

Utopian Urban Society

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Abstract. Quantize influence to the society in terms of three factors (income, education and social equality). Influence of income includes the minimum wage and salary distribution, and education can be reflected by the ratio of education in welfare investment, while influence of social equality include maternity, paternity leave and child care expenditure, of which the parameters are required to be revised and adjusted after a time period.

Indicator of sustainable urban development determined by quantized influence of the three factors can be obtained, which is located between 0 and 3, and a larger indicator represents a better social development. We choose four kinds of countries, collect data and obtain magnitudes of the indicator as well as the corresponding development level. Based on the computation, we find an indicator higher than 1.6 represents a good development, between 1.2 and 1.6 represents a steady development and lower than 1.2 represents a lag development.

Introduction

The LIFE agency launched project UTOPIA: 2100, with the goal of creating an optimal workforce for the 22nd century to give all people the greatest quality of life with a vision of sustainability for the next 100 years.

The first wave of migration, called Population Zero, will include 10,000 people. The mission of Population Zero is to create a sustainable society by maximizing both economic output (GDP) and happiness in the work place for its citizens. These two goals can be in opposition, so the policy recommendation has to consider balancing factors, such as income, education and equality.

Influence to the society in terms of income include the minimum wage and salary distribution, which can be divided by corresponding standards and revised to locate in $[0,1]$ respectively. Influence to the society in terms of education can be reflected by the ratio of education in welfare investment, and proportion of minors and the minimum wage are taken into account, since the welfare investment to education is always less than the total social welfare, of which the domain is $[0,1]$ as well. Influence to the society in terms of social equality include the maternity, paternity leave and child care expenditure, we intend to define the per capita maternity and paternity leave and construct the influence of maternity and paternity leave and child care expenditure to the society respectively.

Therefore, the sustainable urban development model can be built.

Select several typical kinds of countries and collect data of metrics in our model. Conduct numerical computation according to the model we constructed and indicator of sustainable urban development of each country can be obtained. Based on the collected data and calculated indicator of sustainable urban development of each country, conduct some testing and analysis to our model.

Sustainable Urban Development Model

Influence to the society in terms of income.

The total modeling process is shown in Figure 1.

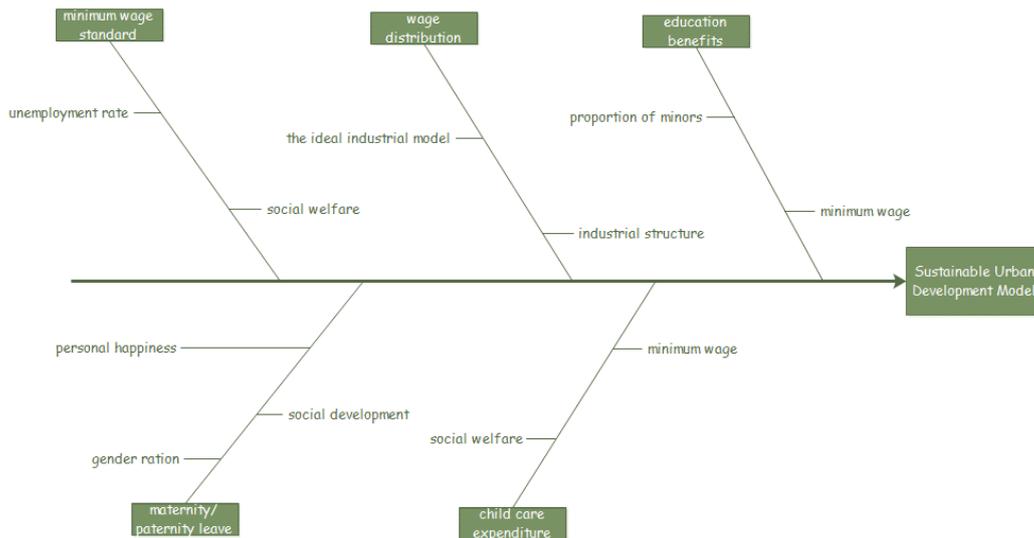


Fig. 1 Modeling process of the sustainable urban development model

Influence to the society in terms of income t_1 includes the minimum wage and salary distribution.^[1] We build the measurement model for the minimum wage min ,^[2] which can be described as

$$min = e^{\alpha_1 \ln u + \alpha_2 \ln w} \quad (2.1)$$

Considering the minimum wage standard mws , the minimum wage can be revised as $\frac{min}{mws}$, of which the domain is $[0,1]$. We need to point out that parameters relative to the minimum wage α_1 and α_2 are required to be revised after a time period, such as the ten year period. In addition, the minimum wage standard mws and the social welfare w are made by the government.

Referring to the ideal industrial model and industrial structure, the salary distribution $g(x)$ aim at primary, secondary and tertiary industries and reflect the salary distribution in the three major industries. The number of people in a certain industry of the three times corresponding per capita gross domestic production makes gross domestic production in the industry, for example, ax_1 represents the gross domestic production in the primary industry. The number of people in the three major industries a , b and c are enacted by the government, while per capita gross domestic production in each industry x_1 , x_2 and x_3 remain constant in a short period. Therefore, the gross domestic production in a certain industry is able to reflect salary distribution in the corresponding industry in a way. For example, a larger ax_1 represents that a higher level of salary distribution in the primary industry. As a result, the salary distribution $g(x)$ can be described as

$$g(x) = ax_1 + bx_2 + cx_3 \quad (2.2)$$

Considering the maximum salary distribution g_{max} , the salary distribution can be revised as $\frac{ax_1 + bx_2 + cx_3}{\max\{ax_1 + bx_2 + cx_3\}}$, which is also located in $[0,1]$. And per capita gross domestic production in each industry x_1 , x_2 and x_3 are required to be revised after a time period.

The influence to the society in terms of income t_1 is considered to be the linear addition of the minimum wage and salary distribution, therefore, t_1 can be expressed as

$$t_1 = \frac{e^{\alpha_1 \ln u + \alpha_2 \ln w}}{mws} + \frac{ax_1 + bx_2 + cx_3}{\max\{ax_1 + bx_2 + cx_3\}} \quad (2.3)$$

Since the two parts of t_1 are both located in $[0,1]$, the domain of t_1 is $[0,2]$.

Influence to the society in terms of education.

Influence to the society in terms of education t_2 can be reflected by the ratio of education in welfare investment, that is the ratio of welfare investment to education e and the total welfare investment w .^[3] Since the ratio is generally located in $(0,0.1)$, the influence to the society in terms of education is negligible compared with influence to the society in terms of income t_1 , however, education takes up a large proportion in the sustainable urban development model. Thus, we modify the influence to the society in terms of education t_2 by multiplying 10 and t_2 can be presented as

$$t_2 = 10 \cdot \frac{e}{w} \quad (2.4)$$

Proportion of minors and the minimum wage are taken into account when it comes to the influence to the society in terms of education t_2 , and a larger t_2 represents that the government pays more attention to education. Since the welfare investment to education is always less than the total social welfare, the domain of t_2 is $[0,1]$. We need to point out that the social welfare w and the social welfare to education e are made by the government.

Influence to the society in terms of social equality.

Since we are required to improve the retention of women in the workforce and pay attention to the child care considering the relatively vulnerable groups, maternity, paternity leave and the child care expenditure are taken into account in the influence to the society in terms of social equality t_3 , while t_3 is considered to be the linear addition of influence of maternity and paternity leave to society MP and influence of child care expenditure to society CE as well.

Generally speaking, maternity leave to the female and paternity leave to the male are not equal, and the former is always much longer than the latter, which aggravate the social inequality. Simply consider the maternity and paternity leave, male candidates are more likely to be employed with a superiority of less paternity leave. Therefore, it may be better to eliminate the difference between maternity leave to the female and paternity leave to the male and we just consider per capita maternity and paternity leave mp .

We neglect the gender factor and consider that per capita maternity and paternity leave mp is the proportion of the sum of maternity leave to the female and paternity leave to the male to total population, which can be described as

$$mp = \frac{\sum m \cdot \lambda \cdot p + \sum p \cdot l \cdot (1-\lambda) \cdot p}{p} \quad (2.5)$$

We need to set a standard to evaluate per capita maternity and paternity leave with the introduction of revised per capita maternity and paternity leave mp' . λ' is the revised proportion of female population after a time period, since the female outweigh the male in per capita maternity and paternity leave considering the much longer maternity,^[6] the revised per capita maternity and paternity leave mp' is deeply affected by the proportion of the female population and can be described as

$$mp' = \frac{\lambda'}{\lambda} mp. \quad (2.6)$$

Considering the connection above, the influence of maternity and paternity leave to the society MP can be described as

$$MP = \frac{mp - mp'}{mp'}. \quad (2.7)$$

We need to pay attention to the relatively vulnerable groups and ease social conflict concerned with the child care. With a high level of child care expenditure, some groups will be under pressure in life seriously, which may result in serious social hazard. Therefore, child care expenditure is introduced to influence to the society in terms of social equality.

A standard to evaluate the child care expenditure is needed as well, therefore, we introduce the revised child care expenditure ce' . When the child care expenditure ce is more than the standard, the correlation ce' , a higher level of the citizens' living standard can be reflected, which means a positive impact on the influence of child care expenditure to the society CE . When the child care expenditure ce is less than the correlation ce' , it reflects a lower level of the citizens' living standard, which means a negative impact on the influence of child care expenditure to the society CE . Based on the analysis above, we can construct the influence of child care expenditure to the society CE as

$$CE = \frac{ce' - ce}{ce'}. \quad (2.8)$$

Combing the comprehensive impact of maternity and paternity MP and child care expenditure CE , the influence to the society in terms of social equality t_3 is considered to be the linear addition of MP and CE , therefore, t_3 can be expressed as

$$t_3 = \frac{mp - mp'}{mp'} + \frac{ce' - ce}{ce'}. \quad (2.9)$$

Need to point out that influence of social equality t_3 reflects a negative impact to the society, therefore, we take the opposite of t_3 when it comes to total influence of the three factors to the society.

Sustainable Urban Development Model.

Based on the quantized influence of the three identified factors (income, education and social equality) to the society and the analysis above, the indicator of sustainable urban development t can be described as

$$t = t_1 + t_2 - t_3 = \frac{e^{\alpha_1 \ln u + \alpha_2 \ln w}}{mws} + \frac{ax_1 + bx_2 + cx_3}{\max\{ax_1 + bx_2 + cx_3\}} + 10 \cdot \frac{e}{w} - \left(\frac{mp - mp'}{mp'} + \frac{ce' - ce}{ce'} \right). \quad (2.10)$$

In the model, parameters relative to the minimum wage α_1 and α_2 , per capita maternity and paternity leave mp' and child care expenditure ce' need to be revised and adjusted after a time period like a ten-year period depending on the current circumstance and data. While the minimum wage standard mws , the social welfare w and the social welfare to education e are formulated by the government. The indicator of sustainable urban development t can be obtained according to the expression (2.10) as shown in Figure 2.

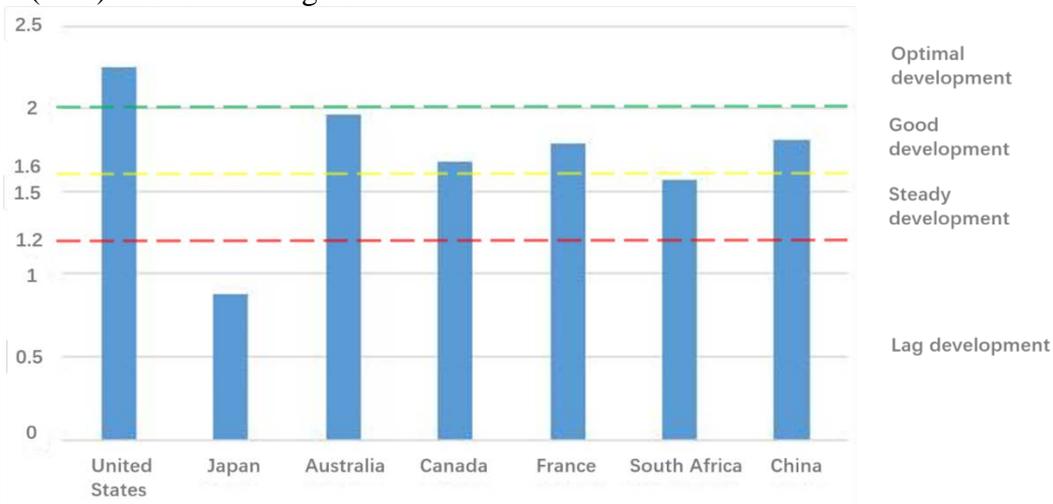


Fig. 2 Indicator of sustainable urban development t of the seven countries

Conclusions

The influence to the society in terms of income t_1 is located in $[0,2]$ and the influence to the society in terms of education t_2 is located in $[0,1]$, while the magnitude of the influence to the society in terms of social equality t_3 is negligible, the indicator of sustainable urban development t is roughly located in $[0,3]$.

We select four typical kinds of countries, collect data and make research about the constructed sustainable urban development model. Generally, a more advanced country corresponds with a higher indicator of sustainable urban development and is in a better development.

References

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