICY AND IMPLEMENTATION IN TAIWAN AREA" IN 1996 AND "THE FIRST NATIONAL ENERGY CONFERENCE" IN 1998

The renewable energy concerns in Taiwan's national policy could be dated back to "Energy Policy and Implementation in Taiwan Area" of July, 1996[3]. One of the policy's guidelines listed the goal "to reinforce energy research and development (R&D) — encourage R&D and promote incentives on renewable energies and new energy technologies" and was expected to apply "review and proceed the research on various renewables, such as solar, wind, biomass, ocean, and water to promote them economically" to be the implementing measures. For reference, Figure 1 depicts the outline of Taiwan's Energy Policy Framework with the guidelines, contents, and master goal of "energy policy and implementation in Taiwan area".

In response to the Kyoto Protocol, the supplementary provision of United Nations Framework Convention on Climate Change of 1997 (UNFCCC)[4], Taiwan's government convened "The First National Energy Conference" in May, 1998[5]. This conference reached consensus to set out the goal to increase the share of new energies, including solar, wind, biomass, geothermal, ocean, and water, etc., up to 3% in Taiwan's total energy supply by 2020; the first time that the deployment of renewable energy was introduced into the energy policy in Taiwan.

To carry out the consensus reached in this conference, the Executive Yuan (the executive branch of the Taiwan's government) approved several administrative programs and plans after the conference. For instance, the "Renewable Energy Development Plan" announced in January, 2002[6] proposed

[1] *See* also, Ayhan Demirbas, *Progress and recent trends in biodiesel fuels*, Energy Conversion and Management 50, 2009, pp.14–34, p. 30.

[2] There is about 98% energy supplied by imported energy. Bureau of Energy, Ministry of Economic Affairs (MOEABOE), *The White Paper on Energy Industry and Technology of 2010*, available at: http://www.moeaboe.gov.tw

[3] MOEABOE, *Energy Policy and Implementation in Taiwan Area*, available at: http://www.moeaboe.gov.tw/Policy/PoMain.aspx?PageId=executepolicy (last visited: 2013/12/5)

[4] United Nations Framework Convention on Climate Change (UNFCCC), *Kyoto Protocol*, available at: http://unfccc.int/kyoto_protocol/items/2830.php (last visited: 2011/12/5).

[5] Ministry of Economic Affairs, *Executive effects and review on the conclusion of "The First National Energy Conference" in 1999*, March 12, 2009, available at: http://www.moeaboe.gov.tw

[6] MOEABOE, *Meeting No. 09100000755 of Executive Yuan,* January

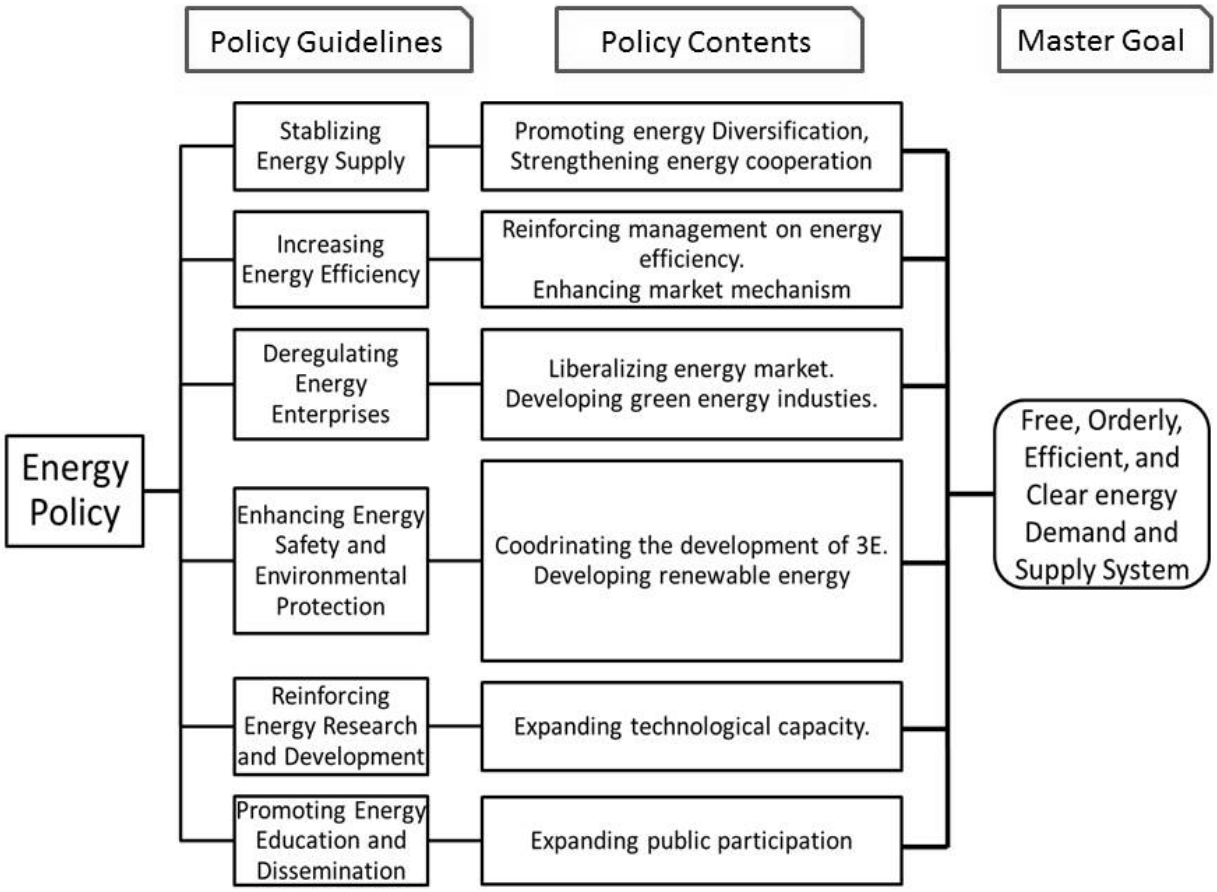


Figure 1. Energy Policy Framework of 1996- Energy Policy and Implementation in Taiwan Area.
(Source: MOEABOE, Taiwan's Energy Policy and Supply-Demand Situation-Implementation Measures, available at: http://www.moeaboe.gov.tw/About/webpage/book_en3/page3.htm (last visited: 2011/12/5))

to appropriate a budget of NT$266.7 billion to support the development of renewable energies in 2003–2022 period. Further, "Challenge of Year 2008, National Development Plan — Water and Green Building"[7] of May 2002 and "Nuclear-free homeland Guideline — Development Policy of Energy Saving and Clean Energy Industry"[8] of September 2003 are also directed at the promotion on green technologies with clean, high efficiency, and sufficient alternative energies to encourage the energy diversification, decrease the dependence on the imported energies and draw up the budget of 3 billion as the incentives for energy saving and renewable energies promotion.

2.2. THE SECOND NATIONAL ENERGY CONFERENCE IN 2005[9]

In light of the fact that the Kyoto Protocol has taken effect from 2005, "The Second National Energy Conference" was held in the same year and addressed "Sustainability, Security, Efficiency, and Clean" as the core issue of this meeting. Through several proposed plans, such as "develop the harmonization of 3 E (energy, environment, economy)", "promote non-regret strategy", "boost independent energy", "strengthen regional cooperation", "intensify price function", "increase energy efficiency", "broaden technology capacity", and "support clean industry", the conclusion of this conference set out to reduce

17, 2002.

[7] Council for Economic Planning and Development, *Challenge 2008 National Development Plan*, available at: http://www.cepd.gov.tw/m1.aspx?sNo=0001539&ex=1&ic=0000015 (last visited: 2011/12/5)

[8] Government Information Office, Republic of China (Taiwan), *News Release-The Announcement on the 5th council of Nuclear-free homeland Promotion Committee*, July 22, 2003, available at: http://info.gio.gov.tw/ct.asp?xItem=23287&ctNode=919 (last visited: 2013/12/5)

[9] MOEABOE, *The conclusion and executive effect of National Energy Conference of 2005*, available at: http://www.moeaboe.gov.tw/Policy/98EnergyMeeting/MeetingMain.aspx?pageid=mainfream (last visited: 2013/12/5)

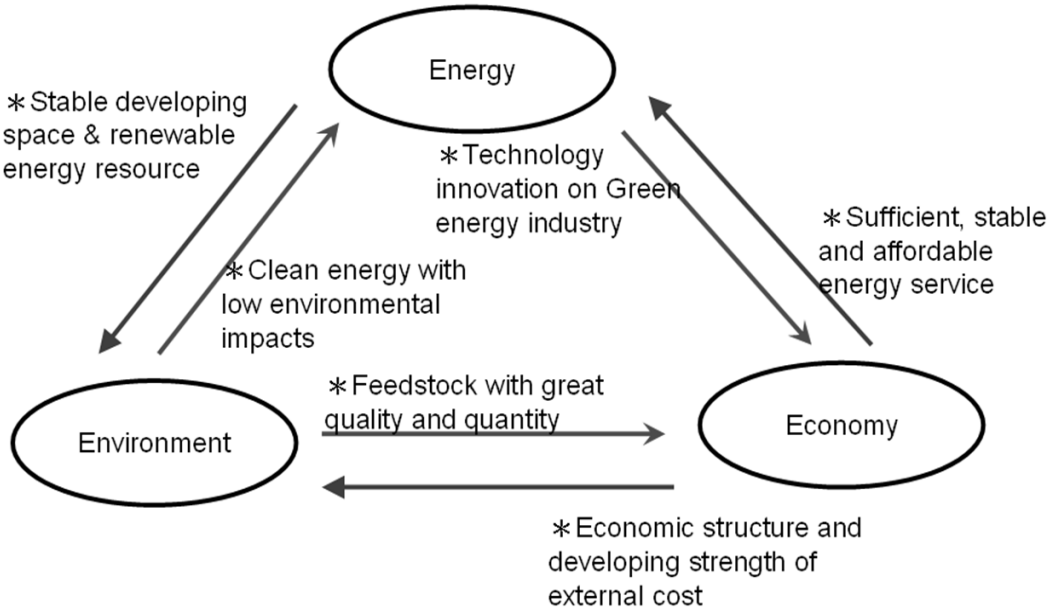


Figure 2. Win-Win-Win Solution for Energy, Environment and Economy.

imported energies for lower consumption percentage and achieve the target of renewable energy account for 10% among total energies in 2010.

In addition, concerning biofuels, this conference first introduced the promotion of biofuel as one of the important strategy to promote the use of renewable energy in the transportation sector. Through "Green Energy Development and Energy-using Efficiency Promotion" plan, this conference set out two goals for the use of biofuel: (a) Ethanol consumption should be up to 100,000–300,000 kiloliters by 2010, 200,000–600,000 kiloliters by 2015, and 300,000–900,000 kiloliters by 2020; (b) Biodiesel consumption should be up to 100,000 kiloliter by 2010, and 150,000 kiloliters by 2020[10]. These goals were incorporated in "Administrative Regulations on the Production and Sales of Renewable Energies Such as Ethanol, Biodiesel, or Oil from Recycled Waste"[11], which was authorized by "Petroleum Administrative Act" and aims to regulate the producers and distributors of biodiesel, ethanol, and renewable oil to comply with the certain regulations.

2.3. FRAMEWORK OF TAIWAN'S SUSTAINABLE ENERGY POLICY IN 2008[12]

In 2008, "Framework of Taiwan's Sustainable Energy Policy", which was approved by the Executive Yuan, proposed the policy object "Win-Win-Win Solution for Energy, Environment and Economy" and introduced the policy guidelines of "Improving energy efficiency, developing clean energy, and securing stable energy supply" to achieve such goal. Several measures were proposed including: (a) To improve energy efficiency by over 2% in 2008–2015 for decreasing the energy intensity over 20% in 2015 and over 50% in 2025, compared with 2005; (b) To reduce nationwide CO_2 emission, aiming to return it in the standard of 2008 in 2016–2020, and in the standard of 2000 in 2025. Further, the share of low carbon energy in electricity generation systems should be from 40% currently to 55% in 2025; (c) To build a security system of energy supply to meet the goal of annual economic growth rate up to 6% in 2008–2012 and US$30,000 per capita income by 2015.

In addition, this policy established an energy consumption and supply system of "Two High and Two

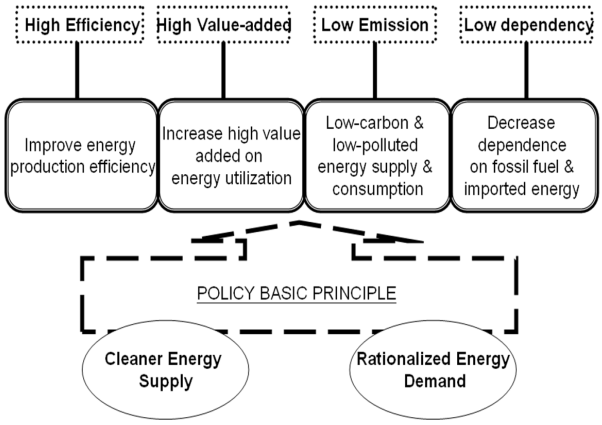
[10] MOEABOE, *Issue 3 of The conclusion and executive effect of National Energy Conference of 2005*, available at: http://www.moeaboe.gov.tw/Policy/98EnergyMeeting/conclusion/conclusion_3.html (last visited: 2013/12/5)

[11] The administration regulation was amended the provisions with the title of "Administrative Regulations on the Production, Import, Blend, and Sales of Ethanol, Biodiesel, and Renewable Oil" on December 17, 2008. Laws & Regulations Database of The Republic of China, Administrative Regulations on the Production, Import, Blend, and Sales of Ethanol, Biodiesel, and Renewable Oil, available at: http://law.moj.gov.tw/News/news_detail.aspx?id=52660 (last visited: 2013/12/5)

[12] MOEABOE, *Framework of Taiwan's Sustainable Energy Policy*, available at: http://www.moeaboe.gov.tw

Low" — high efficiency, high added value, low emission, and low dependency. It stated "cleaner energy supply" and "rationalized energy demand" as the main steps. The former addressed to restructure energies mixing and improve energy efficiency, like the share of renewable energies in the electricity system could reach 8% by 2025 through developing carbon-free renewable energies, increasing the usage of low carbon natural gas to over 25% in total power generated in 2025. On the other hand, rationalized energy demand focused on promotion of energy conservation schemes in various sectors, such as industrial, transportation, residential and commercial, and public sectors.

Further, "Framework of Taiwan's Sustainable Energy Policy" emphasized on provision of a comprehensive regulatory framework and mechanisms by facilitating or amending several laws, acts, and regulations, and applying some specific measures to support the framework, such as: to establish a fair, efficient, and free-opened energy market[13], design a carbon emission trading scheme, set carbon reduction funds, increase the annual energy research budget from NT$5 billion to NT$10 billion, and promote energy conservation and emission reduction education. Figure 2 is the policy object, "Win-Win-Win Solution for Energy, Environment and Economy", proposed in "Framework of Taiwan's Sustainable Energy Policy" as the national energy policy since 2008 in Taiwan. And Figure 3 is the basic principle to establish an energy consumption and supply system of "Two High and Two Low" — high efficiency, high added value, low emission, and low dependency.



Source: "Framework of Taiwan's Sustainable Energy Policy"

Figure 3. An energy consumption and supply system of "Two High and Two Low" — high efficiency, high added value, low emission, and low dependency.

2.4. THE THIRD NATIONAL ENERGY CONFERENCE IN 2009[14]

The Third National Energy Conference in 2009 emphasized four subjects: (1) sustainable development and energy security; (2) energy management and efficiency promotion; (3) energy prices and market openness; (4) energy technology and industrial development. Besides, it also combined with the "Action Program of Energy Saving and Carbon Reduction"[15], enacted by the "Framework of Taiwan's Sustainable Energy Policy of 2008", as "Action Program of Sustainable Energy Policy" by six developing strategies of energy, industry, transportation, environment, life, and law into practice[16].

2.5. 2010 NATIONAL ESTABLISHMENT PLAN OF REPUBLIC OF CHINA (TAIWAN) — POLICY AND ESTABLISHMENT[17]

Taiwan government stated the principle of "Populace Economy" to respond to the industrial reforms worldwide and the economic structure in the post-financial-crisis period. In 2010, the government focuses on "Promote investment, adjust framework, amuse livelihood, expand energy-saving" as the policy to execute. Especially, it emphasized "Green Energy" on several aspects, like industries, transportation, technologies, buildings, education, tax system, the public, and laws, etc.

2.6 THE "REGULATION FOR RENEWABLE ENERGY DEVELOPMENT" IN 2009

In addition to those policy or administrative actions to promote the renewable energy in Taiwan, several legislative efforts were introduced for implementing aforementioned national energy policies. The latest and most noted legislation, "Regulation for Renewable Energy Development", was passed on June

[13] For example, "Greenhouse Gas Emissions Reduction Act" for substantially build emission reduction capacity and enforce reduction measures, "Renewable Energy Development Act" to develop clean energy, "Regulations on Energy Tax" to reflect the external cost of energy consumption, and "Energy Management Act" to effectively promote energy saving measures.

[14] MOEABOE, *The conclusion of "National Energy Conference of 2009*, available at: http://www.moeaboe.gov.tw/Policy/98EnergyMeeting/MeetingMain.aspx?pageid=convention (last visited: 2013/12/5)

[15] Council for Economic Planning and Development, *Framework of Sustainable Energy Policy-Action Program of Energy Saving and Carbon Reduction*, September 4, 2008, available at: http://www.moeaboe.gov.tw

[16] Council for Economic Planning and Development, News release- Practice Sustainable Energy Policy, *Establish low-carbon and energy-saving society*, December 4, 2009, available at: http://www.cepd.gov.tw/

[17] *2010 National Establishment Plan of Republic of China (Taiwan) — Policy and Establishment,* the meeting No.3177 of the Executive Yuan, December 31, 2009, available at: http://www.ey.gov.tw/public/Attachment/01119451771.pdf (last visited: 2013/12/5)

12, 2009 and promulgated by the president on July 8, 2009, after seven years long legislative process in the Legislative Yuan.[18]

The regulation grants the Bureau of Energy (BOE) authorities to promote the usage of renewable energies in Taiwan, increase energy diversification, reduce greenhouse gases, improve relative industries, and boost national sustainable development. The regulation contains only 23 articles but covers several aspects of renewable energies, including operation, facilities, incentives and subsidies, developments, feed-in tariff (FiT), obligations, mediation, and penalties. The categories of renewable energies identified in this bill are solar, ocean, wind, biofuels, geothermal, non-pump and storage hydropower, hydrogen, waste, fuel cell, and other renewable electricity.

The feature of "Regulation for Renewable Energy Development" is to provide the incentive for generation capacity of renewable energies by 650–1,000 MW within 20 years. Further, it is expected to achieve the goal of over 845 MW in 2025 and occupy the share of more than 15% in the total energy generation capacity in Taiwan[19]. The legislation of this regulation confirms that Taiwan's government has made a clear and strong commitment to develop renewable energy (Hwang, 2010).

3. THE PROMOTION OF BIOFUEL IN TAIWAN — ADMINISTRATIVE AND LEGISLATIVE EFFORTS

Pursuant to the policy and legal frameworks depicted in national energy policies, Taiwan's administrations carry out these policies by laws, regulations, and administrative rules. In the vein of promotion of the usage of biofuels in Taiwan, the implementations are mainly executed through Council of Agriculture (COA), Environmental Protection Administration (EPA), and Bureau of Energy (BOE). The followings will introduce the administrative actions and theirachievements related to biofuel promotion of these agencies.

3.1. COUNCIL OF AGRICULTURE, EXECUTIVE YUAN (COA)

In 2005, COA issued "Plan for Production and Distribution of Energy Crops System Establishment" for promoting fallow lands to plant the energy crops with the subsidy of NT$60,000 per hectare. Initially, the plan selected Yunlin, Chiayi, Tainan, Kaohsiung, and Pingtung in Taiwan as the demonstrative regions, where soybean, rape, and sunflower were planted. It was estimated that the area would expand from 90 hectares to 8,000 hectares in 2007 (Lin, Su, 2010).

3.2. ENVIRONMENTAL PROTECTION ADMINISTRATION, EXECUTIVE YUAN (EPA)

3.2.1. Biodiesel Road-Test Program[20]

EPA has cooperated with BOE to engage in "Biodiesel Road-Test Program" from 2004. It encourages the garbage and recycled trucks in 13 counties and cities to fuel B20 (20% biodiesel blended into 80% diesel) for replacing the conventional diesel[21].

3.2.2. The Recycled System for Waste Edible Oil[22]

EPA has established "The Recycled System of Waste Edible Oil" form September 1, 2007. The system requires the large-scale chain stores of fast food, such as McDonalds, KFC, Mosburger, and the instant noodles producers, such as Uni-President, Vedan, Weilih, have to provide the waste edible oil for the local cleaning team or other recycling organizations and report through on-line system. Further, EPA also encouraged the residents, institutions, schools, and companies to voluntarily participate in this system to achieve the goal to recycle the waste edible oil up to 4,692 kiloliter by the end of June 2008.

3.3. BUREAU OF ENERGY, MINISTRY OF ECONOMIC AFFAIRS (MOEABOE)[23]

According to "Developing Green Energy-Biofuel Executive Program" submitted by Ministry of Economic Affairs (MOEA) and approved by the cabinet meeting No. 3010 of Executive Yuan in October 11, 2006, BOE proposed "Executive Project to Promote Biodiesel" and "Executive Project on Ethanol Promotion" in 2007, with the assistance of the Industrial Technology Research Institute (ITRI) through the industry

[18] The Legislative Yuan-legal system, *Regulation for Renewable Energy Development*, available at: http://lis.ly.gov.tw/

[19] MOEABOE, *The comparison between Erneuerbare-Energien-Gesetz (EEG) of German and Regulation for Renewable Energy Development of Taiwan*, December 4, 2009, available at: http://unfccc.epa.gov.tw/unfccc/chinese/_upload/copenhagen/01_wang_2.pdf (last visited: 2013/12/5)

[20] Environmental Protection Administration (EPA), *The Environmental Benefits and Strategy Analysis of the Biodiesel Vehicles*, executed by The Energy and Environment Research Laboratories (EERL) of the Industrial Technology Research Institute (ITRI), available at: http://epq.epa.gov.tw/project/projectcp.aspx?proj_id=HTYUJPORFC (last visited: 2013/12/5)

[21] *Id.*

[22] EPA, *The Project of Used Cooking Oil Recycling, PVC Controlling, and Estimation of General Waste Clearance and Treatment Costs (2nd year),* executed by Sinotech Engineering Consultant, LTD., available at: http://epq.epa.gov.tw/project/projectcp.aspx?proj_id=QJHAMTKLSW (last visited: 2013/12/5)

[23] *Development & Dissemination of Bio-fuel Technologies*, Industrial Technology Research Institute, 96-D0133, 2007.

technology project "Development and Promotion Plan on Biofuel Technology." The plan is divided into two parts, biodiesel and ethanol, and applied gradual steps to execute its individual programs and measures from 2006 till now.

3.3.1 Biodiesel

3.3.1.1. The First Step — "Subsidy Program for Energy Crop on Green Bus"[24]

According to "Subsidy Program for Energy Crop on Green Bus", the BOE will subsidize the cost when the public buses use the convention diesel with 1–5% domestic biodiesel blend. The detail of this program required that the qualified feedstock source for the subsidies should come from the energy crops promoted by COA and blend with the biodiesel produced from the waste edible oil. The program started from November 1, 2006 and expired on June 30, 2008.

3.3.1.2. The Second Step — "Subsidy Program for the Application on Green Country"[25]

This pilot program designated Taoyuan County, Chiayi County and Chiayi City as the demonstrative regions to provide and sell B1 in the local petroleum station where subsidy for costs between biodiesel and conventional diesel would be covered by the administration. The qualified feedstock for the subsidy included sources from the waste edible oil, energy crops, or biodiesel procured by domestic refiners, i.e. the CPC Cooperation or Formosa Petrochemical Cooperation. The period of this program was from July 27, 2007 to July 14, 2008.

3.3.1.3. The Third Step — Mandatory B1 nationwide in 2009[26]

Pursuant to "Rules related to the Range and Ways of Blending Percentages for the Refiner and Importer of Petroleum in Domestic Transportation" authorized by Article 38–1 of "Petroleum Administration Act", the domestic refiners are mandated to blend B1 biodiesel in Taiwan island from July 15, 2008. This mandatory rule also provided refiners three months grace period to replace the supply and storage system, but a nationwide full force mandate started from 2010. Nonetheless, the order did not stipulate the source of biodiesel blend nor provided subsidy.

3.3.1.4. The Forth Step — National Mandatory B2 in 2010[27]and Suspension in 2014

After the implementation on mandatory B1 since 2008, BOE was further ruling mandatory B2 in June 15, 2010, and BOE estimates that demand for biodiesel will achieve the goal of 80,000 kiloliters per year.

However, on May 5th, 2014, BOE officially announced the suspension on the mandatory B2 rule.[28] BOE explained that the suspension of current policy is a response to the protests from the gas stations operators and tourist bus associations claiming that the B2 biodiesel is the cause of sludge which clogging oil pump filters and engines. BOE took these claims seriously and decided to suspend the current mandatory B2 rule indefinitely pending science investigations and quality assurance improvements in the chain of oil supply system.[29]

3.3.2. ETHANOL

3.3.2.1. The First Step — "Program of Green Public Fleet"[30]

The pilot program required the public fleet of Taipei city as the demonstrative region and operated from September 29, 2007. It directed that the public fleet belonging to Legislative Yuan, Judicial Yuan, Examination Yuan, Control Yuan, Executive Yuan and its subsidiary agencies, and Taipei City Government had to apply E3 (3% ethanol blended into 97% gasoline) with the subsidy for purchasing, cost differences, maintenances, and the marketing on ethanol promotion. In addition, the general public could also purchase E3 from selected gas stations where the oil price was cheaper than regular unleaded gasoline by up to NT$1 per liter on account of the subsidy provided by BOE.

3.3.2.2. The Second Step — "Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis"[31]

To boost ethanol into usage in the market is the aim of the second step of "Executive Project on Ethanol Promotion". From July 29, 2009, the petroleum refin-

[24] MOEABOE, *Subsidy Program for Energy Crop on Green Bus*, available at: http://www.moeaboe.gov.tw/opengovinfo/laws/secondaryenergy/LSecondaryMain.aspx? PageId=l_secondary_06 (last visited: 2013/12/5)

[25] MOEABOE, *Subsidy Program for the Application on Green Country*, available at: http://www.moeaboe.gov.tw/opengovinfo/laws/secondaryenergy/LSecondaryMain.aspx? PageId=l_secondary_07 (last visited: 2013/12/5)

[26] MOEABOE, *Rules related to the Range and Ways of Blending Percentages for the Refiner and Importer of Petroleum in Domestic Transportation-Used Diesel blended with Fats*, available at: http://www.moeaboe.gov.tw/opengovinfo/Laws/secondaryenergy/LSecondaryMain.aspx? PageId=l_secondary_11 (last visited: 2013/12/5)

[27] *Id.*

[28] MOEABOE, *Announcement of the suspension of mandatory B2 rule*, 05/05/2014, available in Chinese at: http://web3.moeaboe.gov.tw/ECW/populace/news/News.aspx?kind=1&menu_id=41&news_id=3563 (last visited: 2014/05/30).

[29] *Id.*

[30] MOEABOE, *Program of Green Public Fleet*, available at: http://www.moeaboe.gov.tw/opengovinfo/Laws/secondaryenergy/LSecondaryMain.aspx? PageId=l_secondary_09 (last visited: 2013/12/5)

[31] MOEABOE, *Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis*, available at: http://www.moeaboe.gov.tw/opengovinfo/Laws/secondaryenergy/LSecondaryMain.aspx? PageId=l_secondary_15 (last visited: 2013/12/5)

er offering and selling E3 in Taipei City and Kaohsiung City could apply the subsidy for cost differences, repairing, promotion, and marketing.

3.4. THE EFFECT OF BIOFUEL PROMOTION POLICY IN TAIWAN

In order to balance the requirements on energy, environment, and economy to achieve the target of national energy policies directed since 1996, Taiwan has executed and practiced biofuels since 2004 and made some initial progress through the efforts of the administrative departments. Especially, COA, EPA, and BOE under Executive Yuan have implemented various programs to promote biofuel in Taiwan.

3.4.1. COA — "Established Plan for Production and Distribution System on Energy Crops"

The plan estimated the energy crops could be planted on 2,000 hectares for producing 1,000 kiloliters of biodiesel in 2006, on 6,000–8,000 hectares for producing 3,000–4,000 kiloliters of biodiesel in 2007, and planted on 20,000 hectares for producing 10,000 kiloliters in 2008. And the actual achievements were 1,721 hectares in 2006 and 2,334 hectares in 2007 (Lin, Su, 2010). Further, the biodiesel produced by these energy crops like soybean, rapes, and sunflower, were used in the program of "Green Bus" and "Green Country" executed by BOE.

3.4.2. EPA — "Biodiesel Road-Test Program" and "The Recycled System for Waste Edible Oil"[32]

EPA executed and promoted "Biodiesel Road-Test Program" with the budget of 100 million every year in accordance with "Nuclear-free homeland Guideline — Development Policy of Energy-saving and Clean Energy Industry" promulgated by Executive Yuan since 2004. 13 counties and cities have already received the subsidy for using B20 as the alternative fuel produced mainly from the waste edible oil.

"The Recycled System for Waste Edible Oil" was aimed to put the waste edible oil to reuse as the transportation fuel with the goal of recycling it up to 4,692 kiloliter by the end of June 2008. According to the government public information, there were 5,370 kiloliters of waste edible oil recycled and accounted from July 2007 to June 2008.

3.4.3. BOE — "Plan of Development and Promotion on Biofuel Technology"[33]

"Subsidy Program for Energy Crop on Green Bus" was implemented from November 1, 2006 to June 30, 2008 and made the public buses' usage of biodiesel in Kaohsiung City and Chiayi County reach the amount about 160 kiloliters of B100. It contributed Kaohsiung and Chiayi to be the second and the third city in Asia with the public buses fueled by biodiesel entirely after Kyoto, Japan. Moreover, "Subsidy Program for the Application on Green Country", started on July 27, 2007, selected Taoyuan County, Chiayi County and Chiayi City as the demonstrative regions to supply B1. The government public information indicated that 297 gas stations participated in this program and supplied 343,241 kiloliters of B1 accounted on July 14, 2008. Further, Taiwan has approved 9 biodiesel refineries to produce, blend, and distribute nationally, and also implemented the mandatory B2 on June 15, 2010 authorized by the amendment of Article 38 (1) of "Petroleum Administration Act"[34] with the target of 100,000 kiloliters. The study showed that the consumption of biodiesel reached 36,000 kiloliters and reduced 120,000 metric tons of CO_2 in 2009.

In addition, the development on promotion of ethanol sets are also in progress, for example, "Program of Green Public Fleet" had consumed 123 kiloliters of E100 from September 29, 2007 to July 28, 2009 and decreased 258 metric tons of CO_2 emission. Besides, there are 8 gas stations in Taipei City and 6 E3 gas stations in Kaohsiung; about 145 kiloliters were consumed from July 2009 to July 2010 based on "Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis".

4. CONCLUSION AND PERSPECTIVE

Through tracking and observing the international trend, we see that energy policies currently address issues related to developing environment-friendly technology with for increasing energy supplies, encouraging cleaner and more efficient energy usage, reducing air pollution and carbon dioxide emission to alleviate the global warming and climate change (Demibras, 2007). Taiwan's energy policies has emphasized the significance of renewable energies since 1996, while the government promoted biofuel since 2004.

Based on the review of the track of recent Taiwan energy policy developments, one could find that through the proposal of several administrative actions, such as the establishment of "Framework of

[32] *See generally,* ITRI, *Supra* note 23.
[33] *Id.*
[34] The Executive Yuan Gazette Online, *Amend Executive Period, Range, and Way of Esters Blended Percentage on Petroleum Refinery and Importers to Sell Domestic Transportation Diesel*, issued on June 10, 2010, effected on June 15, available at: http://gazette.nat.gov.tw/EG_FileManager/eguploadpub/eg016112/ch04/type1/gov31/num5/Eg.htm (last visited: 2011/12/5)

Taiwan's Sustainable Energy Policy", as well as latest legislative action on new renewable promotion regulations, Taiwanese government has taken the step to incorporate sustainable considerations into its energy policy. However, based on the background reviews of the formation of Taiwan's recent energy policy, we also can find the facts of lacking of comprehensive and solid legal scheme, relying heavily on administrative pilot programs, shortage of interagency cooperation, which indicate the limitations of current policy formation.

In observing the progress of introducing and promoting the usage of biofuel in Taiwan, we could conclude the initial progress is successful through the stages of pilot programs and mandates. However, lack of strategic policy goals, industry, technology or agriculture fostering measures and comprehensive developing schemes, reveals the deficiency of current policy. The suspension on the mandatory B2 rules in 2014 due to sludge issues, also reflects such deficiency in its policy implementation as well as to the lacking of quality assurance rules in current practice. In addition, currently, many countries or regions are adapting their biofuel policies to incorporate sustainable criteria in terms of biofuel production and deployment, which should also be one of the major policy considerations for Taiwan to deploy the large scale of biofuel use in the future.

REFERENCES

2010 National Establishment Plan of Republic of China (Taiwan) — Policy and Establishment, the meeting No.3177of the Executive Yuan, Dec. 31, 2009.

Administrative Regulations on the Production, Import, Blend, and Sales of Ethanol, Biodiesel, and Renewable Oil.

Amend Executive Period, Range, and Way of Esters Blended Percentage on Petroleum Refinery and Importers to Sell Domestic Transportation Diesel.

Council for Economic Planning and Development, Challenge 2008 National Development Plan.

Council for Economic Planning and Development, Framework of Sustainable Energy Policy-Action Program of Energy Saving and Carbon Reduction, Sep. 4, 2008.

Development & Dissemination of Biofuel Technologies, Industrial Technology Research Institute, 96-D0133, 2007.

EPA, The Environmental Benefits and Strategy Analysis of the Biodiesel Vehicles, executed by The Energy and Environment Research Laboratories (EERL) of the Industrial Technology Research Institute (ITRI).

EPA, The Project of Used Cooking Oil Recycling, PVC Controlling, and Estimation of General Waste Clearance and Treatment Costs (2nd year), executed by Sinotech Engineering Consultant, LTD.

Ministry of Economic Affairs, Executive effects and review on the conclusion of "The First National Energy Conference" in 1999, March 12, 2009.

MOEABOE, Energy Policy and Implementation in Taiwan Area.

MOEABOE, Framework of Taiwan's Sustainable Energy Policy.

MOEABOE, Meeting No. 09100000755 of Executive Yuan, January 17, 2002.

MOEABOE, Program of Green Public Fleet.

MOEABOE, Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis.

MOEABOE, Rules related to the Range and Ways of Blending Percentages for the Refiner and Importer of Petroleum in Domestic Transportation-Used Diesel blended with Fats.

MOEABOE, Subsidy Program for Energy Crop on Green Bus.

MOEABOE, Subsidy Program for the Application on Green Country.

MOEABOE, The comparison between Erneuerbare-Energien-Gesetz (EEG) of German and Regulation for Renewable Energy Development of Taiwan, Dec. 4, 2009.

MOEABOE, The conclusion and executive effect of National Energy Conference of 2005.

MOEABOE, The conclusion of "National Energy Conference of 2009.

MOEABOE, The White Paper on Energy Industry and Technology of 2010.

Regulation for Renewable Energy Development.

Ayhan Demibras (2007), "Importance of biodiesel as transportation fuel", *Energy Policy 2007*; **35**:4661–70.

Ayhan Demirbas (2006), "Global biofuel strategies", *Energy Education Science Technology*, 2006; **17**:27–63.

Ayhan Demirbas (2009), "Progress and recent trends in biodiesel fuels, Energy Conversion and Management" **50**, 2009, pp.14–34.

Jenn Jiang Hwang (2010), "Promotional policy for renewable energy development in Taiwan", *Renewable and Sustainable Energy Reviews* **14**, 2010, pp.1079–1087.

Mark Rosegrant and Siwa Msangi (2007), "Agriculture and the Environment: Linkages, Trade-Offs and Opportunities", **19** *GEO. INT'L ENVTL. L. REV.*, 2007, 699.

Poonam Singh Nigam and Anoop Singh (2010), "Production of liquid biofuels from renewable resources", *Progress in Energy and Combustion Science* (2010), pp.1–17.

Council for Economic Planning and Development, News release-Practice Sustainable Energy Policy, Establish low-carbon and energy-saving society, December 4, 2009, available at: http://www.cepd.gov.tw/

Government Information Office, Republic of China (Taiwan), News Release-The Announcement on the 5th council of Nuclear-free homeland Promotion Committee, July 22, 2003, available at: http://info.gio.gov.tw/ct.asp?xItem=23287&ctNode=919

United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol.

Lin Mei Hua, Su Tzung Jen (2010), "Executive effect on the adjustment of paddy field and upland utilization in 2007–2009", *Agricultural policy and information*, September, 2010, **Vol. 219**, available at: http://www.coa.gov.tw/view.php?catid=22082.

Priority Issues for Boosting Smart Grid-Smart Customers in Taiwan*

Wen-Ling SUN
Deputy Director General, Science & Technology Law Institute, Institute for Information Industry, Taiwan
wensun@iii.org.tw

Abstract. There is no doubt that smart grids are the essential part of the energy policies all over the world. This article starts with an overview of the smart grid policy framework and its latest progress of deployment in Taiwan. It points out the difficulties of how to adequately urge Taiwan Power Company to deploy the target amounts of Advanced Metering Infrastructure (AMI) and how to encourage residential customers to install smart meters or join the AMI-related pilot programs. Accordingly, it contends possible solutions for wide rollout of smart meters. To sum up, it makes preliminary legislation suggestions in order to boost smart grid-smart customers in Taiwan.

Аннотация. «Умные сети электроснабжения» (smart grids), без сомнения, являются существенным элементом энергетической политики во многих странах мира. Данная статья начинается с обзора государственной политики Тайваня в этой области и последних достижений в ее практическом осуществлении, затрагивает проблемы взаимодействия с Тайваньской энергетической компанией в развертывании измерительной инфраструктуры нового поколения (AMI), вопросы стимулирования населения к участию в пилотных программах по AMI и установке «умных» (smart) счетчиков электроэнергии. В статье представляются возможные решения существующих проблем, а также законодательные предложения с целью роста числа пользователей «умных сетей электроснабжения» в Тайване.

Key words: Smart grid, AMI, smart meters, smart customers, energy efficiency.

1. INTRODUCTION: SMART GRID AND ITS SMART CUSTOMERS

According to the Smart Grid Master Plan, smart grid is defined as "an integrated electricity network of smart generation, transmission, distribution and consumers enabled by technologies of information, communication and automation". It emphasizes on "automation, security and close coordination of supply and demand side to achieve policy goals of enhancing efficiency of electricity system operation, quality of electricity power supply and reliability of electricity grid, and promoting wide application of renewable energy, energy saving and carbon reduction". As for end-use electricity consumers, smart grid-smart customers will be able to know how much electricity they use, when they use it, and how much it costs in a shorter-period (e.g. every 15 minutes) or real-time basis. Nevertheless, to realize this, the first step is to install smart meters, one component of Advanced Metering Infrastructure (AMI), at consumers' premises.

This article attempts to introduce the latest progress and difficulties of deployment of smart grid and smart meters under the framework of the Smart Grid Master Plan in Taiwan. In this respect, this article argues that solutions might be sought from the prospective of smart grid-smart customer policy.

1. OVERVIEW OF SMART GRID POLICY FRAMEWORK AND THE LATEST PROGRESS OF DEPLOYMENT

2.1 SMART GRID-RELATED ENERGY POLICIES

The "New Energy Policy of Taiwan" promulgated in November 2011 establishes the policy purposes "to ensure nuclear energy security, steadily reduce nuclear energy dependence, create a friendly low-carbon green energy environment, and gradually move towards a nuclear-free homeland". According to this policy, both demand-side and supply-side measures are needed "to further promote energy savings and carbon reduction and build a low

* Приоритетные вопросы развития «умных сетей электроснабжения» в Тайване.

carbon green energy development environment". As for the supply side, it has been noted that the government will deploy smart meters, promote the smart grid, and enhance efficiency of electric power system in order to ensure stable power supply.

In October 2012, the Bureau of Energy of the Ministry of Economic Affairs (BOE, MOEA) issued the "Guideline on Energy Development" (the Guideline) in accordance with the Paragraph 2 of Article 1 of the "Energy Management Law". The Guideline makes it clear that the smart grid requires policies not only on supply side or demand side. Instead, the Guideline highlights the policy need on "system side" to achieve the balance of supply and demand side and then enhance energy efficiency. In this prospective, the Guideline indicates the following tasks: to plan and deploy fundamental infrastructure for the smart grid, to enhance efficiency of the adjustment of power system, to enhance efficiency of the management of the electricity grid, and to adopt demand-side management. Meanwhile, the Executive Yuan (the executive branch of the Taiwan's government) approved the "Smart Grid Master Plan".

2.2 THE SMART GRID MASTER PLAN

The "Smart Grid Master Plan" ("Master Plan"), drafted by BOE, MOEA, was approved by the Executive Yuan in September 2012. Since then, the deployment of smart grid in Taiwan was officially launched. The government will invest 139.9 billion New Taiwan (NT) dollars in the period of 20 years. The "Master Plan" consists of three phases and six dimensions, which are set to achieve four goals, nine effect indexes and one vision.

The Phase One of the "Master Plan" starts from 2011 to 2015 and focuses on early-stage deployment of the smart grid. The Phase Two starts from 2016 to 2020 and focuses on further spread of the smart grid. The Phase Three starts from 2021 to 2030 and focuses on wide application of the smart grid. The aim of the "Master Plan" is to achieve the goals: namely, "ensure the stability of power supply", "promote energy saving and carbon reduction", "increase the use of green energy" and "activate low-carbon industry". "To build a high quality, high efficiency and environment-friendly smart power grid in order to realize low-carbon society and sustainable development" is the ultimate vision of the "Master Plan".

The six dimensions of the "Master Plan" are based on the characteristics of how electricity power is delivered and the relationship between demand side and supply side, and divided into the following primary tasks:

1) Smart generation and adjustment: To increase the use of renewable energy; to enhance the operation efficiency and accountability of power plants.

2) Smart transmission: To enhance the efficiency and safety of power transmission.

3) Smart distribution: To enhance the efficiency and safety of power distribution; to strengthen the integration of distributed energy resource.

4) Smart customers: To build up client/end-user information infrastructure; to design services for advanced clients.

5) Smart grid industry: To develop essential system and equipment industries, as well as energy management service industry. Eight system and equipment industries have been assigned as the priority industries that will benefit from related mass investment; namely, advanced metering infrastructure (AMI), electric vehicle (EV) charging system, distribution automation system, wide area monitoring system, smart appliance, micro grid system, energy storage system and energy management system.

6) Smart grid supporting infrastructure: For R&D, to develop essential technologies to increase the use of renewable energy and rapidly balance demand and supply of electric power grid. For standards, to set up standards for smart grid equipment and the testing platform. For laws/policies, to review regulations related to electricity enterprises, to design pricing mechanism that can reflect costs of electric power supply and have incentives for power saving, and to establish the training mechanism for relevant professionals. For field trials, to establish Peng-Hu Smart Grid Demonstration Site in order to combine smart grid related technologies and industries, and verify the effect of smart grid.

During the period of the "Master Plan", there are nine effect indexes to evaluate whether the goals have been achieved; namely, to decrease the time of nation-wide black-out, to reduce the loss caused by the power lines, to improve the imbalance of power supply, to realize the intelligent transformer stations, to achieve the automation of power distribution, to build up AMI, to reduce CO_2 emission, to increase the use of renewable energy and to develop smart grid industries.

Accordingly to BOE, MOEA, the "Master Plan", which integrates automation and information and communication technologies (ICT), will improve the efficiency, reliability and quality of the power system.

MOEA was instructed by Premier Sean Chen to form a cross-ministerial "Smart Grid Promotion

Taskforce". The taskforce was formed by the following agencies: the National Science Council, Atomic Energy Council, Council for Economic Planning and Development (CEPD), Executive Yuan Board of Science and Technology, Executive Yuan Department of Economics, Energy and Agriculture, Taiwan Power Company and the MOEA's subordinate agencies. The minister of MOEA serves as the convener.

2.3 DEPLOYMENT OF AMI AND SMART METERS

An AMI system consists of three components: "a "smart meter" at customer's premise, communications network between the smart meter and the utility, and a "meter data management application" (MDMA) at the utility".

Meters can measure and record usage data at hourly intervals or more frequently, and provide usage data to both consumers and energy companies at least once daily. Data are used for billing and other purposes. As for smart meters (advanced meters) based on FERC (2012), they include "basic hourly interval meters, meters with one-way communication, and real time meters with built-in two-way communication capable of recording and transmitting instantaneous data".

In fact, MOEA has proposed the "National Advanced Metering Infrastructure (AMI) Deployment Plan" (the "AMI Deployment Plan"), approved by the Executive Yuan on June 23, 2010. The aim of the "AMI Deployment Plan", which is one of the key components of the "Green Energy Industry Emerging Scheme" of the Executive Yuan, is to develop new information and communication technologies (ICT) applicable to various AMI systems. The expected benefits are reducing peak load by 650 MW, saving 5% of electricity consumption (9.8 TWh), and reducing 4.39 million tons of CO_2 emissions.

The "AMI Deployment Plan" consists of two parts:

1) AMI in High-Voltage and Super-High-Voltage systems

There are 23,000 users of high voltage (from 11.4kV to 69kV) and super high voltage (higher than 69 kV) in Taiwan. They are typically industrial and commercial users, who contribute up to 58% of the total energy consumption. Since 2009, the Taiwan Power Company has started to install AMI for high voltage and super high voltage users. The goal set up for users of this category is to finish the installation of all 23,000 users by the end of 2012.

2) AMI in Low-Voltage systems

There are 12 million users of low voltage users in Taiwan. They are typically residential users, who contribute up to 42% of the total energy consumption. The goal set up for users of this category is to finish the installation of 6 million users in four stages. In the first stage (2009–2010), the tasks are to deploy 300 smart meters in order "to validate and evaluate available technologies". In the second stage (2011–2012), the tasks are to deploy 10,000 smart meters in order "to evaluate the availability of technologies and estimate the effectiveness of time-of-use (TOU) and demand response (DR) for further deployment plan". In the third stage (2013–2015), the tasks are to deploy 1 million smart meters. In the fourth stage (since 2016), the tasks are to deploy 5 million smart meters in order "to upgrade the electric power system and achieve the balance between supply and demand".

Since the progress of AMI deployment for low-voltage users was delayed far behind in each stage, the Smart Grid Promotion Taskforce has decided to adjust the deployment goal in the third stage from "1,000,000" to "100,000". In addition, efforts will focus on developing measures such as load management and demand response and conducting the cost-benefit analysis.

MOEA has declared that the government will cover 30% of the expenses for smart grid deployment and will establish "Time of Use" (TOU) for residential consumers in 2015. Further, the Taiwan Power Company also has declared to deploy AMI at no charge for 10,000 residential consumers in 2013. However, at present, difficulties remain on how to adequately urge the Taiwan Power Company to deploy the target amounts of AMI and how to encourage residential customers to install smart meters or join the AMI-related pilot programs.

3. SMART CUSTOMERS IN TAIWAN AND POSSIBLE SOLUTIONS

3.1 SMART CUSTOMERS POLICIES

Among the total 139.9 billion NT dollars investment of the "Master Plan", the fourth dimension "Smart Customers" accounts for 95.8 billion NT dollars, which represents 68.5% of the total amount of the investment. It shows the importance of this dimension in the "Master Plan".

According to the "Master Plan", its primary tasks are divided into "client/end-user information infrastructure" and "foresight client services" in coordination with the deployment progress of AMI, including smart meters. As for "client/and-user information infrastructure", primary tasks include: deployment of AMI, demand response, internet key

exchange system for management data, pricing mechanism enabled to reflect costs of supply and offer incentives of energy saving, models of derivative energy service (e.g. EMS). As for "foresight client services", primary tasks include: electric vehicle (G2V and V2G) and power stations for EV, and systems of distributed power supply and energy storage.

Residential consumers use about 42% of the total electricity consumption in Taiwan. How to raise the awareness of residential consumers and let them make informed decisions to save energy by virtue of assistance of technologies and service are priority issues? By installing smart meters, residential consumers are able to obtain usage data in a shorter interval of time and have more opportunities to cut their electricity bills. There is surely no one-size-fit-all solution for all consumers; however, the current challenges in Taiwan seem to lack legal obligations or policy incentives directly or indirectly contributing to deploy or install smart meters either for Taiwan Power Company or residential consumers.

The Paragraph 1 of Article 62 of the Electricity Act provided that "Unless otherwise a flat rate has been agreed upon, electricity enterprises collecting electricity fee from users shall install electric meters and calculate the fee with the kilowatt-hour readings gauged by the meters." Article 63 further provides that "Electricity enterprises may collect a guarantee payment or an alternative rental payment for the electric meters it installs for users as the said meter is provided by the enterprise. The said guarantee or the total amount of the said rental payment shall not exceed the market price at the time of installation of the said meter." Pursuant to these two articles, Taiwan Power Company, as the sole electricity supplier to end-users in Taiwan, is obliged to provide all consumers meters to calculate the fees on the basis of kilowatt-hour. However, the meters are not provided for free. Taiwan Power Company is allowed to collect a guarantee payment or an alternative rental payment from consumers.

As mentioned above, the priority task of the fourth dimension of the "Master Plan" is to finish the deployment of AMI for 100% of all high- and super-high voltage consumers and about 50% of all low-voltage consumers. The fact is that the progress of deployment is delayed far from the said goal. It has been noted that major obstacles of deployment of AMI may come both from Taiwan Power Company and consumers themselves as well.

Here come the following questions:

1) Does the Taiwan Power Company have the obligation to provide "smart meters"? Whether consumers can ask the Taiwan Power Company to install smart meters at their premise? If so, who shall bear the high expenses of smart meters?

2) On the other hand, in fact, the Taiwan Power Company indeed suffered from the reluctance of consumers to install AMI. Whether the Taiwan Power Company can make the installation of smart meters to be mandatory for all or certain consumers? If so, who shall bear the high expenses of smart meters?

As for the first question, the answer is "NO" under the existing laws and regulations. Taiwan Power Company is obliged to provide "meters", which cannot be expected to extend to "smart meters". As for the second question, the answer is also "NO" under the existing laws and regulations.

3.2. POSSIBLE SOLUTIONS FOR WIDE ROLLOUT OF SMART METERS

This article contends that if the presumption of cost-effectiveness requirement is met, possible solutions are: Whether obligations or incentives shall be imposed or given to the Taiwan Power Company for deploying smart meters or taking other actions attributable to energy efficiency? Whether incentives or other measures shall be given to residential consumers for installing smart meters and enrolling pilot projects?

3.2.1. Lessons learned from EU Energy Efficiency Directive: Obligation of Mandatory Roll-out of Smart Meters in Certain Circumstances and Obligation of Annual Energy Saving by Volume

The EU Energy Efficiency Directive (Council Directive 2012/27/EU, 2012 O.J. (L 315) 1.) was in force since December 2012. Pursuant to the first subparagraph of Paragraph 1 of Article 9 of the Energy Efficiency Directive, member states shall provide to the end-use electric consumers "competitively priced individual meters that accurately reflect the final customers" actual energy consumption and that provide information on actual time of use", provided that it is "technically possible, financially reasonably and proportionate in relation to the potential energy savings". Furthermore, the second subparagraph of Paragraph 1 of Article 9 directs member states to provide smart meters when "an existing meter is replaced" and "a new connection is made in a new building or if a building undergoes major renovations". As for the first circumstance, the obligation can be waived only if "it is technically impossible or not cost-effective in relation to

the estimated potential savings in the long term". As for the second circumstance, since public bodies' buildings of member states are required to renovate "3% of the total floor area of heated and/or cooled buildings" each year from January 1 2014 to meet at least the minimum energy performance requirements pursuant to Article 5 of the Energy Efficiency Directive, it can be anticipated that smart meters will be installed in those public buildings in a constantly rising rate each year.

Article 7 of the Energy Efficiency Directive directs member states to set up "energy efficiency obligation schemes" to ensure that "energy distributors and/or retail energy sales companies are designated as obligated parties" bearing the obligation of achieving "a cumulative end-use energy savings target by 31 December 2020". According the second subparagraph of paragraph, the said target "shall be at least equivalent to achieving new savings each year from 1 January 2014 to 31 December 2020 of 1.5% of the annual energy sales to final customers of all energy distributors or all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013".

Subject to this provision, it is the energy distributors or the retail energy sales companies themselves that bear the burden to achieve the said target of energy savings. Driven by this obligation, energy distributors or the retail energy sales companies are supposed to take some actions and measures, such as deploying smart meters, implementing demand response, or introducing energy service, to reduce the said amount of energy consumption of end-use consumers. In the United Kingdom, the national smart meter rollout is expected to reduce domestic consumption by 3% and peak demand by another 5%, which is equivalent to about USD 22 billion in annual savings. According to IEA (2011), in the United Kingdom, the national smart meter rollout is expected to reduce domestic consumption by 3% and peak demand by another 5%, which is equivalent to about USD 22 billion in annual savings. Since deployment of smart meters seems to be an effective way to save energy, energy distributors or the retail energy sales companies do have incentives to adopt this method.

3.2.2. Lessons Learned from US Green Button, EU Energy Efficiency Directive and Their Privacy Policies

Except financial incentives (e.g. grants, subsidies, etc.) and pricing mechanism, this article contends that there are still other measures to promote behavioral change and eventually contribute to the willingness of installing smart meters. These measures empower consumers with more information and protect consumers' privacy at the same time.

In the United States, the White House issued "A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future" in June 2011. The Policy Framework sets "empowering consumers and enabling informed decision making" as one of the four guiding principles. It highlights the importance of "consumer education, timely access to data, device usability, data privacy, and consumer protection".

According to Edison Foundation (2011), in September 2011, about one fourth of residential consumers had installed smart meters. At the same time, with regard to increasing access to data of energy consumption, the White House brought up the idea of "Green Button" that would provide consumers with simple online access to their detailed energy usage information. When a consumer clicks on the Green Button, the consumer's computer downloads energy usage information in a standardized human-to-machine and machine-to-machine readable electronic xml format. This kind of access will make it easier for consumers to engage with third parties offering services and products to help them understand and take actions to better manage their energy usage.

The Green Button Initiative was officially launched in January 2012. As of May 2012, 36 million smart meters have been installed, which means almost one third of residential consumers have a smart meter. As of October 2012, more than 16 million consumers have access to Green Button to download usage information by a simple click. According to the White House (2013), as of February 2013, 35 utilities joined the industry-led initiative. It is estimated that more than 36 million consumers will have access to Green Button and they will be able to use web and smart-phone apps to choose the best rate plan or to receive customized energy efficiency tips. In addition to "Green Button-Download My Data", the Obama Administration has been working to enable "Green Button-Connect My Data", which is designed to help consumers "automatically and securely transfer" their usage data to authorized third parties.

In EU, the Energy Efficiency Plan of 2011 adopted by European Commission on March 8, 2011, indicates that "consumers need clear, precise and up to date information on their energy consumption". It points out that measures should be taken to em-

power consumers with new technology and further affirms the deployment of smart meters, which member states are obligated to roll out for at least 80% of consumers by 2020, to allow consumers save energy by "gathering and communicating information about energy supply and consumption". And this information should be presented in ways that consumers can easily understand and that can help them to improve energy efficiency.

In order to further strengthen the empowerment of end-use consumers with regard to access to information from meters and bills of energy consumption, Article 10 and Annex VII of the Energy Efficiency Directive expressly indicates the minimum requirements for billing information on actual consumption, which include billing based on actual consumption, minimum information contained in the bill and advice on energy efficiency accompanying bills and other feedback to final consumers.

Information usually accompanies concern of privacy. Indeed, it is suggested that privacy is one of the leading concerns of consumers to install smart meters. Both the United States and European Union have taken some policies to ensure that the consumers' detailed information created by deployments of smart grid and smart meters is adequately collected, saved and used.

In the United States, the White House issued Consumer Privacy Bill of Rights Report in February 2012 and set forth the following principles: individual control; transparency; respect for context; security; access and accuracy; focused collection; and accountability. In the European Union, Expert Group 2 of Smart Grid Task Force issued a report in February 2011 suggesting to distinguish personal data and non-personal data in smart grid. Furthermore, in March 2012, European Commission's recommendation indicated that it will establish a "data protection impact assessment template" and required member states to adopt the template and apply it to all network operators and operators of smart metering systems.

CONCLUSION: PRELIMINARY LEGISLATION SUGGESTIONS

Smart grid and smart meters will fundamentally change the way the consumers use electricity. Consumers will be able to get enough information to reduce electricity consumption or to use electricity when the price is lower, provided that time-of-use rate applies. Both the United States and European Union have taken policies and correspondent measures to empower consumers to make informed decisions of saving energy and using energy at specific time (e.g. off-peak time) or in a specific way (e.g. turn off specific appliances remotely). However, to make all these scenarios happen in our houses, the premise is to install smart meters. Accordingly, this article proposes that the government may take into account the following legislation suggestions.

Since the Taiwan Power Company is the sole electricity enterprise in charge of generation, transmission, distribution and delivery (sales) of electricity in Taiwan, there are fewer incentives for them to take actions to reduce the consumption of their customers. In this regard, this article suggests that the government may consider imposing specific obligations on the Taiwan Power Company to ensure the progress of deployment of smart grid and smart meters being on the right track. Firstly, following the second subparagraph of Paragraph 1 of Article of Energy Efficiency, Article 62 of the Electricity Act or Article 17 of Energy Management Act may add provisions to make the installation of smart meters mandatory, provided that "an existing meter is replaced" and "a new connection is made in a new building". Secondly, following the "1.5% savings target" in Article 7 of the Energy Efficiency Directive, Energy Management Law in Taiwan may add provisions to obligate electricity enterprises in charge of distribution and delivery (sales), namely the Taiwan Power Company, to reduce certain amount of end-use electricity consumption per year. Driven by this obligation, the Taiwan Power Company will work actively on tasks, such as the deployment of smart grid and smart meters, which may significantly contribute to the compliance of the mandatory provision.

On the other hand, since most of residential consumers in Taiwan apply rate type of non-TOU (non Time-of-use), there are fewer incentives for them to change their behaviors to save electricity, either. It explains more efforts are needed to persuade residential consumers to install smart meters and/or join relevant pilot projects. In this regard, this article suggests that except financial incentives and/or pricing mechanism (e.g. application of time-of-use rate on residential consumers that install smart meters), efforts shall be taken on how to provide consumers with the "right" information and how to provide it "right". Following the example of Green Button, the government may consider making online access to detailed electricity usage information as a requirement for consumers who install smart meters. The web portal can be established by

the Taiwan Power Company or other entities, which are interested in providing this kind of service. Further, following the "minimum requirements for billing information" in Article 10 and Annex VII of the Energy Efficiency Directive, the Electricity Act may include similar provisions.

As for the privacy concern of consumers who installs smart meters, the government may consider to follow the "data protection assessment template" mechanism taken by the European Commission. The Paragraph 2 of Article 27 of the Personal Information Protection Act in Taiwan, which was in force in October 2012, provided that "the government authority in charge of subject industry at the central government level may designate a non-government agency for setting up the plan of security measures for the personal information file or the disposal measures for the personal information after termination of business". Subject to this provision, the MOEA may designate the Taiwan Power Company to set up appropriate data protection assessment and plan to ensure the protection of personal data collected by smart meters. In this regard, the government may consider establishing a template for the said data protection assessment.

Taken the above measures as a whole, it might indirectly encourage residential consumers to install smart meters to receive the "right" information in a "right" way.

REFERENCES

The White House (February 2013), *A Policy Framework for the 21st Century Grid: A Progress Report*, at **7**.

Institute for Electric Efficiency, Edison Foundation (May 2012), *Utility-scale Smart Meter Deployments, Plans, & Proposals-IEE Report*, at **1**.

Commission Recommendation of 9 March 2012 on Preparations for the Rollout of Smart Metering Systems, 2012 O.J. (L73) 9, **11**.

U.S. FEDERAL ENERGY REGULATORY COMMISSION [FERC] (2012), *Assessment of Demand Response and Advanced Metering*, at **7**.

The White House (2012), *Consumer Data Privacy in a Networked World: A Framework for Protecting Privacy and Promoting Innovation in the Global Digital Economy*, at **1**.

International Energy Agency [IEA] (2011), *Smart Grid-Smart Customer Policy Needs*, at **8**.

The White House (2011), *A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future*, at **V**.

Smart Grid Task Force [SGTF] (2011), *Expert Group 2: Regulatory Recommendations for Data Safety, Data Handling and Data Protection*, at **28–29**.

Pei-San Huang, TOU Will Apply to Residential Consumers in 2015, CHINA TIMES, Nov. 14, 2012, at **A11**.

Mao-Jean, Wang, Smart Meters-10,000 Consumers Will Be Able to Install for Free in 2013, UNITED DAILY NEWS, Nov. 25, 2012, at **A11**.

The Executive Yuan of ROC, "Smart Grid Master Plan (2012)", http://web3.moeaboe.gov.tw/ECW/populace/content/SubMenu.aspx?menu_id=1946 [accessed 30 July 2013].

The Bureau of Energy, MOEA, "The New Energy Policy of Taiwan (2011)", http://web3.moeaboe.gov.tw/ECW/populace/news/News.aspx?kind=2&menu_id=56&news_id=2433 [accessed 30 July 2013].

What's New: Taiwan Launched Smart Grid Deployment (19 Nov. 2012), MOEA Website, http://www.moea.gov.tw/Mns/english/news/News.aspx?kind=6&menu_id=176&news_id=28433 [accessed 30 July 2013].

Press Release: Smart Grid Taskforce to Be Established (27 Aug. 2012), The Executive Yuan of ROC Website, http://www.ey.gov.tw/en/News_Content2.aspx?n=1C6028CA080A27B3&sms=E0588283EFAA02AD&s=72BCCF053E016FFF [accessed 30 July 2013].

Chinese Taipei Advanced Metering Infrastructure (AMI) Road Map, APEC Energy Working Group-Energy Smart Communities Initiative Website, http://esci-ksp.org/?project=chinese-taipei-advanced-metering-infrastructure-ami-road-map&task_id=639 [accessed 30 July 2013].

News: MOEA Helps ICT Move on to Smart Grid Industry, Invest in Taiwan Website, http://investtaiwan.nat.gov.tw/news/news_eng_display.jsp?newsid=944&nowpage=1&Q_ANSWER=&MID=8 [accessed 30 July 2013].

Advanced Metering Infrastructure (AMI) pilot projects and National AMI Deployment Plan in Chinese Taipei, APEC Energy Working Group-Energy Smart Communities Initiative Website, http://esci-ksp.org/?project=advanced-metering-infrastructure-ami-pilot-project-and-national-ami-deployment-plan-in-chinese-taipei [accessed 30 July 2013].

National AMI Deployment Plan, APEC Energy Working Group-Energy Smart Communities Initiative Website, http://esci-ksp.org/wp/wp-content/uploads/formidable/National-AMI-Deployment-Plan.pdf [accessed 30 July 2013].

Increase Accountability of Power Grid and Efficiency of Power Generation and Transmission, MOEA of ROC Website, http://www.moea.gov.tw/AD/Ad04/content/ContentDetail.aspx?menu_id=4598 [accessed 30 July 2013].

What's New: AMI Deployment Plan Supported by BOE Stimulates Development of Smart Meter Industry and International Collaborations (22 Feb. 22 2012), MOEA of ROC Website, http://www.moea.gov.tw/Mns/english/news/News.aspx?kind=6&menu_id=176&news_id=25939 [accessed 30 July 2013].

Modeling a Green Energy Challenge after a Blue Button, The White House Blog website, http://www.whitehouse.gov/blog/2011/09/15/modeling-green-energy-challenge-after-blue-button [accessed 30 July 2013].

Pricing Chart for Low-voltage Consumers (valid since 10 June 2012), Taiwan Power Company Website, http://www.taipower.com.tw/content/q_service/images/main_3_6_3.pdf [accessed 30 July 2013].

"Social Impact Bonds": Implications for Government and Non-Profit Organizations*

Antonio COSTA, Professor of Business Administration
Department of Management, Economics, Mathematics, Statistics, University of Salento, Italy
antonio.costa@unisalento.it

Paolo LEOCI, Associate Professor of Business Administration
Department of Management, Economics, Mathematics, Statistics, University of Salento, Italy
paolo.leoci@unisalento.it

Alessandra TAFURO, Researcher of Business Administration
Department of Management, Economics, Mathematics, Statistics, University of Salento, Italy
alessandra.tafuro@unisalento.it

Abstract. In recent years the weak economy has forced state and local governments to cut back on funding for existing programs and to limit investments in new services. All levels of government routinely partner with non-profit organizations to provide social services, and these cutbacks can have serious implications for service delivery and non-profit capacity. One very exciting response to these pressures is the development of a new financing model that raises private money to fund effective social services: the Social Impact Bond (SIB). This new method involves the formation of new partnerships and the re-alignment of roles for the first and third sectors. The purpose of this paper is to provide an overview of the challenges that developing and implementing Social Impact Bonds may produce both on the public administration (PA) and on non-profit service providers (NPOs). Social Impact Bonds ask governments and non-profit service providers to almost completely rethink the way they do business.

Аннотация. В последние годы слабость экономики стала приводить к тому, что во многих странах на уровне правительств и регионов было урезано финансирование существующих социальных программ, а вложения в создание новых услуг ограничены. Власти на всех уровнях регулярно взаимодействуют с некоммерческими организациями в оказании социальных услуг, и поэтому данные сокращения могут сильно повлиять на социальное обслуживание и уменьшить возможности НКО. Одним из весьма интересных ответов на эти вызовы является разработка новой модели финансирования через «социальные облигации» (*Social Impact Bonds*, SIB), которые способствуют привлечению частного финансирования социальных услуг. Целью данной работы является обзор вопросов, которые возникают при реализации «социальных облигаций» — как со стороны госструктур, так и со стороны поставщиков услуг из некоммерческого сектора. «Социальные облигации» заставляют госструктуры и НКО полностью пересмотреть обычные схемы их деятельности.

Keywords: Social Impact Bonds, SIBs, public administration, non-profit service providers, innovative social public service.

INTRODUCTION

Social innovation is a new and emerging concept that has no clear definition. In general, we refer to the European Commission report (2011, 9–10) where social innovations have been defined as "*innovations that are social in both their ends and their means. Specifically, we define social innovations as new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act*."

In this sense, the term *innovation* can be referred to as the capacity to create and implement novel ideas which are proven to deliver value; while the

* «Социальные облигации» и их применение в государственных и некоммерческих организациях.

term *social* can be referred to as the kind of value that innovation is expected to deliver: a value that is less concerned with profit and more with issues such as quality of life, solidarity and well-being.

In the public and scientific debates, there are developing innovative solutions and new forms of organization and interactions to tackle social issues. In this sense, social innovations can be seen as dealing with the welfare of individuals and communities, both as consumers and producers.

In any case, they bring about new references or processes. In particular, an important aspect of social innovation is the process of social interactions between individuals to reach certain outcomes. This process of social interactions is participative, involves a number of actors and stakeholders who have a vested interest in solving a social problem, and imposes a change in the respective roles of the private, public and third sectors.

In times of economic recession and austerity, governments are under pressure to do more with what they have: most major cities and states are facing staggering budget deficits and taxpayers and politicians are not willing to risk their public money for testing programs that are not a guaranteed success. In addition, publicly funded attempts to help poor or vulnerable population are often remedial, ineffective and expensive. In the meantime, there are prevention-focused interventions with proven efficacy that are not being identified, taken up and scaled by government or that require more capital than governments can provide upfront.

At the same time, sponsorships and donations to support the social sector have experienced declines and non-profit organizations and charities have recognized a need to explore new revenue-generating models to achieve financial sustainability. Further cutbacks in government spending accompanied by reduced investment from the second and third sectors has required the use of innovative, sustainable and multi-stakeholder approach for the investment in social welfare.

Sometimes, these new methods involve the formation of new partnerships and the re-alignment of roles for the first, second and third sectors. Indeed the implementation of SIBs program provides another opportunity to assess the relationship between nonprofit organizations (NPOs) and public agencies.

A Social Impact Bond is a multi-stakeholder partnership in which philanthropic funders and impact investors — not governments — take on the financial risk of expanding proven social programs. Non-profits deliver the social program to more people who need it; the government pays only if the program succeeds.

In this way, SIB reduces the role of the state or local government in funding or supervising social welfare programs; it attempts to increase the role of private investment and the responsibility of non-government organizations in the provision of social welfare and to allay the underperformance and underfunding afflicting the non-profit sector (Bolton, 2010; Bolton & Savell, 2010; Mulgan *et al*., 2010 a, b; Liebman, 2011; Von Glahn & Whistler, 2011; Siddhart, 2012, p. 4).

Under a SIB, *a payer — usually a government at a national, regional or local level — agrees to pay for measurable improved outcomes of social projects, and this prospective income is used to attract the necessary funds from commercial, public or social investors to offset the costs of the activity that will achieve those better results* (Mulgan *et al*., 2011, 5).

The approach introduced by the SIB can pay for holistic, collaborative community development because it captures disparate benefits and enforces accountability. It brings together organizations that often work in isolation and encourages client service that can better lead to outcomes, rather than just outputs. The rationale behind SIBs is akin to the payment-by-results schemes associated with target-based performance management.

In the remainder of this paper:

- Section 2 seeks to explain the SIB concept by examining the limited literature and the existing reports on the SIB's pilot projects implemented in the world;
- Section 3 discusses the effects of "Social Impact Bonds" on government and
- Section 4 highlights some implications, which this new model produced on non-profit service providers.

2. THE SOCIAL IMPACT BONDS

Despite the recent development of the SIB concept, the review of the limited literature on the subject (Strickland, 2010; Azemati *et al*., 2012; Mulgan *et al*., 2010; Disley *et al*., 2011; Wongetal, 2013; Warner, 2013; Ragin & Palandjian, 2012) and the examination of some reports edited by consultants, foundations and financial services firms (Rockefeller Foundation, 2010; Center for American Progress, 2011; The Young Foundation, 2011; McKinsey & Company, 2012; Harvard Kennedy School Social Impact Bond Technical Assistance Lab, 2013; MaRS, 2013) is sufficient to reveal the theoretical basis for the Social Impact Bond.

Before presenting how the SIB works, it is important to make two clarifications about the term

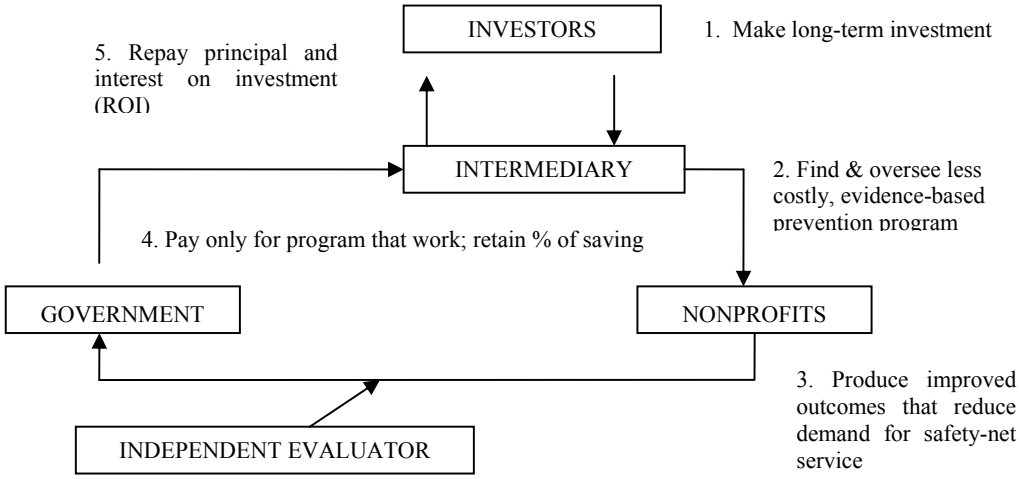


Figure 1. Social impact bond model.

"Social Impact Bond" which sometimes can lead to confusion.

The first is about the use of the word "bond". SIBs are not bond or debt instruments but rather multi-stakeholder partnerships managed through a series of contracts. To avoid this confusion, in some countries the SIBs have been called *Pay for Success Bonds* (e.g. U.S.) and *Social Benefit Bonds* (e.g. Canada).

Indeed, SIBs share features of both debt and equity or fixed-income instruments that are often used for infrastructure or other capital projects: generally, SIBs offer returns more similar to an equity instrument, rather than a bond; their returns are variable like equity, rather than fixed as with a bond.

The second clarification concerns the use of the terms "Social Impact Bond" and "Pay for Success Bonds" as synonyms: this is wrong because the SIBs are a specific kind of Pay for Success (PFS) contract.

PFS contract is a contracting mechanism in which government (or another payer) pays service providers after they achieve predefined outcomes. Providers entering into these contracts have several options for financing program delivery: internal resources, loans from community development financial institutions and banks, or grants or program related investments from foundations. Most of these options impose significant financial risk on the provider. A SIB, by contrast, is a financing mechanism that shifts this risk to investors. By participating in a SIB, a provider working under a PFS contract can obtain operating funds to grow and scale without incurring additional financial risk. Given the scarcity of growth capital and the difficulty providers face in securing resources that enable them to serve a greater proportion of at-risk populations, SIBs can offer an appealing path to scale.

PFS contracts and SIBs share a premise of payment by results, but they differ in purpose. Beyond achieving results, SIBs explicitly seek to create a marketplace for impact investment, up ported by rigorous due diligence and analytics. These market-building elements add costs for evaluation, legal, performance management, and other intermediation services necessary for driving social and financial outcomes. Because SIBs must bear these costs, their greatest potential lies where scale and improved performance are principal goals as well as social needs. Uniquely, the capital markets have the depth, flexibility, and rigor to support these aims. According to Warner (2013, 305) *SIBs represent an extreme expansion of new public management precept into social program delivery*. Indeed SIBs are characterized by two concepts: the creation of a partnership and the use of performance measurement.

At its core, Social Impact Bond has a public private partnership that has the potential to substantially transform the social sector, support poor and vulnerable communities, and create new financial flows for human service delivery by offering an innovative way to scale what works and break the cyclical need for crisis-driven services. SIBs signify a new paradigm of public-private partnerships in the wake of the financial crisis, one that privatizes the risks and shares the gains. Collaboration among philanthropy, government, and the investment community is vital.

According Ragin & Palandjian (2012, 63), Social Impact Bonds offer a new way to advance cross-sector partnerships and introduce innovative financing solutions to scale proven preventative social programs. To achieve this goal, strong relationship

Table 1. Benefits to stakeholders of successful SIBs.

Government	Accountability for taxpayer funds Reduction in the need for costly downstream remediation Increased supply of effective services for citizens without financial risk
Non-profits	Access to growth capital to scale up operations Access to a stable and predictable revenue stream without labor-intensive fundraising Facilitated coordination with organizations working on overlapping problems
Investors	Achievement of financial returns and social impact Participation in a new asset class with portfolio diversification benefits
Communities	Access to an increased supply of effective social services Reduction in the need for crisis-driven interventions

Adapted from: Social Finance, Rockefeller Foundation, *New Tool For Scaling Impact: How Social Impact Bonds Can Mobilize Private Capital to Advance Social Good*, p. 11

management skills are vital, so that the perspectives and concerns of the different realms — from policy maker to social entrepreneur, from financier to public service commissioner — can be taken on board and made intelligible to all the parties involved in creating a SIB.

The partnership is among four actors — investors, the public sector, an intermediary and non-profit (social service provider) — where each acts independently with the common goal of creating increased positive social outcomes in a more efficient way. Figure 1 depicts the relationship among the key actors and explains how the SIBs would work. In detail:

1. The intermediary issues the SIB and raises capital from private investors;

2. The intermediary transfers the SIB proceeds to non-profit service providers, which use the funds as working capital to scale evidence-based prevention programs. Throughout the life of the instrument, the intermediary would coordinate all SIB parties, provide operating oversight, direct cash flows, and monitor the investment;

3. By providing effective prevention programs, the non-profits improve social outcomes and reduce demand for more expensive safety-net services;

4. An independent evaluator tracks and aggregates performance data to determine whether the intervention achieved target benchmarks and consequently determines whether the target outcomes have been achieved according to the terms of the government contract. If they have, the government pays the intermediary a percentage of its savings and retains the rest. If outcomes have not been achieved, the government owes nothing;

5. If the outcomes have been achieved, investors would be repaid their principal and a rate of return. Returns may be structured on a sliding scale: the better the outcomes, the higher the return (up to an agreed cap).

SIBs codify the performance measurement approach and link financial return to rigid metrics. For this reason it is fundamental that social outcome goals need to be clear, objective, measurable and non debatable and the evaluation process must be transparent and clear to all parties. McKinsey & Company report (2012) proposes seven stakeholders that are involved in social impact bonds model:

1. *Governments:* Public entities establish policy on social impact bonds and commit to making future payments to private partners if specific outcome goals are achieved and public sector costs lowered.

2. *Investors:* Philanthropic and other social innovation investors finance social impact bond projects, providing the upfront capital to service providers to cover the costs of service delivery.

3. *Non-profit service providers:* These organizations directly deliver social interventions to affected populations.

4. *Intermediaries:* Intermediaries are typically non-profit organizations that manage social impact bond projects on behalf of governments and create a separation between service providers and public agencies to minimize the potential for government micromanagement that could limit providers' flexibility to achieve targeted outcomes. They are responsible for raising funds from investors, selecting the service providers to deliver interventions, receiving success payments from governments, and repaying investors if program goals are reached.

5. *Independent assessors:* Assessors perform the critical task of measuring program performance to determine whether outcome targets are met.

6. *Evaluation advisers:* Evaluation advisers work with intermediaries to provide ongoing monitoring and refinement of social impact bond programs.

7. *Constituents:* Program beneficiaries receive the social services delivered.

SIB will function effectively only if every stakeholder is willing and able to uphold its end of the deal and fulfill its unique roles and responsibilities. It is clear that the power of SIBs lies in their ability to align all stakeholders' interests around achieving common objectives. In fact, all stakeholder — non-profits, investors, government, and communities — benefit from successful of SIB programs as it was evidenced in the Table 1.

SIBs operate at the intersection of three important trends: greater funder interest in evidence-based practices in social service delivery; government interest in performance-based contracting; and impact investor appetite for investment opportunities with both financial returns and social impact.

The idea of a Social Impact Bond has generated significant interest in multiple developed countries — e.g. UK, U.S., Australia, Canada, Ireland and Israel — that are now in varying stages of exploring, developing and/or implementing SIB pilots. To date these have been focused mostly on criminal justice, homelessness, workforce development and youth services, but work is underway to develop applications in new sectors like health, social care, affordable housing (Disley *et al.,* 2011; Greenblatt, 2011; Pauly & Swanson, 2012; Siddhart, 2012).

The pilot projects — as described in some reports — demonstrate that there is no one approach to designing and negotiating a social impact bond. SIBs have great potential in a range of preventive social programs: this means that SIBs are a vehicle that can be used in a range of areas, but not for every area of social need.

SIBs are not a one-size-fits-all solution: there are currently a limited number of areas with proven interventions, strong organizations, and opportunities to invest in prevention programs and create public value (Warner, 2012). Moving from remedial programs to preventive solutions requires a public-private partnership to shift the risk from government and allow a transformation to occur in the current system.

As highlighted before, not all social issues or interventions are suitable for a SIB model, there are shortcomings to the SIB model that will limit its effectiveness to specific situations and, in particular, the value of this funding innovation will be strongly context-dependent (Pauly & Swanson, 2012).

3. SOCIAL IMPACT BONDS: THE ROLE AND THE EFFECT ON GOVERNMENT

For social problems, each year, governments spend hundreds of billions of public money, but the citizens have no idea how effective this spending is. Performance is rarely assessed, the measurements tend to be too operationally focused and the results have not lived up to expectations (Atkinson and McCrindell, 1997). Unfortunately, no single performance measure is appropriate, and the results do not always meet the needs of relevant stakeholders: the measurements, for example, focus on tracking the number of people served and the amount of service provided rather than the outcomes that are achieved (Behn, 2003).

Governments are starting to recognize the need for a new approach to social services that places its emphasis on identifying innovative ideas, testing their effectiveness, and scaling up the interventions that prove successful. In this direction, according to Liebman and Sellman (2013, 6) there are three features of current funding mechanisms that inhibit innovation in social services:

1. Government budgeting focuses on paying for inputs rather than achieving outcomes;
2. Budgets are built in a backward-looking manner;
3. Time horizons are too short.

Most social service spending today funds organizations to deliver a set quantity of services rather than to produce results. Outcomes are rarely assessed, making it hard, for example, to reallocate resources based on the comparative performance of different service providers or to stop spending money on programs that don't work. Instead, a properly implemented performance measurement system can provide the data necessary to identify strengths and challenges in local government programs so those programs can be adjusted to perform at acceptable levels, thus saving scarce resources and improving citizen satisfaction.

Most budgets are built around funding the same things that were funded the previous year with small adjustments for inflation. In some cases, legislatures require that the same providers be hired year after year to deliver the exact same, possibly ineffective, services. Governments lack a systematic way to work with innovative non-profits to test and scale up promising new solutions. And fear of public scrutiny makes it hard to take the risks associated with trying new things and rigorously assessing them.

While it is relatively easy for a governor or mayor to set up an interagency task force to tackle a

tough issue and to get the task force to meet a few times, rarely these efforts manage to sustain energy over several years necessary to achieve results. Political leadership turns over; new priorities emerge; or inadequate provision of staff time and other resources dooms the effort. Moreover, fiscal realities make it difficult to make preventive investments even when those investments can deliver large savings in future budgets. This problem is exacerbated when the required investments would occur in one agency's budget, while the savings would appear in another's.

Trough the SIBs, governments will have access to better data that enable rigorous assessment of various program alternatives and inform responsible public investment. In addition, governments may begin to measure success using outcomes rather than outputs, driving greater accountability within the public sector.

4. SOCIAL IMPACT BONDS: IMPLICATION FOR NON-PROFIT SERVICE PROVIDERS

As noted, non-profit sectors world-wide account for 5–10 percent of GDP; providing a variety of quality-adjustable goods and services that often contribute to civil society (Powell & Steinberg, 2006; Anheier & Toepler, 2010). All levels of government routinely partner with non-profit organizations to provide services especially when, in this way, they may save money and provide more effective services to its citizens. However, the relationship between government and non-profit organizations is not without problems and, as Van Slyke has noted (2006, 157), *contextual changes at the national and local level have led to a transformation from governance by authority to governance by contract*, to governance in which public organizations increasingly devolve the implementation of public policies to cross-sectorial collaborations networks, alliances, or partnerships among public and for-profit organizations (Borgonovi, 1995; Zangrandi, 2000).

This reliance on public funds imposes a special fiduciary duty to society for non-profits to deliver services efficiently. However the ways in which non-profits actually use public funds to create value is poorly understood and, usually, the information is self-reported and does not require external appraisal (Krishman *et al.,* 2006).

Unfortunately the current modes of contracting, relying overwhelmingly on what we call inputs-based and performance-based contracts, and social impact measurement are far from perfect. The problem seems to be two-fold: on the one hand, non-profits are rarely as transparent and accountable as society has a right to expect; on the other hand, governments are both bad at monitoring because they might not have the technology or the funds to spend on monitoring, and unreliable in their long-term provision of funds (Boris *et al.*, 2010).

From the non-profit or service provider perspective, the SIBs introduce innovation, rigor and effectiveness to the social sector by emulating the incentives and outcome-focus of private markets.

First of all, while in the current contracts the government is overly prescriptive, specifying how funds should be used and what services should be provided, in a SIB the government does not dictate how they will perform the service: the success of the SIB is not determined by the execution of particular programs or activities, but by achieving a social outcome.

In particular, the shift in monitoring, evaluating and reporting from outputs to outcomes, introduces management principles and tools more appropriate to these organizations (Anthony & Young, 2008) and to the goals of the SIB's program and allows to better understanding and managing outcomes. As known, a better performance management is key to achieving better outcomes within the populations these organizations serve and to increasing the social impact generated (Gibbon & Dey, 2011; Jackson, 2013; Perrini, Giordano & Vurro, 2013, 53).

Service providers struggle to access the capital needed to complement the limited funds currently available from government and philanthropy. SIB is an attractive tool to nonprofits, which need more resources, considering also that, usually, the blame of their limited success is the lack of funding. SIBs may influence larger shifts within the non-profit: this new source of capital, which relies on demonstrated results, will encourage non-profits to develop robust data collection methods, create performance metrics, and measure social outcomes. A greater clarity around performance is essential for the efficient and sustainable provision of value-for-money services in a competitive environment. Therefore, management accountants in non-profit bodies need to be more proactive in developing and implementing good information systems to provide necessary information (Preite, 2011).

Social impact bonds will also allow NPO organizations to do their work at a greater scale because the bonds are designed to fund large, multi-year contracts. The long-term funding allows social service providers to improve their financial planning and resourcing, and operate on a timeframe re-

quired to achieve the target social outcomes. This fosters a culture of collaboration creating alliance, network among the different non-profit service providers. More specifically, in this way NPOs can obtain resources to meet programmatic needs, sharing the goals and reaching the ideal organizational dimension (Dyer and Singh, 1998; Guo and Acar, 2005; Cho and Gillespie, 2006).

To avoid the drift of SIB's mission, non-profit service providers must ensure that SIB programs and the associated target outcomes are aligned with their missions and their organizational size and — while they continue to adapt to address different social issues — they must adapt to play new roles in different organizational models.

As So and Jagelewski noted (2013, p. 10) the most existing SIBs, service providers have taken two different roles:

- working as part of a collaboration in a "wrap-around" model,
- or scaling up their intervention and operating as the sole service provider.

While in sole service provider model only one service provider organization is accountable for meeting the performance standards specified in the service provider contract, in " wrap-around" model, a set of providers works together as a coalition to achieve the defined outcome for the target population. As known, the contracting out of social services to different bodies is often canvassed as a more efficient way of achieving the objectives that are been fixed. No primary service provider is identified, and the providers are each accountable to the performance standards specified in their contracts with the SIB delivery organization. In this case, however, there is a clear need for a strong co-ordinating body to manage multi-agency solutions that intermediates between frontline provision and government strategy (Graddy, Chen, 2006).

CONCLUSION

The SIB concept is emerging on the policy agendas of many countries' governments as a novelty, and study of its theoretical foundations, potential applications and steps is necessary for its implementation. The current spending squeeze in each European Community country — and also in the others around the world — means that there is more interest than ever, both in tools to achieve greater social value, and ones that can tap new sources of finance for social goals. SIB is an attractive tool to non-profit organizations, which frequently feel undercompensated, need more resources, and blame their limited success on lack of funding. NPOs service providers will benefit from the growing number of resources to learn about and engage with SIBs.

SIBs should not be viewed solely as a financing mechanism and should not be relied upon as the sole funding source, indeed they present a solution to several problems in funding social services, including performance measurement and the distribution of risk.

SIBs improve innovation process and learning: indeed, government agencies will need to learn to ceding some control to the external organization — non-profit service providers they partner with — and, with appropriate but limited oversight, trusting that organization to act to best achieve the desired outcome. Also, whereas traditional procurement contracts reward a service provider's adherence to prescribed program models, the SIB model rewards a provider's ability to improve the efficiency and effectiveness of its services. Therefore service providers have the opportunity to analyze the feasibility of applying the SIB model to their interventions and they may proactively engage governments to consider their proposals.

In this sense, social innovation should not be seen as simply a way of privatizing social services. It is intended to rather encourage an existing change of behaviour by people and institutions regarding the responsibility of finding the most appropriate solutions to respond to unmet social demands. This objective may be served by a flexible borderline between business innovation and social innovation that exploits their complementarities.

REFERENCES

Azemati H., Belinssky M., Gillette R., Liebman J., Selleman A., Wyse A., *Social Impact Bonds: lesson learned so far*, Reserve Bank of San Francisco available at: www.frbsf.org.

Atkinson, A. A., McCrindell J.Q., (1997), Strategic Performance Measurement in Government, *CMA — the Management Accounting Magazine*, Vol. 71, No. 3.

Anthony R.N., Young D.W., (2008), *Management control in nonprofit organizations*, McGraw-Hill International Edition.

Behn R.D., (2003), Why Measure Performance? Different Purposes Require Different Measures, *Public Administration Review,* Volume 63, Issue 5, pages 586–606.

Bolton, E. (2010). *Social Impact Bonds: Unlocking investment in rehabilitation,* available at http://www.socialfinanceus.org/pubs/socialfinance/socialimpact-bonds-unlocking-investment-rehabilitation.

Borgonovi E., (1995), *Aziende non profit: problemi teorici, profili giuridici e politiche di indirizzo*, Bologna, Clueb.

Callanan, Laura, Jonathan Law and Lenny Mendonca, "From Potential to Action: Bringing Social Impact Bonds to the US," McKinsey & Company, May 2012.

Costa K., Kohli J., (2012). Social Impact Bonds: New York City and Massachusetts to Launch the First Social Impact Bond Programs in the United States, Washington, D.C.: Center for American Progress available at http://www.americanprogress.org.

Disley E, Rubin J., Scraggs E., Burrowes N., Cully D., (2011), Lessons Learned from the planning and early implementation of the Social Impact Bond at HMP Peterborough (Research Series 5/11). UK Ministry of Justice. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/217375/social-impact-bond-hmp-peterborough.pdf.

Drucker P.F., (1990), Managing the Nonprofit organizations. Practices and Principles, Butterworth Heinemann, London.

Gibbon J., and Dey C., "Developments in Social Impact Measurement in the Third Sector: Scaling Up or Dumbing Down?" *Social and Environmental Accountability Journal* 31, no. 1 (2011): 63–72.

Glahn, D., and C. Whistler. "Translating Plain English: Can the Peterborough Social Impact Bond Construct Apply Stateside?" *Community Development Investment Review* (2011): 58–70.

Graddy E.A., Chen B. (2006), Influences on the Size and Scope of Networks for Social Service Delivery, in Journal of Public Administration Research and Theory, 16 (4): 533–552.

Hood C. (1991.) "A Public Management for All Seasons? ", *Public Administration* 69:3–19.

Jackson E.T., (2013), "Evaluating social impact bonds: questions, challenges, innovations, and possibilities in measuring outcomes in impact investing", *Community Development*, 44, (5), pp. 608–616.

Krishnan, R., Yetman, M., & Yetman, R. J. (2006). Expense Misreporting in Nonprofit Organizations. *Accounting Review, 81* (2), 399–420.

Liebman, J. B. "Social Impact Bonds: A Promising New Financing Model to Accelerate Social Innovation and Improve Government Performance." Center for American Progress.

McKay, K. (2013, April 8), Debunking the Myths Behind Social Impact Bond Speculation. Stanford Social Innovation Review, available at http://www.ssireview.org.

Mulgan, G., Reeder, N., Aylott, M., & Bo'Sher, L. (2010a). *Social Impact Investment: The opportunity and challenge of Social Impact Bonds*. London UK: The Young Foundation. Available at http://evpa.eu.com/wp-content/uploads/2011/06/11–04–11_Social_Impact_Investment_Paper_2.pdf.

Mulgan, L. J., Reeder, N., & Shelupanov, A. (2010b) *Financing social value: implementing Social Impact Bonds*. London UK: The Young Foundation available at: http://youngfoundation.org.

Mulgan, Geoff, Neil Reeder, Mhairi Aylott & Luke Bo'sher, "Social Impact Investment: the challenge and opportunity of Social Impact Bonds," The Young Foundation, November 2010, Revised March 2011.

Perrini F., Giordano F., Vurro C., (2013). "Promuovere l'imprenditorialità sociale in Italia: una visione di sistema". (Enhancing social entrepreneurship in Italy) in Economia & Management n.3, June. ETAS Milan (SDA Bocconi Journal of Management).

Pauly M., Swanson A, Social Impact Bonds in Nonprofit Health Care: New Product or New Package?, available at http://www.nber.org/papers/w18991.

Pratt, J. (2013, April 17), Flaws in the Social Impact Bond/Pay for Success Craze, available at http://www.nonprofitquarterly.org/policysocial-context/22149-flaws-inthe-social-impact-bond-craze.html.

Preite D. (2011), "Progettare un sistema di misurazione della performance nelle aziende non profit: finalità e metodologia", *Non profit* 17, (1), 71–84.

Osborne, D. and Gaebler, T. (1992). *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector*. New York: Penguin Books.

Johnston, J. M. & Rozmek, B.S. (2008). Social Welfare Contracts as Networks: The Impact of Networks Stability on Management and Performance. *Administration & Society,* 40 (2), 115–146.

Ragin L. Jr., Palandjian T., "Social Impact Bonds: Using Impact Investment to Expand Effective Social Programs", *Community Development INVESTMENT REVIEW*, pp. 63–67, available at http://www.frbsf.org.

Schmidt, E, "Pay Businesses to Keep People Out of Prison," Harvard Business Review, January-February 2012.

Siddharth N. (2012), *Exploring the Application of Social Impact Bonds to Affordable Housing*, Masters in City Planning, UC Berkeley, Literature Review for CP207 — Economic Analysis for Planners.

Social Finance (2010), *Peterborough Social Impact Bond*, London: Social Finance.

Social Finance, (2012), "A New Tool or Scaling Impact: How Social Impact Bonds Can Mobilize Private Capital to Advance Social Good".

Von Glahn, D., & Whistler, C. (2011). Translating plain English: can the Peterborough Social Impact Bond construct apply stateside? *Community Development Investment Review,* 58–70.

White House Office of Social Innovation and Civic Participation and Non-profit Finance Fund, "Pay for Success: Investing in What Works," Report from October 21, 2011 Convening.

Wong J., Ortmann A, Motta A, Zhang L., *Understanding social impact bonds and their alternatives: An experimental investigation*, Australian School of Business Research Paper No. 2013 ECON 21, available at http://research.economics.unsw.edu.au/RePEc/papers/2013–21.pdf.

Warner M.R., (2012), *Profiting from Public Value? The Case of Social Impact Bonds*, Draft paper prepared for Creating Public Value Conference, University of Minnesota, Sept 20–22, 2012.

Warner M.R., (2013), "Private finance for public goods: social impact bonds", *Journal of Economic Policy Reform*, 16 (4): 303–319.

Zangrandi A. (editor), *Aziende Non Profit. Le condizioni di sviluppo*, Egea, Milano, 2000.

Social media's role in intellectual capital's growth*

Michał FALKOWSKI, Ph.D. Candidate
University of Management & Finance in Warsaw, Business Analyst, Excelian Limited
michal.s.falkowski@gmail.com

Abstract. Traditionally wealth has been seen as physical and financial resources. However, over the past several decades that value equation has been changed dramatically. Radical changes brought about by revolutions in technology, globalization, and communications have forced us to rethink how prosperity in societies is really generated. The most valuable asset of any society is its knowledge — resource with much greater value than any material goods or financial shares. In today's information age collecting, processing and exchanging knowledge is strongly leveraged by an easy access to the social media via World Wide Web. The rise of technologies such as the Internet and the emergence of a global society require new ways of thinking about the unprecedented opportunities and challenges societies encounter. This study sums up the current evidence of social media's role in intellectual capital (IC) generation. The key research dilemma of this theoretical study is to assess the extent to which social media can participate in intellectual capital growth and how can its potential be leveraged to exploit greater growth opportunities. The collective arguments of social media's benefits in generating IC are visible, however, the question remains is it a good source to drive sustainable intellectual capital expansion.

Аннотация. Традиционно благополучие рассматривалось как совокупность физических и финансовых ресурсов. Однако за последние десятилетия это уравнение претерпело кардинальные изменения. Радикальные перемены, вызванные революциями в технологиях, коммуникациях, а также глобализацией, подталкивают нас к переосмыслению того, как вырабатывается общественное благосостояние. Наиболее ценный ресурс любого общества — знание, значение которого выше материальных и финансовых ценностей. В наш век информации получение и обмен знаний легко осуществляются с помощью быстрого доступа в социальные сети и Всемирную сеть. Развитие таких технологий, как Интернет и появление всемирного сообщества, требует новых взглядов на новые возможности и вызовы, которые стоят перед обществом. Данное исследование резюмирует современные взгляды на роль социальных медиа в создании интеллектуального капитала. Ключевая дилемма данного теоретического исследования состоит в оценке степени участия социальных СМИ в увеличении интеллектуального капитала и показывает, как этот потенциал может быть использован для создания дополнительных возможностей роста. Мы видим аргументы в поддержку преимуществ социальных медиа в создании интеллектуального капитала, однако остается открытым вопрос о том, являются ли они хорошим ресурсом для его устойчивого расширения.

Key words: Intellectual capital, social media, economic development.

LITERATURE REVIEW

A general examination of academic research conducted since the emergence of social networking has revealed that current studies are mainly focusing on what social networking is, how social networks are structured and distributed and why social networks exist.

The specific phenomenon of social media's impact on intellectual capital's (IC) growth has yet to be thoroughly analyzed by academia and business practitioners. As a particular study this subject had neither extensive research coverage nor a reliable scientific approach to measure the possible impact of social media on intellectual capital growth. In order to fully understand how social media in general can impact IC it is worth breaking down the components of this statement and analyse them independently against this study.

Intellectual capital itself has been the subject of academic and professional study for a long time. Despite wide studies conducted in this area a uni-

* Роль социальных медиа в увеличении интеллектуального капитала.

versally accepted definition of Intellectual Capital is difficult to find. As noted by Guthrie (2001), the term IC is commonly used as a synonym for Intellectual Assets (IA), Intangible Assets (INA) or Knowledge Assets (KA). Edvinsson and Sullivan (1996) define IC as "knowledge that can be converted into value". This is a very broad definition, which includes ideas, inventions, general knowledge, designs, software programs and publications. Consistent with the economic literature, some authors (Hunter *et al.,* 2005; Webster, 1999) categorize IC as a subset of Intangible Capital (INC). From this perspective, the term "intangible" refers to assets that do not exist physically, and "capital" relates to assets retained by the organization to contribute to future profits. James (1997) defines IC as "the difference between a company's market value and its book value".

When we consider the modern societies and the fundaments, which they build their wealth on, it is a fact that general knowledge, ideas and innovation come to the forefront of all key aspects responsible for driving development. In his work Stewart (1991) refers to the "information age" economy and the "knowledge economy" as a revolution. Within this radical change, information replaces working capital, and intellectual assets replace physical ones. We are now in an era when natural resources and physical labor have largely been replaced by knowledge and communication as the fundamental sources of wealth. According to Sveiby (1998), we have entered a "New Economy" with "invisible" values.

For the last 10 years the sources of the aforementioned invisible values gained unique shape of social media networks. There is little doubt that nowadays social media plays an ever-more central role in peoples' everyday lives (Rainie *et al.*, 2006). One of the first definitions of social media was developed by Boyd and Ellison (2008) using an activity-based approach to define what they call social network sites: "social network sites are web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site".

The first forms of web-based interactions gave the possibility to communicate information over the Internet by creating web site and filling them with content. It was very much static one-way communication with limited interactivity between sender and receiver (Naik, Shivalingaiah, 2008). O'Reilly (2007) analyzed what social media added to the initial shape of the World Wide Web and described it as the "harnessing of collective intelligence" since hyperlinking connects anything that is posted to the web. When Kaplan *et al.* (2010) discussed the current state of social media environment, more emphasis was put on its collaborative and participatory character as "a platform where by content and applications are no longer created and published by individuals, but instead are continuously modified by all users in a participatory and collaborative fashion".

Today social media's benefits are not only understood as storage of document where users can exchange their own content. Nowadays it's seen as community-like platforms where individuals can come together and engage on various different matters. Majority of research around social media's benefits was conducted on the micro economical scale. In the research (Clearswift 2007a; Matuszak 2007) social media have been credited with the ability to expand social contacts, accelerate business processes, improve customer relations and morale, motivation and job satisfaction among business staff. (MessageLabs, 2007b).

Up till now we do not have a clear understanding how and on what scale intellectual capital can benefit from social media. Taking into account what social media has to offer future research should be conducted aiming to measure its impact in intellectual capital.

METHODOLOGY

This theoretical study is intended to examine the way in which social media can impact intellectual capital growth. Approaching this issue it is important to note that, as an Internet-based phenomenon, social media has virtually no boundaries on how it can be used, shaped and utilized.

As the subject had yet little empirical study around this phenomenon, the study firstly focuses on analyzing the exact meaning of intellectual capital. To understand the ways in which intellectual capital can be created it is important to understand its main sources. In order to connect the process of intellectual capital development via social media it is vital to recognize how social media had developed during the information age and what exactly does it offer to its users.

The main objective of characterizing the use of information and communication technologies in a symbiotic relationship between human action and technological capability was to analyze what kind of social media's capabilities correlate to intellectual capital growth. The research is based on current dis-

coveries of the aspects propagating intellectual capital development in relation to social media's features.

As the examined study object is very dynamic the author is aware that the presented paper is not exhaustive of all possible conditions under which social media use can facilitate or inhibit intellectual capital creation and innovation, and hopes that this examination can inspire researchers of social media to venture further into new theory-building.

ORIGINS AND IMPORTANCE OF INTELLECTUAL CAPITAL

Land, labor and capital were the traditional resource inputs of industrial economies from which wealth could be created. In accounting terms these resource inputs were treated as tangible items (International Accounting Standard No 16). In post-industrial enterprises other kinds of resource inputs have become the sources of value creation. Increasingly, however, the real value of all kinds of entities is being recognized on the basis of both intangible and tangible assets.

In recent times intellectual capital (IC) has been a subject of interest especially in the business world. The constantly changing environment has stimulated stiff competition in almost every sector surrounding human activities. Developing intellectual capital management as the organizational *modus operandi* became the current recipe for success. According to Nermien Al-Ali (2003) traditionally business resources were formerly comprised of 80 percent of tangible and capital resources, with intangible assets only making up around 20 percent. Nonetheless due to the fast-paced technology development now this proportion changed dramatically with intangible assets reaching 80 percent of resources.

It is important to define what exactly is intellectual capital. Can we analyze it only on a micro economical level or is it a broader phenomenon?

Over time people representing different backgrounds have developed the discipline of intellectual capital. Because everyone was analyzing it from a different perspective there is no standard definition and each of the perspectives they developed is true for its specific user need. It would be highly inaccurate and ineffective to claim that only one definition is correct and therefore the others are wrong.

In the past capital could be viewed in purely physical terms — as factories, machinery, and money. But in the new ideas economy it is the brainpower that has become the most important factor in economic life. This is what we call the age of intellectual capital, which we can define as the collective ideas, imagination, and know-how of an organization or entity. Intellectual capital is also often characterized as intangible, elusive, mobile and hard to pin down. Its subtle nature has clear implications for organizations as well as those who try to determine their worth or forecast their performance (The Management Club, 2012).

More detailed definition of intellectual capital describes it as knowledge, applied experience and professional skills that provide for a competitive edge in the "market". A more dynamic view on this says that intellectual capital is knowledge that can be converted into value or profit. It is the value embedded in peoples' ideas. This definition takes into account individuals who make up organizations, the structural dimensions of entities, and all of the existing relationships of business establishments (Chatzkel, 2010).

Irrespectively of how precisely we define intellectual capital, being a relatively new concept it covers some already known and studied theories (Lindley 2000, Mortensen 2000).

On occasion in the current literature IC is considered as education and training (E&T), personal experiences or attitudes. In this case very often intellectual capital is linked to Human Capital (HC) and described as a set of soft skills which are essentially possessed by individuals (Tome, 2004). In a subsequent conception IC is seen as property rights, patents, research and development (R&D) and innovation, which is often associated and derived from businesses activities (Carlton, Perloff, 2000). In all analyzed notions, IC is seen as an important and often underestimated production factor and an asset class (like physical capital, energy, land), which organizations and other entities have to mix, in order to have success. Consequently intellectual capital is now being seen as a tremendous tool of wealth production and economic development not only for business entities but for national economies as well.

While examining intellectual capital as a foundation of economic development it is studied mainly on the human resources side. To give detail on this theory much useful thought and many interesting concepts have been developed to explain the importance, which education, training and skills have in modern societies, and in the development process in particular. One of the theories is the Human Capital Theory (Blaug, 1976), which analyses the abilities and skills of any individual — especially the skills acquired through investment in education and training — that enhance potential income earning. Studies of advantages of human capital being the source of economic development (Heckman,

Lalonde and Smith, 1999) consider "labor" as not a standardized concept, and look at all forms of IC as the main differentiator for steady and long-term wealth creation.

Taking into account the dynamic development of the world economy, the current value of an organization or state economy is not only a simple sum of tangible and intangible assets (Edvinsson, Malone, 1997). The intellectual capital element is currently used to name the assets which are not recorded anywhere in "in the books" but play an important part as a potential generator of future value. The Economics Institute of Washington, D.C., in its study on human intellectual capital, concluded that the economic value of the nation's productivity depends more upon employee skills and knowledge and business problem solving aptitude than it does upon the market value of the firm's commercial output. It is hard not to agree with this conclusion. In the technology era, intellectual capital will be the primary resource and driver of our information economy (Di Stefano, Kalbaugh, 1999).

While past economies depended on use of land, natural resources, equipment and capital for the creation of value, our information economy will depend on application of knowledge. As mentioned in the initial remarks, knowledge is very important source for people, firms and countries. Managing knowledge and intellectual capital creates new source of competitive advantage. The fortunes and values of firms can increase or decrease depending on how well they create, capture, and leverage their knowledge.

In the current global environment intellectual capital encompasses the models, strategies, unique approaches and mental methodologies organizations use to create, compete, understand, and replicate (Bell Chip, 1997).

As we mentioned before, the most important intellectual capital source is knowledge. Based on this, not only companies but also whole nations build and develop their current and future wealth. Pure knowledge being the source of growth originates from all forms of information. When this information is put into meaningful context it can be translated to knowledge, which is then used as the main intangible asset propelling growth. In the next section we will examine how the current technology age is shaping the global information exchange and what are the sources of fast and reliable information transfers.

SOCIAL MEDIA'S EVOLUTION

History is littered with stories of technologies changing cultures and cultures changing technologies. Social media is a prime example of both. The recent rise of social media is part of a cultural revolution and touches all aspects of our lives. As a continuously evolving phenomenon social media are often described as various forms of electronic communication (as web sites for social networking and micro blogging) through which users create online communities to share information, ideas, personal messages, and other content (such as videos) (BITS, 2011). Its success lies in the simple fact that it allowed users to expand and enhance something people did anyway — socialize. Humans are naturally social beings. From the beginning of time they formed groups based on everything from survival needs to common interests to spreading information. Social media has given people the ability to break down geographic and physical barriers and connect on a seamless, 24/7 sharing platform.

The earliest roots of social media can be traced to the first email that was sent in 1971 across the ARPANET (Advanced Research Projects Agency Network), the world's first set of connected computers that would become the root of today's Internet (Social Media Week, 2012). That initial email, and the millions sent in the years after, gave people the first experience with connecting digitally and in real-time, opening up a completely new way to connect with friends, family, colleagues and beyond.

The next advancement came around 1977 with the rise of Internet forums (Social Media Week, 2012). That development utilized web applications to manage user-generated content allowing users to share, post and comment on particular topics. This gave the ability to have more group exchange and interaction.

From those modest beginnings social media developed and formed its present state through different forms of virtual interaction. It can be said that late 2009 and 2010 were the years when social media truly gained respect across the globe. Twitter became a place for breaking news as it began alerting the world to major news events before media giants, and propelled political and cultural revolutions in the Middle East and other countries.

Looking back, since the first sent e-mail, much has evolved. The World Wide Web is currently not simply a place to make a declaration, but in fact it is a multi-layered medium that intersects with nearly every aspect of our lives. It is a place where people build alliances, raise awareness and forge momentum for future innovation.

The main reason and explanation of this fast growth of social media significance can be pointed

towards a broad cultural evolution. Majorities of societies changed dramatically in the last decade. People no longer stay at one job for their careers, instead they move much more frequently. The need to stay connected and build new networks with each of these new changes is very prominent. Social media meets that particular need and fits perfectly with the new culture.

The discussed phenomenon also touches on a clear shift of power. Societies in general are currently much more actively involved and participatory in events happening all around the world. Everyone wants his/her voices to be heard, and social media provides a platform for that. It levels the communication playing field so that any consumer or commentator has the ability to speak up and others can respond if it resonates with them. It can be said that the current social media's popularity benefited from its organic adaptation to the cultural and social shift taking place in the late 20th and 21st century.

As a technological revolution, computers and services that enable online social interaction are essentially the production of 40 years of technology evolution and fulfillment of a long-held vision of what computers and digital technology could do. When the Internet became available to the public, among the first commercial services were those that hosted interest groups. The web's growth in reach and capability, and as a medium for interaction, set the stage for the explosive growth of social media. The speed in which social medial was adopted is astonishing, outpacing any other media technology known in the modern world.

To put this particular phenomenon in context it is worth pointing that it took commercial television 13 years to reach 50 million households, and Internet service providers 3 years to sign their 50 millionth subscriber. It took Facebook just 1 year to get 50 million users, while in case of Twitter it took just 9 months. In May 2012, Facebook logged its 900 millionth user (McKinsey Global Institute, 2012). It is estimated that currently 80 percent of the world's online population use social networks on a regular basis. In the United States, the share of total online time spent on social networking platforms more than doubled from January 2008 to January 2011, from 7 percent to 15 percent. Moreover, social technologies are replacing other web applications and practices like use of e-mail and instant messaging (comScore Media Metrix, 2011). This modern technology shift of power suggests social media's almost primal appeal. It is fundamental human behavior to seek identity and "connectedness" through affiliations with other individuals and groups that share their characteristics, interests, or beliefs. Social technology taps into well-known, basic sociological patterns and behaviors — sharing information with members of the family or community, telling stories, comparing experiences and social status with others, embracing stories by people with whom we desire to build relations, forming groups, and defining relationships to others. Social technologies have given these basic behaviors the speed and scale of the Internet. With virtually zero cost, people can now interact daily with a very large group of people, across geographical and time zones.

Today, as we all know, social media has exploded in popularity, as Facebook inevitably closes in on one billion consumers and Twitter tops 200 million. It has been said that social media is the great equalizer, leading to democratization of media (Social Media Week, 2012). In many ways that is true. Social media gave consumers a platform for their voices, thoughts and ideas to be heard and shared. We can definitely expect that social media will continue to expand into the mainstream channel and not only companies but also governments will start putting even more emphasis on its importance. As technologies and tools will advance, the future can see social media being incorporated into all areas of peoples' lives.

SOCIAL MEDIA AS LEVERAGE FOR INTELLECTUAL CAPITAL

In the wake of intense global and domestic competition, firms are increasingly turning to innovation to compete (Holsapple, Singh, 2001). In the previous paragraph we have discussed the recent rise of a new generation of information and communication technologies including social media which play a vital part in fostering innovation and intellectual capital creation (Faraj *et al.,* 2011). By intellectual capital creation, we can understand the outcome of the integration of dispersed knowledge into novel recombination (Grant, 1996). When applied to online collectives, intellectual capital creation can occur in a variety of ways, ranging from generation of helpful suggestions within an online support group to remixing videos to offering improvements to an article on Wikipedia.

Today's knowledge society is totally shaped by the information revolution and advanced by communication technologies. At the dawn of this new age, the concept of intellectual capital has been used for the first time to explain the importance in the modern economy of intellectual resources such

as information, knowledge, and experience. Many authors have explained the importance of intellectual capital, comparing it to technological advances developing in the past (Sarrocco, 2011). Since the beginning, developments of sciences and technology improvements have been always the precursors of change in society and the economy. In the past, discoveries such as steam engines or electricity contributed to the creation of new social and economic development, generating along the way original forms of business, working processes and products.

Nowadays we have completed the transition to a service economy and are on the way towards an information economy, where the primary source of wealth is considered to be information. This includes notably scientific knowledge, but also communication, entertainment, services, news, information sharing and working processes.

It is hard not to agree that current development and well-being of entities both on a micro- as well as macroeconomical level depend very much on the flow and efficient usage of information. Considering that majority of information and vital data can be provided via the World Wide Web, or specifically from use of social media, this is and, undoubtedly, will be the unsurpassed source of all sorts of facts, figures, statistics and opinions.

For understanding the role of social media in intellectual capital creation and innovation, a dynamic approach may be particularly helpful, because social media technologies are infinitely extensible and can be used in an almost limitless set of different ways. Specific niche tools like applets or add-ons are being developed at previously unheard speeds. Users are downloading and reinventing these tools in ways not originally anticipated. New organizational forms, ranging from political campaigns to Internet trading, are being derived from the confluence of the technology capabilities provided and the actions users take. A more in-depth understanding of how innovation and intellectual capital creation can be fostered in such a context cannot rest on a static conception of individuals' use of technology, since social media can be continuously recombined and transformed into new objects in real time.

To try to examine the exact impact that social media can have on intellectual capital creation we can study the use of new technology in four different aspects.

As the first impacting factor we can examine the ability of targeted feedback given by online users. We can define this relevant feedback as the combination of technology capabilities and human actions in which individuals in an online social collective provide feedback on others' online content by both sharing their own comments on that content and rate the content through voting. The technological capabilities that support this approach are the various mechanisms by which users can record their views of particular content, such as by commenting a blog post or a YouTube video, or engaging via Facebook's "Like" button. Giving online feedback can also involve rating commentators and commenting on the comments of others. In comparison to traditional media, the online feedback sharing raises the speed and range in which reactions are shared. There is now little delay between the time that content is posted and the time when readers start commenting and discussing.

In result, feedback sharing can act as fostering aspect for intellectual capital creation and innovation. The reason for this is that feedback in any acceptable form becomes a self-perpetuating input such that more information and comments posted on the web spur more participants who issue further comments, some of which offer creative interpretations of the article and unexpected associative links. Different example might include advice-giving platforms where people offer constructive information regarding their opinion on a product or offer. This in fact is likely to drive new clients but what's more important it will also make author or owner of the service more aware of the strengths and weaknesses of their product, creating the motivation for new ideas to improve the service.

One of the mechanisms through which targeted feedback can foster intellectual capital creation and innovation is definitely responsiveness. It is most likely that participants in the online community will be drawn to highly trending content, attracting them to make further contributions. As a result broader pool of contributions will lead to a greater probability that some of these comments may be creative or may stimulate creative thought in others. Providing feedback on different online platforms brings attention not only to a topic but may also bring attention to the individual who posts content which is well-received by the community. Therefore, those who post creative content are more likely to receive wider approbation, thereby receiving more attention and increased reputation, extending a feedback cycle that encourages intellectual capital creation.

Subsequent impact factor that is particularly noticeable for fostering intellectual capital creation and innovation is what can be referred to as network correlating. We can define network correlating as online interaction with other people or

content that is influenced by the availability of others' digital connections. By this we mean the ease with which information or people can be connected through different forms across different venues and with which these connections are made known to others. Network correlating allows users to view another individual's social network interactions prior to their individual engagement.

Participants' intellectual capital creation in online communities appears to be to some extent affected by their view of others' connections and contributions. By reviewing other members' connections prior to deciding to participate in a community, individuals interested in innovative collaboration can more easily find the communities in which innovation is already occurring and can choose whether or not to participate in those communities. In that case any individual is able to examine the links connecting an online platform to determine its significance in respect of any present innovators before deciding to contribute. This way an individual is able to examine the whole spectrum of associations of other individuals or threads to determine the potential for innovation within a given community.

Network correlating may affect intellectual capital creation through a mechanism of allowing people to manage their connections and to inform people deliberately in order to enhance their opportunities to participate in community-based intellectual capital creation (Nahapiet and Ghoshal, 1998). The identification of experts is made easier by viewing whether one is linked to other experts or whether the individual participates in known expertise content forums. Network correlating may also foster intellectual capital creation through a process of developing a collective social identity (Ren, Kraut, Kiseler, 2007). It may be that as individuals find networks in which they feel comfortable they are better prepared to share their innovative ideas and encourage others to share them as well.

Another aspect of social media that may have an affect on intellectual capital creation and innovation is what we can refer to as prompt engaging. We can characterize this as collaboration that is driven by a change in monitored content or by actions of tracked others. Today's social media platforms enable users to establish preset rules for when and on what purpose they want to be notified of changes in content or activity located in the field of their interest.

Efficiently managed notification, such as grouping by all news related to a particular topic of interest can play a vital part in contributions to intellectual capital creation. In a study (Kane, Fishman, Gallaugher, 2009) on the evolution of the autism article in Wikipedia, a group of participants were found to use events monitoring in the article's development. They used the tools to be informed immediately when changes were made to the article and to immediately highlight the changes to ensure that they did not dramatically change the existing article. This study showed that the group of participants would quickly review the change to the article and either allow the change to stand when it fits within the general direction of the article, or decline it on the basis of no added value. In this context, the ability to monitor specific content via social media fostered only incremental forms of innovation.

Prompt engaging can however lead to different results in discussion building. It may lead to less innovation because individuals pre-determine the changes they will be informed about, reducing the opportunity for unexpected combination and exchange of knowledge, a critical element of innovation (Kane, Alavi, 2007). On the other hand, prompt engaging may increase the possibility of innovation by drawing larger groups of individuals to important topics, fostering involvement of an increased diversity of perspectives on that topic, another critical element of innovation.

The last aspect of social media, which can have a direct impact on intellectual capital creation, can be identified as developing knowledge consolidation. This aspect refers to the speed and frequency, with which consolidation principles are created, broken down, experimented with and redesigned to facilitate intellectual capital creation and innovation. Social media allows standard consolidation framework to emerge and change at a speed and frequency that was virtually impossible to achieve previously. Unanticipated and previously unseen roles may emerge within a community that people choose to participate in. In this case social media give people the opportunity to fill a specific role not because it is an official assignment, but because they feel competent and interested to play that role at that particular moment in time. In a recent research on corporate wiki pages (Yates *et al*., 2009), individuals were found to adopt a role in which they shaped and integrated other's contributions to the wiki. The willingness to adopt this role was not related to their job title, their responsibilities in the workplace, expertise, or their expectations for the wiki. Interviews indicated that contributors would adopt the role of shaping a new discussion or material when they saw connections between topics or found it difficult to find things in the wiki.

This aspect of developing knowledge consolidation is enabled technologically by the persistence and flexibility of digital interactions that are preserved in social media. While others have identified the importance of digital persistence in technology in general (Clark, Brennan, 1991), and social media in particular, it is important to note that one of the values of persistence is that it allows a group the freedom to evolve in unexpected ways as persistence provides a narrative for revisiting past identities and decisions, while informing future ones (Boland, Tenkasi, 1995). Social media preserves collaborative interactions over time, which allows joint groups to examine their history of interactions and adopt or discard specific practices. Individuals can also search and sort this preserved history, enabling them to observe the need for consolidation such as the need for a particular role (i.e. resolving a conflict or integrating a group) to be filled. The flexibility of the social media technologies leverages knowledge consolidation by making it easy to add new functionalities to social media technologies through flexible technology settings, third-party apps, or automated "bots" which allow individuals to quickly introduce and automatically enforce new routines.

Allowing effective knowledge consolidation, social media may foster intellectual capital creation by setting up a level playing field for dynamic knowledge exchange, encouraging innovative breakthroughs (Sheremata, 2000). Knowledge consolidation may in effect encourage reflective discussions, which create openness among the interacting participants, leading to productive and creative dialogue (Tsoukas, 2009).

CONCLUSIONS

In the previous paragraphs we have discussed the potential, which social media brings when it comes to intellectual capital creation. We have established that an indispensable factor for intellectual capital and innovation growth is a broad and efficient access to information. In this paper, we have taken an approach to understand the relationship between social media, human actors and the intellectual capital they can create. By examining four main aspects of those relations we can somehow quantify the potential of social media and generally the new technology for innovation and welfare production.

The outlook for social media's place in today's technology world remains very optimistic. We can expect that technology, including social media, will further develop its capabilities and broaden the range of its accessibility. Based on the presented assumption we can be sure that the potential impact brought by those developments will be positive across small communities as well as whole economies. Yet, to fully leverage social media's potential and foster intellectual capital creation some key and pressing factors — like high degree of political stability, profound degree of economic and political integrity or evidence for high quality internet debate — have to accompany the social media hype.

REFERENCES

Bell Chip, R. (1997), "Intellectual Capital", *Executive Excellence* **14** (1), Jan. 1997, p. 15.

BITS Financial Services Roundtable, (2011), "Social Media Risks and Mitigation", [online at: http://www.bits.org/publications/security/BITSSocialMediaJun2011.pdf accessed 17.10.2012].

Blaug M. (1976), "The Empirical Status of Human Capital Theory", *Journal of Economic Literature* v**ol 14** — Nº 3 — September — p. 827–55.

Boland, R.J., Tenkasi R.V. (1995), "Perspective Making and Perspective-Taking in Communities of Knowing", *Organization Science* **6** (4), p. 350–372.

Boyd, D., M., Ellison, N., B., (2008), "Social Network Sites: Definition, History & Scholarship", *Journal of Computer-Mediated Communication* **13** (1), p. 210–230.

Carlton, D.; Perloff, J. (2000), *Modern Industrial Organization — Third Edition* — Addison Wesley: USA.

Chatzkel, J. (2011), "Definition of Terms: What is Intellectual Capital?", [online at: http://www.virtuailes.com/ accessed 29.10.2012].

Clark, H.H., Brennan, S.E. (1991), "Grounding in communication", in L.B. Resnick, J.M. Levine and S.D. Teasley, (*eds*) *Perspectives on Socially Shared Cognition*, American Psychological Association, Washington, DC., p. 127–149.

ClearSwift (2007), "15 Common Mistakes in Web Security: Enterprise vulnerabilities that invite attack", [online at: http://i.i.com.com/cnwk.1d/html/itp/clearswift_15MistakesWebSecurity.pdf accessed 10.10.2012].

Di Stefano Paul J, Kalbaugh G. Edward, (1999), "Intellectual Capital", *Rough Notes* **142** (7), Jul. 1999, p. 94–95.

Edvinsson, L., Sullivan, P. (1996), "Developing a model for managing intellectual capital", *European Management Journal* **vol. 14**, n. 4, p. 356–364.

Edvinsson, L.; Malone, M.; (1997), *Intellectual Capital: Realizing your Company's True Value by Finding Its Hidden Roots,* New York: Harper Business.

Faraj, S., Jarvenpaa, S. L., Majchrzak, A. (2011), "Knowledge collaboration in online communities", *Organization Science September/October 2011* **vol. 22** no. 5 1224–1239.

Grant, R. M., (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal* **17**, p. 109–122.

Guthrie, J. (2001), "The management, measurement and the reporting of intellectual capital", *Journal of Intellectual Capital*, **vol. 2,** n. 1, p. 27–41.

Heckman, J., Lalonde, R.; Smith, J. (1999), "The Economics and Econometrics of Active Labour Market Programs" in Orley Ashenfelter, Robert Lalonde (*eds*), *Handbook of Labour Economics,* **vol. 3A** Chapter 31 — North Holland — p.1865–2097.

Holsapple, C. W., Singh, M. (2001), "The knowledge chain model: Activities for competitiveness", *Expert Systems with Applications* **20** (1), p. 77–98.

Hunter, L., Webster, E., Wyatt, A. (2005), "Measuring intangible capital: a review of current practice", *Australian Accounting Review* **vol. 15**, no. 2, p. 4–21.

IAS 16 Accounting for Property (2012), "Plant and Equipment", [online at: http://www.iasplus.com/en/standards/standard14 accessed 02.11.2012].

James, D. (1997), "The troubled language of accounting gets tongue-tied over intangibles", *Business Review Weekly*, **vol. October**, p. 92–94.

Kane, G. C., R.G. Fichman, J. Gallaugher and J. Glaser, (2009), "Community Relations 2.0: With the rise of real-time social media, the rules about community outreach have changed", *Harvard Business Review* **87, 11**, p. 45–50.

Kane, G.C., M. Alavi. (2007), "Information Technology and Organizational Learning: An Investigation of Exploration and Exploitation Processes", *Organization Science* **18** (5) p. 796–812.

Kaplan, A., M., Haenlein, M., (2010), "Users of the world, unite! The challenges and opportunities of Social Media, Business Horizons", [online at: http://www.sciencedirect.com/science/article/pii/S0007681309001232 accessed 05.10.2012].

Lindley, R. (2000), "Knowledge Based Economies: the European Employment Debate in a New Context", *Reports prepared for the Portuguese Presidency of the EU,* Lisbon, Portugal — p. 33–84.

Matuszak, G., (2007), "Enterprise 2.0: Fad or Future? The Business Role for Social Software Platforms", [online at: http://www.kpmg.de/media/20070501_ICE-Enterprise20_fertig.pdf accessed 10.10.2012].

McKinsey Global Institute, (2012), "The social economy: Unlocking value and productivity through social technologies", [online at: http://www.mckinsey.com/insights/mgi/research/technology_and_innovation/the_social_economy accessed 01.11.2012].

MessageLabs (2007), "Social Networking: A Brave New World or Revolution from Hell?" [online at: http://i.zdnet.com/whitepapers/messagelabs_SocialNetworking.pdf accessed 11.10.2012].

Mortensen, J (2000), "Intellectual Capital: Economic Theory and Analysis" in Buiges, P., Jacquemin, A., Marchipoint, F.J., Elgar, E., (*eds*), *Competitiveness and the Value of Intangible Assets,* UK: Cheltenham.

Nahapiet, J., S. Ghoshal. (1998), "Social capital, intellectual capital, and the organizational advantage", *Academy of Management Review* **23** (2), p. 242–266.

Naik, U., Shivalingaiah, D., (2008), "Comparative study of Web 1.0, Web 2.0 and Web 3.0." *Proceedings of the International Convention on Automation of Libraries in Education and Research Institutions,* India: CALIBER-2008, [online at: http://ir.inflibnet.ac.in/dxml/handle/1944/1285 accessed 03.10.2012].

Nermien, A. (2003), *Comprehensive intellectual management,* New Jersey: John Wiley.

O'Reilly, T., (2007), "What is Web 2.0: Design patterns and business models for the next generation of software", *Communications & Strategies* **No. 1** p. 17, First Quarter 2007, [online at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1008839 accessed 03.10.2012].

Rainie, L., Horrigan, J., Wellman, B., Boase, J., (2006), "The Strength of Internet Ties Pew Internet and American Life Project", [online at: http://www.pewinternet.org/Reports/2006/The-Strength-of-Internet-Ties.aspx accessed 01.10.2012].

Ravit Lichtenberg (2010), "10 Ways Social Media Will Change in 2011", [online at: http://readwrite.com/2010/12/15/10_ways_social_media_will_change_in_2011 accessed 03.10.2012].

Ren, Y., R. Kraut, S. Kiseler. (2007), "Applying common identity and bond theory to design of online communities. Organization Studies", [online at: http://oss.sagepub.com/content/28/3/377.abstract accessed 02.10.2012].

Sarracco, C (2011), "Intellectual Capital in the Information Society", [online at: http://www.itu.int/osg/spu/visions/free/ITU-IntCapitalpaper.pdf accessed 31.10.2012].

Sheremata, W.A. (2000), "Centrifugal and centripetal forces in radical new product development under time pressure" *Academy of Management Review* **25** (2), p. 389–408.

Social Media Week, (2012), "The Evolution of Social Media", [online at: http://socialmediaweek.org/london/2012/09/06/guest-blog-post-the-evolution-of-social-media/#.UJ95xOSZSSp accessed 30.10.2012].

Stewart, T. A. (1991), "Brainpower", *Fortune Magazine* **vol. June**, [online at: http://money.cnn.com/magazines/fortune/fortune_archive/1991/06/03/75096/index.htm accessed 02.10.2012].

Sveiby, K. E., (1998), "Intellectual Capital and Knowledge Management", [online at: http://www.sveiby.com/articles/IntellectualCapital.html accessed 01.10.2012].

The Management Club, Intellectual Capital, (2012), [online at: http://www.managementlab.org/ accessed 08.10.2012].

Tome, E. (2004), "Intellectual capital, Social policy, Economic development and the world evolution", *Journal of Intellectual Capital*, v**ol. 5** Issue: 4, p.648–665.

Tsoukas, H. (2009), "A Dialogical Approach to the Creation of New Knowledge in Organizations", *Organization Science* **20** (6), p. 941–957.

Webster, E. (1999), *The Economics of Intangible Investment*, London: Edward Elgar Publishing.

Yates, D., Wagner, C., Majchrzak, A., (2009), "Factors Affecting Shapers of Organizational Wikis", *Journal of the American Society for Information Science and Technology (JASIST)* **61** (3), p. 543–554.

The Need to Design a Quality System for Macedonian Textile Companies*

Elizabeta MITREVA, Ph.D., Nako TASKOV, Ph.D.
Faculty of Tourism and Business Logistics, University "Goce Delcev", Shtip, Macedonia
elizabeta.mitreva@ugd.edu.mk

Abstract. In this paper we elaborate the need to design and implement a system of total quality management (TQM) in the Textile Logistics Center servicing the textile industry in Macedonia. Quality should be sought not only within the production process, but also in all segments of the business processes, even in the employees' behavior. Based on the analysis of the existing quality system we have conducted, an appropriate methodology has been designed for each feature of TQM philosophy. In order to design the quality system we have applied the QC–CE-Pyramid model according to which the system should be realized through the Deming's circle (PDCA), as well as the Ishikava approach (i.e. who, what, when, where), which fits the pyramid hierarchy of the company. Through the QC–CE quality model, the obligations and responsibilities of all employees are defined.
The application of the methods and techniques for faultless operations has provided both greater efficiency and effectiveness in the company. The benefits from the use of the methods and techniques resulted in meeting the needs of the customers, strengthening the company's place at the market, better employees' satisfaction, as well as improvements for the community.

Аннотация. В этой статье мы рассматриваем разработку и осуществление деятельности Системы общего управления качеством (TQM) "Текстильного логистического центра", обслуживающего текстильную промышленность Македонии. Качество следует обеспечивать не только на протяжении производственного процесса, но и во всех сегментах бизнес-процессов, включая даже поведение сотрудников. На основе проведенного нами анализа существующей системы качества соответствующая методология была разработана для каждой функции философии TQM. Для того чтобы разработать систему качества, мы применили модель QC–CE-Pyramid, согласно которой система должна быть реализована через "цикл Деминга" (PDCA), а также "подхода Исикавы" (т.е. *кто, что, когда, где*), который используется для иерархической пирамиды компании. Через модель качества QC–CE определяются обязательства и обязанности всех сотрудников. Применение методов и приемов бездефектного функционирования обеспечило повышение эффективности и результативности компании. Выгоды от использования методов и приемов привели к более полному удовлетворению потребностей клиентов, укреплению места компании на рынке, повышению удовлетворенности сотрудников, а также к социальным улучшениям.

Key words: Quality, TQM philosophy, QC–CE model, Pareto diagram, Ishikava approach.

INTRODUCTION

At a time of great economic turbulence and change, any company that wants to survive, be stable and continuously improve the business processes, needs to build its own quality system (Evans, 2005). The effects of the changes in the environment of the company will trigger changes in its technology and production, as well as application of total quality management, by acquiring knowledge, skills and provision of knowledge-based development (Van der Wiele and Brown, 1997). The application of the TQM (Total Quality Management) strategy in a company means improving quality by examining their business processes by defining, designing and optimization of the cost of quality (Dale *et al*., 2000). The model quality system (Mitreva, 2011) can be presented by "the house of quality" (see Figure1).

At the core of "the house of quality" are the measuring results, evaluating, analyzing and comparing the quality or lack of quality. Metrology is the basis for measuring the quality system. Measurement in production processes must be present at all production stages because it is the only way we will know the level of our quality. The measurement starts with

* Создание системы обеспечения качества для текстильных компаний Македонии.

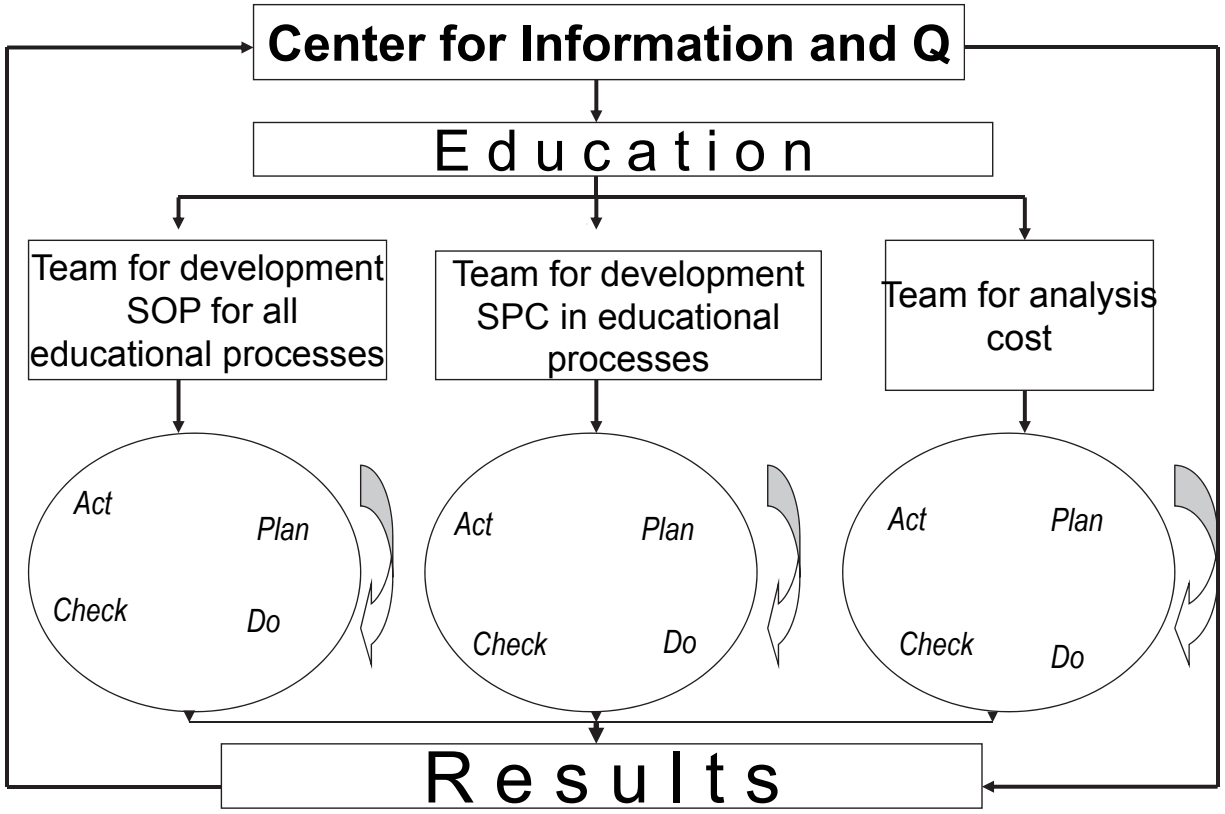


Figure 1. Integrated methodology for design and implementation of the TQM system in the company.

the input of raw materials, continued measurement of semi-finished products, and ends by measuring the properties of finished products. Moreover, the time of the technological process, the time of the production process, and the standard productivity of the worker are all measured.

One of the pillars of "the house of quality" is **standardization**. The internal standardization of all phases of work, construction, procurement, production and quality control are of fundamental importance. The standards are the language of raw materials, products and processes, operations and organization quality. By using the standards, working order and proper communication among employees is achieved.

Daily practice of employees using various **methods and techniques of non-defect operation** ensures stability of the processes and detection, as well as prevention of defects in the workplace.

In order to achieve good quality, quality education and training for the staff is necessary. The purpose of education is to build knowledge and awareness of the employees to perform their tasks more efficiency. The training is carried out according to the needs of the staff, in compliance with their qualifications. In order to achieve and enhance the quality, **a motivation** is needed. It is necessary to develop awareness among employees that everybody is responsible for the quality.

Each company is required to **optimize its costs**. Costs directly affect the formation of the price of the product. If costs are optimized, it may improve the company's reserves. Practice has shown that the errors and their corrections are costly for industry. Therefore, the non-defect operations are preferred by the management. **Management** is the roof of "the house of quality" and it needs to lead and protect the company.

The success of the business processes today cannot be imagined without the use of **IT computer systems** (Mitreva *et al*., 2013). The computer systems with their hardware and software content are the basis for rapid transmission of information for implementation of business processes. They are always connected with the answers of the questions *what, who, how, where, when*, and also related to the question *who* is responsible for completing the work in the enterprise. Through them the data is provided for the development of standardization, non-defect production, cost analysis, which are basic pillars of the system with total quality management (TQM). Today, these data is stored in organized forms and packages (database), which are computerized, searchable and useable at any time, for any working position, in order to achieve efficient operation. The interconnection of business processes of the enterprise network information systems means a complete quality prioritization.

1. THE NEED TO DESIGN A QUALITY SYSTEM IN MACEDONIAN TEXTILE COMPANIES

According to expert analysis, the textile industry is an important economic factor in the Macedonian economy because 30 percent of the value of total exports are created by this industry, and also by the fact that it employs more than 22000 people.

Apparel companies in Macedonia are mostly dealing with loan production, and basic values are fast and quality delivery of orders, meeting the requirements of the customers (Mitreva *et al.,* 2012). Thus, Macedonian apparel industry does not require anything other than effectiveness and efficiency, i.e. rapid preparation and production of the work order. The implementation of these activities is necessary to define business processes and determine the values of the parameters and variables of the system.

The opening of the Textile Logistics Center in Macedonia is an important step in helping the Macedonian textile production in the direction of following the world trends, meeting deadlines and cost optimization. The main activity of the Center is producing prototypes, making cutting strips, plotting and automatic cutting. The creation of this Center is supported by the U.S. Agency for International Development (USAID) and a private company from Shtip. The Center was created with the intention to offer small and medium textile enterprises in Macedonia new types of services through the option of using the latest technology and software in the fields of design and production support of computer systems.

The activities of the computer support center for the apparel companies are realized through CAD (Computer Aided Design) — CAM (Computer Aided Manufacturing) service as a necessary link to effective production.

2. BASIS FOR THE DESIGN AND IMPLEMENTATION OF THE QUALITY SYSTEM IN CAD – CAM TEXTILE PRODUCTION

For the efficient operation of the quality system introduced by ISO 9000:2008 in the Textile Logistics Center, in order to access certain information such as plans and methodology for their implementation, the standard operating procedures (SOP) are required for all business processes, rules of operation, regulations, textile standards, matrix of duties and responsibilities, records for quality control of data, proposals for corrective actions, etc. Therefore, it is necessary to design a good information system (Deming, 1986; Juran, 1988; Feigenbaum, 1991; Crosby, 1979; Ishikawa, 1982).

The company had an information system introduced before the TQM system and it works as follows. The service carried out by the Textile Logistics Center is a CAD — CAM service. For this service high tech equipment of software packages (systems), digitizers, plotters, and computer cutting machine (cutter) are necessary.

In order to fit with the new trends, the Textile Logistics Center is necessary to continuously enhance the business processes for CAD — CAM production. The Center began working with one computer station, a plotter, a digitizer and a cutter. As the needs of the market and the company grew steadily, it was modernized. Today, the company has seven computer stations and three plotters for high speed printing, conducts trainings. This information system is constructed and provides high quality data management, but the problem is that the information does not come in time: it is **delayed and has a reduced ability to intervene during the business process.** In order to shorten the time of transfer of information and increase efficiency in operations, a system of total quality management should be introduced (Mitreva *et al*., 2013).

3. ANALYSIS OF THE CURRENT STATE OF THE TEXTILE LOGISTICS CENTER

The current situation in the Textile Logistics Center analyzed through four pillars of the "house of quality": internal standardization, methods and techniques for providing quality, education and motivation, and cost analysis of quality. The current situation is analyzed through the criteria for the European Quality Award: leadership, policy and strategy, management of staff, resources, processes, customer satisfaction / users, employee satisfaction, impact on society, business results. Through these criteria the current standing was evaluated, presuming that the company was competing for the European Quality Award (European Foundation for Quality Management — EFQM).

Based on the detailed analysis of the current situation, the "age" was determined, i.e. the development of the Textile Logistics Center on the pillars of the "house of quality" (the young and poor system towards mature and developed system, and *vice versa*), Table 1.

The deviations of the subsystems of the TQM system symptoms through the "health" of the quality system were considered and the conclusion was the following (see Table 1).

Based upon the results of the survey, it was found that the Textile Logistics Center cares about the quality of products / services through established quality system. But insufficient attention is given to the continuous education and training of employees to acquire new skills, and there are poor investments in innovation, while the work in a team is considered a return to the past. The company pays attention to employees, cus-

Table 1. Developmental stages of the TQM in the Textile Logistics Center on the pillars of the "house of quality".

House of quality	Development stages in the Textile Logistics Center				
		Beginner	Intermediate	Upper-intermediate	Advanced
	Internal standardization			✦	
	Methods and techniques for Q		✦		
	Education		✦		
	Motivation			✦	
	Costs			✦	
	Measurement, evaluation and analysis		✦		

tomers, suppliers and the community, but has a weak application of statistical process control (SPC) — a state found in most of the Macedonian textile companies resulting in many errors, delays and complaints. Analyses have shown that the existing information system provides good quality of data management. Yet, the problem is that the information does not come in time, is delayed and there is a reduced ability to intervene in time within the business process.

Based on the results it was concluded that the Textile Logistics Center is moving things in the right direction, but to create a center of "world class level" it is necessary to design and implement a system for total quality management.

3.1. DESIGNING A SYSTEM OF TOTAL QUALITY MANAGEMENT IN CAD – CAM TEXTILE PRODUCTION

The introduction of the TQM strategy in an enterprise requires a proper methodology for each function. Starting from this basis, we analyzed the system established in the textile center with corrections and amendments to it through the QC–CE-Pyramid model approach, improving its efficiency and effectiveness.

The design of the quality system has applied the QC–CE-Pyramid model (Mitreva and Filiposki, 2012), according to which the system should be processed through the Deming's circle (PDCA) and the Ishikava approach: *whom, what, where, who* is responsible in the pyramid hierarchy of the company.

Through the QC–CE quality model (Mitreva and Filiposki, 2012), the obligations and responsibilities of all employees are defined. In that way, rules of conduct and good interpersonal relationships are achieved. Through this model, the standardization of all business processes across the enterprise is being achieved, via standard operating procedures in the form of current cards. The standard operating procedure begins with planned activities and baseline inputs; continues with the activities of the business process, and each stage receives an output information that is input for the next stage. In the end, the business process ends with information — the result. This achieves vertical and horizontal connectivity between employees according to the structure of the pyramid, ensuring quality in the company, followed by the information in accordance with standard operating procedures.

The circle closes with correcting and answers the questions *what, whom, where, when, who* provides information with complete supporting documentation with specified quality, obligations and responsibilities. In order to achieve an effective quality system, it should be both defined and well documented (see Figure 2).

Because the quality system defines the obligations and responsibilities of all employees through this mode of transmission of information it can provide complete care for quality.

The design of standard operating procedures must apply appropriate methodology methods and techniques of statistical process control, as well as non-defect production methodology for optimizing the costs. The most important segment in the preparation of templates is their development with high accuracy. Therefore, constant measuring and evaluating is necessary for controlling the plotters with their frequent calibration and performance test — plotting (as daily operational procedure). The company implemented part of the methods and techniques for non-defect operations such as check cards, map of trend, Pareto approach and Ishikava method in some of the business processes (Dale and Lascelles, 2007). The measurements and analysis found irregularities regarding the accuracy of patterns, time of production, quality and time of delivery, so a "sample room" was projected, in order to improve the quality of making patterns, which lead to other benefits and have also increased the reliability of the designers' work (from paper to real piece of clothing).

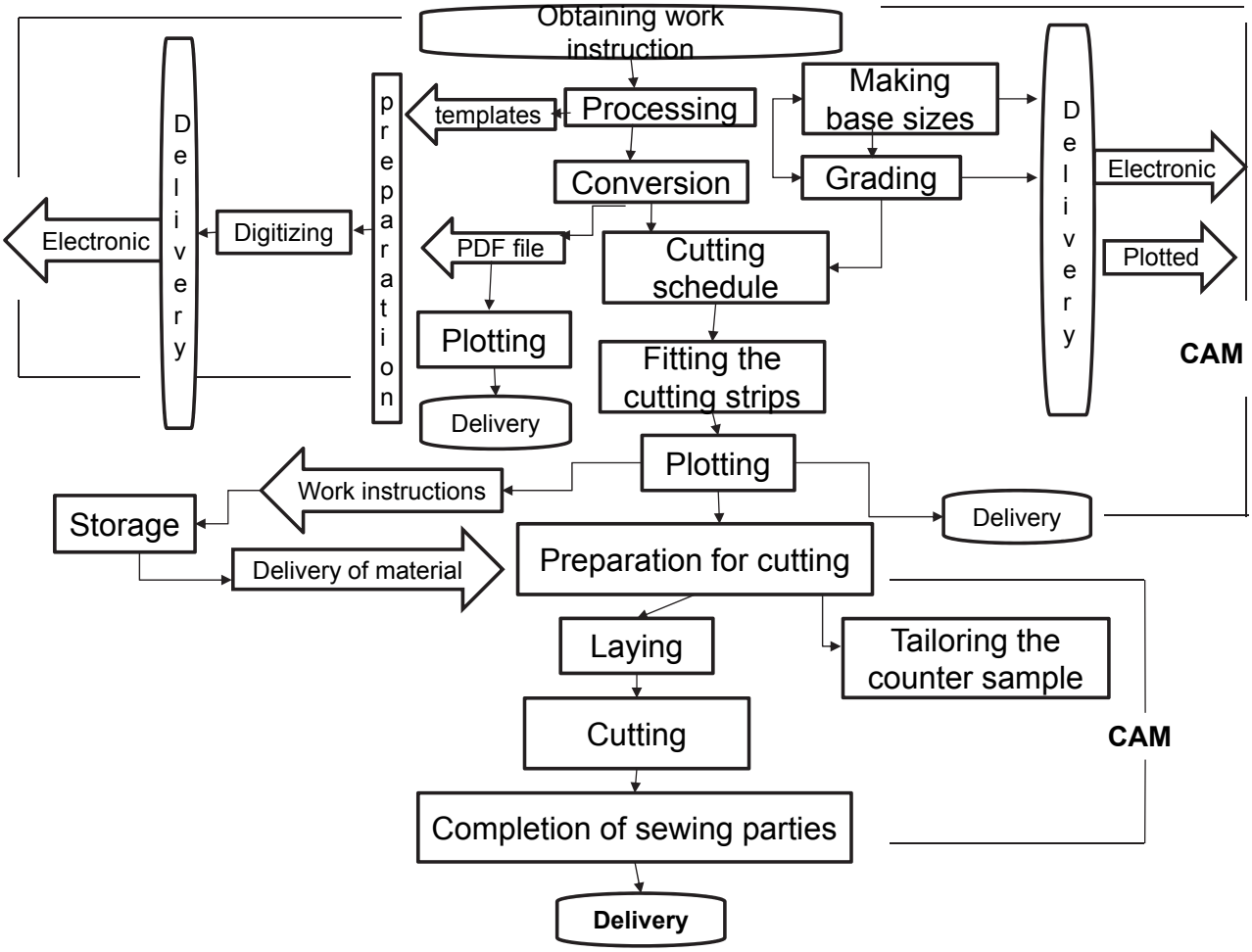


Figure 2. A flow chart of standard operating procedure in CAD — CAM textile production.

Using the Ishikava diagram for analysis we see what is the critical place for reasons of errors in the produced templates at the Textile Logistics Center (see Figure 3).

By analyzing the CE diagram the emphasis is put on the "process" or places where one needs to make changes to improve the characteristics of quality through design control system at all key stages. To avoid even the smallest errors in the quality of the piece, a "sample room" (room for sewing samples) has been created. This section sews a sample in the presence of the modeler to perform measurement and evaluation, and all that is missing or defective will be repaired.

The application of methods and techniques for non-defect production will help avoid the possibility of fault, where the order is released for full production (Feigenbaum, 1991). In this way, the released sample can be delivered to the apparel company as a prototype, after which it will be prepared for the work order.

CONCLUSION

Analysis of the application of the TQM strategy showed that the implementation of the methodology for total quality management has increased the effectiveness and efficiency of the Center. Textile companies that use the services of the Center have reduced the time needed for the preparation of work orders by 20%, increased utilization of fabrics by 5%, and increased the productivity by 50%.

The service center helped achieving a quick and effective response to market demands and the textile enterprises significantly reduced the production costs and time of production.

The creation of the Textile Logistics Center is of great importance for Macedonia viewed from a marketing perspective because it creates conditions for increasing competitiveness of the Macedonian textile manufacturers in the global market.

This Center builds partnerships with Macedonian Apparel in preparatory activities for making models and optimization of business processes. In this way, the traditional models of the development of business processes were measured for errors, omissions and complaints, while in the Center the proactive work is applied with the application of high technology and software that offer great accuracy in preparation of templates.

The application of methods and techniques for non-defect work in the Center contributes for

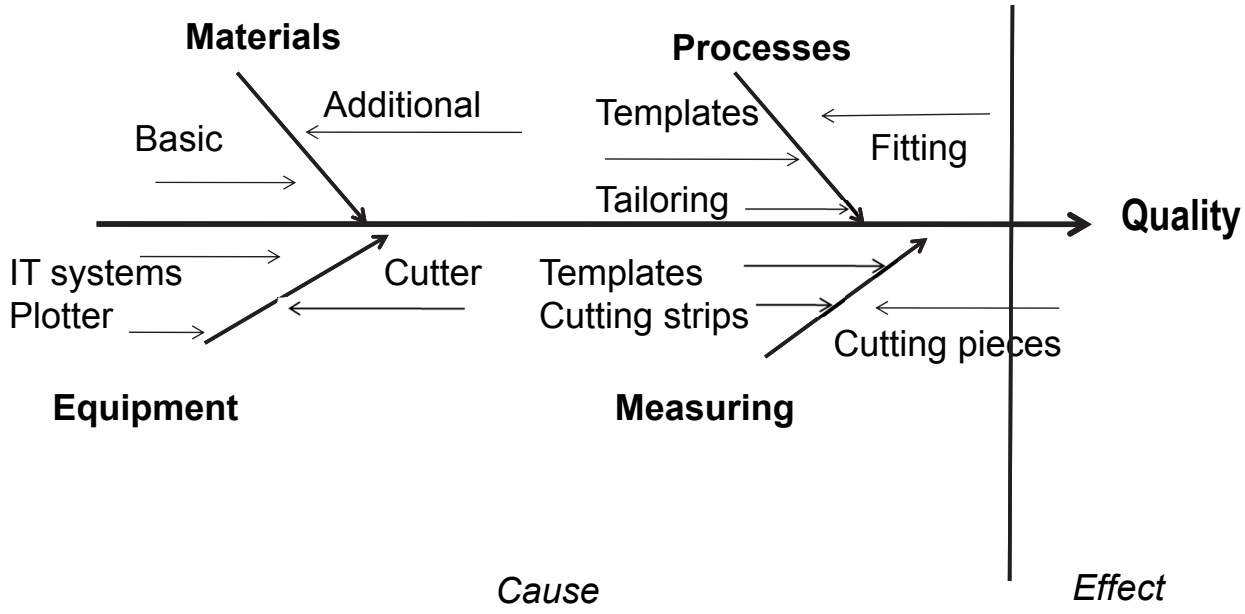


Figure 3. Application of the CE diagram for determining the causes of errors of the produced templates.

greater efficiency and effectiveness in the company (Chepujnoska, 2009). The benefits of their application in practice led to meeting the needs of the customers, strengthening the company's place in the market, employees' satisfaction, and improvements for the community. The daily practice of every employee does not only include control of the work, but employees are trained to act proactively, not be burdened with error detection only.

For successful implementation of the TQM strategy, **learning new approaches to quality** is necessary (Senge, 1990). Given the structure of employees (highly educated and engineers), investment in new technology, new operating systems with new converters, ongoing training and information on new developments in the world is necessary to be compatible with the requirements of the customers. In this way a high level of development in terms of providing quality at optimal cost, maintenance and conquering the market, as well as making a recognizable brand are achieved.

REFERENCES

Chepujnoska, V. (2009), *Quality Management –Theory, Science and Practice*, Faculty of Metallurgy, Skopje, pp.120–137.

Deming, W. E. (1996), *How to go out of the crises*, PS Grmeč, Beograd, pp. 30.

Dale, B.G. and Lascelles, D.M. (2007), "Levels of TQM adoption", in Dale, B.G. (Ed.), *Managing Quality*, 5th ed., Blackwell, Oxford, pp. 111–126.

James, P. (1996), *Total Quality Management*: An Introductory Text, Prentice-Hall, Englewood Cliffs, NJ, pp.106–220.

Evans, J.R. (2005), *Total Quality: Management, Organization and Strategy*, 4th ed., Thomson South-Western, Mason, OH.

Feigenbaum, A.V. (1991), *Total Quality Control*, 3rd ed., McGraw-Hill, New York, NY.

Ishikawa, K. (1982), *Guide to Quality Control*, Asian Productivity Organisation, Tokyo.

Juran, M. J. (1993). "Made in U.S.A.: A renaissance in quality", *Harvard Business Review*, Vol. 71, No 4, pp. 42–50.

Juran, J.M. (1988), *Juran on Planning for Quality*, Free Press, New York, NY.

Kanji, G. K. (1998b), "An innovative approach to make ISO 9000 standards more effective", *Total Quality Management*, Vol. 9, No. 1, pp. 67–78.

Kaplan, R.S. and Norton, D.P. (1992), "The balanced scorecard — measures that drive performance", *Harvard Business Review*, Vol. 72 Nos 1/2, pp. 71–79.

Mitreva, E. (2011), "Model-integral methodology for successful designing and implementing of TQM system in Macedonian companies", *International Journal for Quality Research*, Vol. 5. No 4, pp. 255–260.

Mitreva, E., Jakovlev, Z., Koteski, C., Kitanov, V. and Angelkova, T. (2012), "Analysis of the existing management system in Macedonian companies and the necessity of accepting the TQM philosophy", *International Journal of Pure and Applied Sciences and Technology,* Vol. 8. No. 2, pp. 54–63.

Mitreva, E. and Filiposki, O. (2012), "Proposal methodology of the subsystem-internal standardization as part of TQM system", *International Journal for Quality Research,* Vol. 6. No. 3, pp. 251–258.

Mitreva, E., Taskov, N., Kitanov, V., Filiposki, O. and Dzaleva, T. (2013), "The Need for Information System Design in Building a House of Quality, *International Journal of Pure and Applied Sciences and Technology* Vol.16. No.1, pp. 26–33.

Senge, P. (1990), *The Fifth Discipline: The Art and Practice of Learning Organizations*, Doubleday, New York, NY.

Van der Wiele, T. and Brown, A. (1997), "ISO 9000 series experiences in small and medium-sized enterprises", *Total Quality Management*, Vol. 8 No. 2, pp. 300–304.