Exploration of the Relationship between Planning Research Investment and National Macro Development—An Empirical Study Based on Papers since 1950

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Abstract: The world is accelerating globalization and urbanization; thus, planning plays an irreplaceable role in the macro development, especially in sustainable development. Planning research is important in turning theories of planning into urban practices. This research based on the theory that planning research is crucial, as it represents that planning-related activities improve processes in urbanization. However, the current understanding of the importance of planning research is limited. There is no research on the interaction between planning research and macro national development to support the importance of planning or its research. This study uses 750,000 articles on urban planning fields from WoS from 1950 to the present. Firstly, the study concludes the investment pattern changes of the global planning research. Over the past 70 years, the total number and diversity of countries engaged in planning research have grown rapidly, and developing countries have gradually integrated into the mainstream research community and become the main contributors. Secondly, the investment intensity and characteristics of planning research are consistent with the speed and characteristics of urbanization, which proves that to some extent, the demand of urbanization development drives the investment of planning research. Then, according to the different characteristics of planning research investment in different countries, this paper summarizes the main investment characteristics of major countries, analyzes the development rule behind the investment characteristics, and predicts the interaction with the international political and economic pattern. By analyzing the relationship between planning research intensity and urbanization, it is found that the investment intensity of planning research has a time rule with urbanization and has different interactions in different stages of urbanization development. It was found that the intensity of planning research was strongly correlated with HDI, and the amount of research was crucial.

Keywords: planning research; investment; macroscopic development; driving force; urbanization; bibliometrics

1. Introduction

In the 21st century, the world is accelerating globalization and urbanization; thus, planning plays an irreplaceable role in the macro development of cities and society [1], especially in sustainable development [2,3]. With the help of new technologies, new conceptions of cities, smart cities, for example, are flourishing to better fulfill the goal of sustainable development [4]. From the perspective of the features and philosophy of urban planning, the origin of planning is to deal with the increasingly serious problems of urbanization, and it had a strong problem-solving origin, that is, to solve the problems of cities during urbanization. Planning research is important in turning theories and research of planning into applications in urban practices [5], and planning research and urban practices could be correlated [6]. From a macro point of view, planning and its related systems were first originated in the countries where urbanization and industrialization

first occurred and reached a high level. With the deepening of urbanization, problem-solving-oriented planning is gradually endowed with greater social responsibilities [7,8]. For instance, Habitat III, the UN summit on human settlements, New Urban Agenda, or SDGs, the UN Sustainable Development Goals, elevated planning as an important means to promote urbanization and social sustainable development [9].

However, the current understanding of the importance of planning and its research in the world is limited despite the fact that planning is recognized by international communities in sustainable development. Although many experiences proved planning and its research are very important, could in some extent help stimulate economy, and can fulfill the sustainable development, the solid evidence of the importance of planning and its research is limited. Thus, the research problem in this study is based on the following questions: Is planning research important or not? How important is planning research in the macro development process? After searching the literature, we found that research papers were focused on the correlation between innovation and economic development [10,11], between the development of ICT clusters and economic development, between urbanization process and economic growth [12], between financial investment and planning processes in city and regional planning [11,13], and contributing to sustainability [14], etc., mainly in economic field [15–17]. In terms of planning-related research, however, there is no research on the interaction between planning research and macro national development to support the importance of planning or its research [18], and there is no quantitative research based on data to confirm the importance of planning for national macro development and urbanization development [19,20]. The research gap is very clear; there is no solid and quantitative evidence supporting the importance of planning and its research, despite the fact that its importance is commonly recognized. The specific hypotheses are proposed by authors that planning research and social macro development is closely correlated, which to a large extent means that better planning research leads to better social macro development. Therefore, through quantitative analysis of data, this study attempts to fill this gap, testing whether planning and its research has a correlation with national macro economy, finding implicit links between planning research and urbanization, and economic and social development. This research provides us a new thought in different perspectives and may enhance our understanding of the significance of planning research in macro development based on quantitative statistics. Therefore, it is suggested that countries should increase their investment in planning research at the appropriate time, in order to maximize the role of planning in promoting sustainable urbanization and sustainable development.

2. Research Design

It has been discussed and proved that planning has a comprehensive scope, which means it includes a wide range of research areas, consisting of economics, public management, sociology, ecology, life science, and politics, etc. [21,22]. In the process of development, its knowledge system has been expanded and integrated with external knowledge and theories from other areas [23–26].

The academic literature of planning research represents the results of planning research and the investment effort in research; in this study, ‘planning research investment’ is given to define the input of planning research. By studying the characteristics of academic literature on planning research, we could objectively understand the attitudes of academia and society towards the field of planning. The relevant characteristics of planning research can be understood, such as the investment intensity, investment speed, and investment time rule of planning research. ‘Planning research’, in this study, is based on the 750,000 papers retrieved from WoS system in Urban/City Planning field from 1950 to 2020. Since WoS is one of the largest academic libraries in the world, its collected papers in Urban Planning and relevant fields could, to a large extent, represent the global academic investment features on planning research.

In the WoS database, all relevant literature from 1950 to the present were searched with the search inquiries “topic: (urban) OR topic: (city) AND topic: (planning)”.
same time, a 5-year time interval was entered into the system for retrieval one by one. The searching conditions were ‘topic retrieval’. According to the definition of WoS, its topic search works as follows: the system will retrieve the following fields in the record: title, abstract, author keyword, and Keywords Plus. As a result, the search results are all the literatures with the title, abstract, author keyword, and Keywords Plus including urban/city/planning field, which meet the sample requirements of the study.

The results of the search reflect the evolution of research in planning and related fields. According to the retrieval requirements of all the literature on urban planning every 5 years, the literature of all time periods was sorted out. Through the analysis of planning and related research literature in nearly 70 years from 1950 to 2019, it can be regarded as a panoramic sample to explore the evolution of world planning knowledge.

In addition, the method for how WoS counts source countries/regions needs to be explained. International cooperation has become increasingly popular, especially in the last decade; however, if the horizon is extended to more than half a century, the international cooperation of previous papers before 2000s is limited. This study is based on WoS system, and the rule for how the system defines source country/region is to count the authors from multiple countries of one article as multiple source countries. Thus, the absolute number of publications of a country could largely explain how much it has invested in planning research.

According to the number of publications in each country, as well as the comprehensive economic and social indicators, this study screened 47 countries in the world (Table 1). This study observed the evolution of planning research investment since 1950, then compared it with the macro national economic indicators, thus quantitatively discovering the links between planning research investment and macro national economy. This study tried to verify the importance of planning through quantitative literature data.

Table 1. Major countries selected in this study [27–29].

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>GDP (us$mm)</th>
<th>GDP per Capita (USD)</th>
<th>Population (Million)</th>
<th>Urbanization Rate (%)</th>
<th>HDI</th>
<th>Land Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>156,080</td>
<td>3715</td>
<td>42.0</td>
<td>72</td>
<td>0.758</td>
<td>2,381,740</td>
</tr>
<tr>
<td>Argentina</td>
<td>545,866</td>
<td>12,215</td>
<td>44.7</td>
<td>88</td>
<td>0.832</td>
<td>2,736,690</td>
</tr>
<tr>
<td>Australia</td>
<td>1,204,616</td>
<td>48,628</td>
<td>28.8</td>
<td>65</td>
<td>0.912</td>
<td>8,520,465</td>
</tr>
<tr>
<td>Austria</td>
<td>386,428</td>
<td>44,154</td>
<td>9.5</td>
<td>75</td>
<td>0.815</td>
<td>202,910</td>
</tr>
<tr>
<td>Belgium</td>
<td>466,366</td>
<td>40,559</td>
<td>11.5</td>
<td>96</td>
<td>0.917</td>
<td>8,520,465</td>
</tr>
<tr>
<td>Brazil</td>
<td>1,796,186</td>
<td>8518</td>
<td>210.9</td>
<td>84</td>
<td>0.76</td>
<td>8,358,140</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>52,395</td>
<td>7446</td>
<td>7.0</td>
<td>74</td>
<td>0.813</td>
<td>108,560</td>
</tr>
<tr>
<td>Canada</td>
<td>1,529,760</td>
<td>41,397</td>
<td>37.0</td>
<td>81</td>
<td>0.921</td>
<td>9,093,510</td>
</tr>
<tr>
<td>Chile</td>
<td>247,028</td>
<td>13,575</td>
<td>18.2</td>
<td>90</td>
<td>0.845</td>
<td>743,532</td>
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<tr>
<td>China</td>
<td>11,199,145</td>
<td>7914</td>
<td>1415.0</td>
<td>84</td>
<td>0.753</td>
<td>9,388,211</td>
</tr>
<tr>
<td>Colombia</td>
<td>282,463</td>
<td>5710</td>
<td>49.5</td>
<td>79</td>
<td>0.76</td>
<td>1,109,500</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>192,925</td>
<td>18,157</td>
<td>10.6</td>
<td>74</td>
<td>0.888</td>
<td>77,240</td>
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<tr>
<td>Denmark</td>
<td>306,143</td>
<td>53,202</td>
<td>5.8</td>
<td>87</td>
<td>0.929</td>
<td>42,430</td>
</tr>
<tr>
<td>Finland</td>
<td>236,785</td>
<td>42,722</td>
<td>5.5</td>
<td>84</td>
<td>0.924</td>
<td>303,890</td>
</tr>
<tr>
<td>France</td>
<td>2,465,453</td>
<td>37,794</td>
<td>65.2</td>
<td>80</td>
<td>0.89</td>
<td>547,557</td>
</tr>
<tr>
<td>Germany</td>
<td>3,477,796</td>
<td>42,261</td>
<td>82.3</td>
<td>76</td>
<td>0.938</td>
<td>348,560</td>
</tr>
<tr>
<td>Greece</td>
<td>194,559</td>
<td>174,622</td>
<td>11.1</td>
<td>78</td>
<td>0.871</td>
<td>128,900</td>
</tr>
<tr>
<td>Hungary</td>
<td>124,343</td>
<td>12,834</td>
<td>9.7</td>
<td>73</td>
<td>0.841</td>
<td>90,530</td>
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<tr>
<td>India</td>
<td>2,263,792</td>
<td>1672</td>
<td>1354.1</td>
<td>32</td>
<td>0.643</td>
<td>2,973,190</td>
</tr>
<tr>
<td>Indonesia</td>
<td>932,259</td>
<td>3494</td>
<td>266.8</td>
<td>54</td>
<td>0.704</td>
<td>1,811,570</td>
</tr>
<tr>
<td>Iran</td>
<td>425,326</td>
<td>5186</td>
<td>82.0</td>
<td>74</td>
<td>0.799</td>
<td>1,628,550</td>
</tr>
<tr>
<td>Italy</td>
<td>1,858,913</td>
<td>31,352</td>
<td>59.3</td>
<td>72</td>
<td>0.881</td>
<td>294,140</td>
</tr>
<tr>
<td>Japan</td>
<td>4,940,158</td>
<td>38,842</td>
<td>127.2</td>
<td>94</td>
<td>0.913</td>
<td>364,555</td>
</tr>
<tr>
<td>Libya</td>
<td>29,153</td>
<td>5058</td>
<td>6.5</td>
<td>79</td>
<td>0.704</td>
<td>1,759,540</td>
</tr>
<tr>
<td>Malaysia</td>
<td>296,359</td>
<td>9249</td>
<td>32.0</td>
<td>75</td>
<td>0.802</td>
<td>328,550</td>
</tr>
<tr>
<td>Mexico</td>
<td>1,046,922</td>
<td>8006</td>
<td>130.8</td>
<td>78</td>
<td>0.765</td>
<td>1,943,950</td>
</tr>
</tbody>
</table>
Table 1. Cont.

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>GDP (us$mm)</th>
<th>GDP per Capita (USD)</th>
<th>Population (Million)</th>
<th>Urbanization Rate (%)</th>
<th>HDI</th>
<th>Land Area (km^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>777,227</td>
<td>45,493</td>
<td>17.1</td>
<td>91</td>
<td>0.932</td>
<td>33,720</td>
</tr>
<tr>
<td>New Zealand</td>
<td>185,017</td>
<td>38,954</td>
<td>4.7</td>
<td>85</td>
<td>0.92</td>
<td>263,100</td>
</tr>
<tr>
<td>Norway</td>
<td>370,557</td>
<td>69,219</td>
<td>5.4</td>
<td>79</td>
<td>0.953</td>
<td>365,268</td>
</tr>
<tr>
<td>Peru</td>
<td>192,094</td>
<td>5901</td>
<td>32.6</td>
<td>78</td>
<td>0.756</td>
<td>1,280,000</td>
</tr>
<tr>
<td>Poland</td>
<td>469,509</td>
<td>12,322</td>
<td>38.1</td>
<td>61</td>
<td>0.868</td>
<td>306,230</td>
</tr>
<tr>
<td>Portugal</td>
<td>204,565</td>
<td>19,878</td>
<td>10.3</td>
<td>67</td>
<td>0.848</td>
<td>91,590</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>1,411,246</td>
<td>27,583</td>
<td>51.2</td>
<td>81</td>
<td>0.904</td>
<td>97,230</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>1,283,162</td>
<td>8913</td>
<td>144.0</td>
<td>73</td>
<td>0.856</td>
<td>16,376,870</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>646,438</td>
<td>19,265</td>
<td>33.6</td>
<td>77</td>
<td>0.704</td>
<td>2,149,690</td>
</tr>
<tr>
<td>South Africa</td>
<td>294,841</td>
<td>5137</td>
<td>57.4</td>
<td>62</td>
<td>0.891</td>
<td>1,213,090</td>
</tr>
<tr>
<td>Spain</td>
<td>1,237,255</td>
<td>26,666</td>
<td>46.4</td>
<td>82</td>
<td>0.935</td>
<td>498,800</td>
</tr>
<tr>
<td>Sweden</td>
<td>511,000</td>
<td>51,189</td>
<td>10.0</td>
<td>85</td>
<td>0.943</td>
<td>410,340</td>
</tr>
<tr>
<td>Switzerland</td>
<td>668,851</td>
<td>78,283</td>
<td>8.5</td>
<td>73</td>
<td>0.762</td>
<td>39,516</td>
</tr>
<tr>
<td>Thailand</td>
<td>406,840</td>
<td>5881</td>
<td>69.2</td>
<td>52</td>
<td>0.805</td>
<td>510,890</td>
</tr>
<tr>
<td>Turkey</td>
<td>857,711</td>
<td>10,471</td>
<td>81.9</td>
<td>71</td>
<td>0.747</td>
<td>769,630</td>
</tr>
<tr>
<td>Ukraine</td>
<td>93,270</td>
<td>2119</td>
<td>44.0</td>
<td>70</td>
<td>0.864</td>
<td>579,320</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>348,743</td>
<td>36,550</td>
<td>9.5</td>
<td>90</td>
<td>0.919</td>
<td>83,600</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2,647,898</td>
<td>39,774</td>
<td>66.6</td>
<td>87</td>
<td>0.919</td>
<td>241,930</td>
</tr>
<tr>
<td>United States of America</td>
<td>18,624,475</td>
<td>56,996</td>
<td>326.8</td>
<td>89</td>
<td>0.69</td>
<td>9,147,420</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>202,616</td>
<td>2100</td>
<td>96.5</td>
<td>34</td>
<td>0.683</td>
<td>310,070</td>
</tr>
</tbody>
</table>

Source: UN 2019a, UNDP 2020, and Worldometer.

The key issues of this article are concluded as follows: (1) Evolution of planning research investment; (2) Characteristics of investment in planning research; (3) Relationship between investment in planning research and urbanization; and (4) Relationship between planning investment intensity and level of development.

3. Evolution of the World Pattern of Planning Research Investment

This section examines the development pattern of planning research investment since the 1950s based on literature data. The findings are, firstly, that growth in the number of countries contributing and participating in planning research since the 1950s showed a sharp increase in total numbers, and participating countries became more diverse. Then, relationship between the growth of the total number of participating countries and urbanization is highly coherent, indicating the significance of planning-related research in the process of urbanization. Finally, a comparison of planning investment in developed and developing countries since 1966 was conducted, in order to discover the competitions between two types of countries to a large extent.

3.1. A Sharp Increase in the Total Number and Diversity of Participating Countries

Of all the countries, only eight countries participated in the urban planning research in the 1960s, means these countries invested their research efforts in the field of planning. It can be seen that these 8 countries are all ‘big countries’ in the political and economic sense at that time. They are the United States, Canada, France, Pakistan, United Kingdom, India, Sweden, and Switzerland. Until current days, 2016 to 2019, there were 193 countries and regions that invested their research efforts in the planning field, covering almost all countries and regions in the world.

The studies show that the number of participating countries and regions increased rapidly over the past 70 years, from only single-digit countries involved to coverage of all countries in the world, which proves that as a result of the urbanization, countries realized the importance of planning research and increasingly took the research investment seriously.
By analyzing the diversity of participating countries, it is found that the diversity of countries engaged in planning research has grown rapidly over past 70 years, initially dominated by developed countries, followed by developing countries, which have gradually integrated into the mainstream research community and become the main contributor. For example, China overtook the United States since the end of 2000 and became the world’s largest investor in planning research. This is highly related to economic and political situation; after WWII, developing countries started the process of rapid urbanization, which caused a multitude of urban problems, thus planning practices and research of planning were proved to be useful in dealing with large scale urbanization and gradually resulted in high investment in planning research (Figure 1).

![Figure 1. Growth in the number of countries contributing to and participating in planning research since the 1950s [30]. Source: based on data from Web of Science. Note: Due to (1) international conventions, (2) statistical methods of WoS system, and (3) different names of different countries in history, statistical standards of different countries are different. For the convenience of statistics, the author deals with them as follows: Czech is calculated as Czech Republic or Czechoslovakia (Czech = Czechoslovakia + Czechoslovakia); The four regions of the United Kingdom, England, Scotland, Wales, and Northern Ireland, all calculated as United Kingdom. The historical East and West Germany, the German Democratic Republic and the Federal Republic of Germany, were united as Germany. The Soviet Union in history was counted as Russia.]

From 1961 to now, the number of participating countries engaged in planning research shows a rapid rise, from 8 in 1966 to 193 in 2019.

According to the yearly increased number, on average 18.4 countries are engaged in the investment every 5 years. The largest increase was in the decade of 2001–2005 to 2006–2010; participation increased by 35 countries, contributing to an increase of 81.4%.

3.2. Relationship between the Growth of the Total Number of Participating Countries and Urbanization

From the overall interaction between the increase of the total number of countries investing in planning research and the growth of the world urbanization rate, the biggest increases in the number of countries investing in planning research were located in two periods, which are distributed in (Table 2):

(1) During the decade from 1966 to 1975, the average increase in numbers of countries were 31.5 every 5 years, and the average growth rate were 73.3%. At that time, the corresponding global urbanization rate was about 37%. According to Northam’s classic theory of ‘three stages of urbanization’, urbanization will accelerate during the 30–70% period, defined as the ‘accelerating stage’ [31]. In this stage, the number of countries participating increased largely; this might be in response to the fact that after the urbanization rate reached over 30%, the world’s urbanization rate began to enter the fast lane, resulting in increasingly urban problems. Thus, planning research was needed as the basis
to cope with complicated problems in rapid urbanization, leading to accelerated investment by countries.

Table 2. The number of participating countries in planning research has changed since 1961 [30,32].

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participating countries</td>
<td>9</td>
<td>19</td>
<td>72</td>
<td>75</td>
<td>91</td>
<td>112</td>
<td>107</td>
<td>133</td>
<td>154</td>
<td>189</td>
<td>193</td>
<td></td>
</tr>
<tr>
<td>Countries increased compared to last year</td>
<td>9</td>
<td>34</td>
<td>29</td>
<td>3</td>
<td>16</td>
<td>21</td>
<td>5</td>
<td>26</td>
<td>21</td>
<td>35</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Countries increased percentage compared to last year</td>
<td>378%</td>
<td>67.4%</td>
<td>4.2%</td>
<td>21.3%</td>
<td>23.1%</td>
<td>-4.5%</td>
<td>24.3%</td>
<td>15.8%</td>
<td>22.7%</td>
<td>2.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urbanization rate</td>
<td>36.5%</td>
<td>37.7%</td>
<td>39.3%</td>
<td>41.2%</td>
<td>43.0%</td>
<td>44.8%</td>
<td>46.7%</td>
<td>49.2%</td>
<td>51.6%</td>
<td>53.9%</td>
<td>55.3%</td>
<td></td>
</tr>
</tbody>
</table>


(2) During the decade from 1996 to 2006, the average growth rate reached 27.3 countries per five years or a 63.6% growth rate. At that point, the corresponding world urbanization rate was 50%, which means that for the first time the urban population overtook the rural counterpart; the urban population dominated global population, which meant that urban problems were no longer only problems of the city, but should be the problems of the world. The result was that countries realized the importance of the city and urbanization. In 2015, when the world urbanization rate reached 54%, there were 189 countries that became involved in planning research, almost covering the UN’s 193 member states. This figure proved the importance of planning research and its role in urbanization.

3.3. Planning Research Investment of Developed and Developing Countries

If all involved countries were divided into two categories as developed and developing countries, thus, the comparison of planning research investment between developed and developing countries could be seen from 1966 to the present (Table 3). Here to note, the selection is based on 47 major countries, in which half are the developed countries and the rest are developing countries. However, there are more than 150 developing countries around the world according to UN’s definition; in fact, the proportion of developing countries in this comparison is lower. Only ‘big developing countries’ were counted, not covering all developing countries, so the developing countries could share a larger proportion in planning research investment [33,34].

Table 3. Comparison of planning research investment from developed and developing countries since 1966 [30].

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<tbody>
<tr>
<td>Developing countries</td>
<td>1</td>
<td>28</td>
<td>101</td>
<td>143</td>
<td>212</td>
<td>271</td>
<td>450</td>
<td>2616</td>
<td>7880</td>
<td>15,121</td>
<td>26,222</td>
</tr>
<tr>
<td>Developed countries</td>
<td>53</td>
<td>342</td>
<td>949</td>
<td>1096</td>
<td>1157</td>
<td>2286</td>
<td>3189</td>
<td>5413</td>
<td>10,346</td>
<td>19,589</td>
<td>32,607</td>
</tr>
<tr>
<td>Percentage of developing countries</td>
<td>0.02</td>
<td>0.08</td>
<td>0.10</td>
<td>0.12</td>
<td>0.15</td>
<td>0.11</td>
<td>0.12</td>
<td>0.33</td>
<td>0.43</td>
<td>0.44</td>
<td>0.45</td>
</tr>
<tr>
<td>Percentage of developed countries</td>
<td>0.98</td>
<td>0.92</td>
<td>0.90</td>
<td>0.88</td>
<td>0.85</td>
<td>0.89</td>
<td>0.88</td>
<td>0.67</td>
<td>0.57</td>
<td>0.56</td>
<td>0.55</td>
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Source: based on data from Web of Science.

By comparing two types of countries, it is found that the developed countries dominated in the 1960s with 98%, all the way to today where they account for 55%, which shows a declining trend. On the contrary, the developing countries rose from only 0.01% in the 1960s, all the way to 46% in 2019 (the real proportion is higher). The reason is that
developed countries have already completed the process of urbanization and entered into the slow stage of in-depth urban development. However, urbanization mostly occurred at a high speed in developing countries, based on a series of urban problems, resulting in developing countries needing to invest in planning research profoundly [35].

4. Investment Characteristics of Major Countries in Planning Research

This study selected 47 ‘major countries’ globally, according to the proportion account for total planning research literature of the world at particular years since 1950, and the selected countries in this study are major powers in the sense of economy and politics.

This research discovered the investment characteristics of planning research in major countries since 1950, which could be summarized as different ‘investment characteristics’. The investment characteristics could to some extent reflect the interaction between planning research and global political and economic pattern.

According to the proportion changes of investment in planning research, the characteristics of investment in planning research of countries around the world can be concluded into the following categories (Figure 2):

**Figure 2.** The proportion of major countries’ investment in planning research [30]. Source: based on data from Web of Science.

**Slowly rising countries:** these countries basically maintain a slowly rising proportion. The planning research investment of such countries showed relatively stable increasing. Saudi Arabia, New Zealand, Romania, Czech Republic, Denmark, Finland, Norway, Chile, Austria, Greece, Belgium, Singapore, Malaysia, Colombia, Mexico, Switzerland, South Africa, Iran (its previous proportion was tiny, but began to rise in 2006), the Netherlands (1986–1990s was at the bottom), and Australia.
Rapidly rising countries: Korea, Poland, Indonesia (started to grow faster in 2006), Russia (started to grow faster in 2006), Portugal (began to rise rapidly in 1996, before which the proportion was almost zero), Turkey (began to rise rapidly in 1996, before which the proportion was almost zero), Brazil, and Spain (began to rise rapidly in 1991), Italy (kept stable after 2000). These rapidly rising countries are emerging industrial countries, for instance the ‘BRICS’, whose investment in planning research basically keeps pace with their economic performance.

Extremely rapid rising countries: China (the proportion was almost zero before 1981, and it started to grow from 1981 to 2000 with a small increase. The proportion was only 2% until 2000, then suddenly began to rise sharply in 2000, and reached nearly 30% in 2010, surpassing the United States, which had occupied the first place for a long time, becoming the world’s No.1 country in investment).

Countries that went up first and then down: Nigeria, Israel, Argentina, Japan (which declined slowly after peaking in 2011), and France (which was in shrinking state during the 1976–1990s).

Balanced countries: India, Germany, Sweden, the proportion of planning research investment in these countries has remained stable during the whole process.

Shrinking countries: Canada (shrunk since 1991 steadily), United Kingdom (1976–2005 was at peak, accounted for about 20% globally, down to less than 10% currently), United States (experienced shrinkage from the highest proportion of 80% in 1970s, to maintaining 50–80% between 1966 and 2000s; began to shrink sharply from 1996, currently account for 15% in investment).

5. Interaction between Planning Research Investment Intensity and Urbanization

5.1. Time Feature of Planning Research Investment Intensity and Urbanization

The interactive relationship between planning research investment intensity and urbanization was studied based on quantitative data. It is country-level research taking the country as case studies, and the research time is selected as year of 2019.

In this research, ‘planning research investment intensity’ is defined as the amount of planning research literature per capita (per million population) in the selected country. The urbanization refers as the urbanization rate of selected countries. Therefore, by comparing the urbanization rate and ‘planning research investment intensity’ of countries in 2019, the interactive feature between the two is studied.

The urbanization rate and literature per capita of countries are plotted in the form of a scatter plot, in which the horizontal axis is the urbanization rate and the vertical axis is the literature per capita, which represents the investment intensity of planning research. Through the scatter diagram, a pattern can be found visually and these countries could be divided into two types of development pattern, namely, (1) countries whose urbanization rate increased while their planning research investment intensity does not increase, and (2) countries for with both urbanization rate and planning research investment intensity increased. Further in-depth analysis will be conducted in this study.

In theory, urbanization is a long and dynamic development process from low urbanization rate to high over time. It is assumed that the urbanization rate of all countries will grow with the development [14]. Therefore, from the perspective of dynamic development of urbanization, the dynamic relationship between planning research investment and urbanization is studied, and a relatively obvious time feature is found. From a dynamic perspective, this paper analyzes the characteristics of the relationship between planning research investment and urbanization in various countries, and presents them in a scatter plot, which can be analyzed and summarized into 6 six different categories, represented by A, B, C, C1, D, and D1 (Figure 3).
Figure 3. Dynamic relationship between investment in planning research and urbanization [30]. Source: based on data from Web of Science.

The relationship between planning research investment and urbanization can be generally summarized into following categories.

**Category A: pre-urban societies with very little investment**
Before the urbanization rate reaches 50%, the intensity of planning research is very low, and countries seldom pay attention to it. Before urbanization rate reaches 50%, only two countries in the 47 countries carried out the research outcome, with very low per capita (0.9 to 1.6 per one million people), which proves that when the urbanization rate is lower than 50%, major countries were unlikely to invest in planning research, largely because in the low stage of urbanization rate, there were fewer urban problems. In another view, in the early stage of urbanization, planning was mainly based on practice, and the research on planning was not the mainstream, thus a complete research eco-system had not established.

**Category B: began to accelerate when urbanization past 50%**
Based on data, the investment of planning research began to grow after the urbanization rate exceeds 50%, when urban problems soaring in this stage of urbanization, as many relevant studies have also proved the correlation between the stage of urbanization and urban problems. It is not until the urbanization rate exceeds 50% that urban problems erupt, leading to a surge in relevant research as the basis for solving urban problems [36]. This is related to the theory of ‘intelligent urbanization’ put forward by scholars [37].

**Category C: high urbanization but low investment**
When the urbanization rate reaches 60–80%, a large number of planning studies begin to appear in this stage, while their per capita number is low. There are a large number of countries in this range, with the urbanization rate reaching 60–80%, but the intensity of planning research is stagnated. Most of these countries are developing countries.

**Category C1: high urbanization with high investment**
The urbanization rate is over 70%−80%, and the number of articles per capita is above the average. Countries in this range have the same level of urbanization as countries in category C, with the urbanization rate reaching 60–80%, but the intensity of planning research is relatively high. Most of these countries are developed countries.

**Category D: very high urbanization with low investment**

The urbanization rate is over 80%, which is in the range of 80–100% in these countries with a high urbanization rate. In such countries, the urbanization rate is high, but with low planning and research intensity. Most of these countries are developing countries and ‘overurbanization countries’, such as Argentina and Brazil in Latin America.

**Category D1: very high urbanization with high investment**

The urbanization rate is over 80%, which is in the range of 80% to 100%. In such countries, both the urbanization rate and the planning research intensity are high. Most of these countries are developed countries.

To sum up, the investment intensity of planning research has a time feature with the advancement of urbanization, and has different interactions in different urbanization stages, resulting in different types of countries. According to the different interactions, they are divided into six categories. When urbanization develops to a certain stage, the research on planning appears immediately. There are different interactions between them, and they are divided into different categories according to different interactions.

5.2. Path Choice of Interaction between Planning Research Investment and Urbanization

According to the interaction feature between planning research intensity and urbanization rate of major countries, this study concluded the interactions into six categories, which can be further summarized as two ways for countries in terms of different interactions. The study of the interaction between planning research investment and urbanization proposes the influence of planning research investment might result in different urbanization responds.

In other studies on interaction between macro-economy and urbanization, for example, researchers proposed a scatter plot of urbanization rate and GDP per capita of major countries. Through relevant studies, it is found that the urbanization paths of 47 major countries are mainly divided into two groups. In the urbanization, major countries can be divided into two groups when the urbanization rate reaches 70%. For one category, after the urbanization rate reaches 70%, the GDP per capita of these countries increases, normally exceeding 15,000 US dollars. In the other category, after the urbanization rate is over 70%, the GDP per capita will not increase and normally cannot grow over 15,000 US dollars. Therefore, such countries are stagnated in urbanization and economy [37].

Since urban planning research represents solving urban problems, enhancing the quality of urbanization, and improving living standards, more urban planning research is the basis for ensuring high-quality urbanization development.

The per capita planning research investment and urbanization rate of 47 major countries in 2019 were selected and made on the scatter plot, with the horizontal axis being the urbanization rate and the vertical axis being the ‘per capita amount of planning research literature’. It can be found that these countries are divided into two groups as well. In detail, the group whose urbanization rate and the per capita amount of urban planning literature increase simultaneously is called ‘Stand group’, and the group whose urbanization rate increases while the per capita amount of planning literature stagnates is called ‘Lay group’. By observing the two groups, it can be found that the types of corresponding countries have clear features. For instance, the Stand group is made up of developed countries mostly, while the Lay group consists of developing countries mostly. The turning point between the two groups is roughly at a 70% urbanization rate. Countries experience a process from low urbanization rate to high, thus, the Stand group and Lay group can be understood as two approaches in the development of urbanization, which stands for (1): Stand approach, high urbanization and planning research investment, mostly happened in developed countries, and (2): Lay approach, high
planning research investment but low urbanization rate, mostly in developing countries. According to the findings, obviously, countries should choose a Stand approach with both high urbanization and planning research intensity and reasonably increase the investment in planning research before the turning point as means of strengthening the research basis, so as to fulfill a better urbanization development (Figure 4).

![Figure 4. Planning research input and urbanization path choice [30]. Source: based on data from Web of Science.](image)

6. The Correlation between Planning Investment Intensity and Level of Development

6.1. Use the HDI to Represent the Country’s Level of Development

HDI (Human Development Index, HDI) was developed by the United Nations Development Programme (UNDP) since 1990 [28]. According to the UN, the creation of HDI was based on the fact that although economic development of human society is necessary, it should not be the only focus; other aspects of social development should be taken into consideration. Therefore, other criteria should be considered to evaluate the development of a society. The HDI can also be used to question countries’ policy choices and to test, for example, how two countries with the same level of GNI per capita result in different human development outcomes. Such comparisons can fuel debate about the priorities of government policy.

The HDI has compiled three groups of indicators into a single composite index to more accurately reflect a society’s achievements in terms of health, education, and economy. HDI is an aggregated measure of average achievement in key aspects of human development: whether people in a country or region are living long, healthy, knowledgeable, and well-off. The HDI value is the geometric average of normalized indicators for each of the three dimensions. The health dimension is assessed by life expectancy at birth, while the education dimension is measured by years of schooling for adults aged 25 and over and the expected years of schooling for school-age children. The standard of living is measured by GNI per capita. The HDI uses the logarithm of income to reflect the declining importance
of income as GNI increases. Then, the scores of the three HDI dimensional indexes are aggregated into a composite index using geometric averages.

Therefore, HDI can largely represent the level of development in a country, because the development is not only the economic development, but also the health and longevity of people, knowledgeable and good living standards.

6.2. Planning Research Correlation Analysis between Investment Intensity and HDI

The number of publications on planning research in a certain country to a large extent represents the country’s investment in the field of planning research. Due to the huge population difference among countries, it is unfair to only use the total literature quantity of a country to represent the country’s investment in planning research field. This is because some large developing countries with large populations have a huge quantity due to their agglomeration advantages, while some small developed countries with small populations have a relatively small literature quantity. Therefore, ‘planning research intensity’ is introduced to evaluated in per capita value. It could fairly reflect the intensity of investment in planning research.

A correlation analysis is designed to figure out the relationship between planning investment intensity and level of development. The selected countries in this study are major powers in the sense of economy and politics. The correlation analysis of the per capita amount of planning research literature in these countries and its HDI index shows that the correlation coefficient is 0.71, which is a strong correlation (Figure 5).

![Figure 5](image.png)

**Figure 5.** Correlation analysis between input intensity of planning research and HDI [28,30]. Source: based on data from Web of Science and UNDP 2020.

The correlation analysis outcome could be explained as the more research investment in planning and related fields, the higher the country’s HDI would be. Thus, the amount of research is crucial. Strong correlation can also be interpreted as, in a sense, the more developed the society is, the more attention it pays to planning research, as basis for better economy and development, to some extent forming a virtuous circle.

7. Discussion and Conclusions

This study, based on literature data on ‘urban planning’ and related topics in the WoS system with total number of 750,000 articles since 1950, could largely represent the development feature in ‘planning research’ area. Academic literature is a manifestation of research investment; by analyzing the characteristics of academic literature of planning research, we could accurately understand the correlations between planning research and macro development.

The study found the pattern evolution of planning research investment in major countries since 1950s. In past 70 years, the total number of countries investing in planning research has grown rapidly. From the perspective of participating country numbers, the number of participating countries engaged in planning research has shown a rapid rise
since 1961, from only 8 countries involved in 1966, soaring to 193 in 2019, covering almost every country in the world. The rapid increase of planning research investment proves that countries were increasingly aware of the importance of planning and its research. Over the past 70 years, the diversity of countries engaged in planning research have also continued to grow. For diversity analysis of participating countries, the participating countries have developed rapidly from only major countries to 193 countries/regions. From the initial monopolization by developed countries to the gradual emergence of developing countries, scholars and practitioners from developing countries gradually became active and integrated into mainstream research community, finally becoming the main contributors. It is highly related to global economy and politics; the surging of developing world is because developing countries started the process of high-speed and massive urbanization after World War II, which needs the support of planning research. At the same time, the research finds that the investment intensity of planning research is consistent with the problems and characteristics of urbanization development stage, which proves that the demand of urbanization development promotes the investment of planning research.

At the same time, this study discovers planning research characteristics of different countries in 1950–2019, according to the proportion changes of planning research investment accounts for the total world planning research investment during this period, the characteristics of investment in major countries are summarized as different investment characteristics, and further speculate its interaction with the international political and economic pattern.

The correlation analysis between the intensity of planning research investment and HDI shows a strong correlation, indicating that the amount of research in planning and related fields is crucial in national macro development. In a sense, the more developed the society, the more attention paid to planning research, forming the virtuous cycle in this sense.

8. Possibilities for Further Studies

In this study, literature data were used to measure the amount of investment in planning research from an innovative perspective, that is, the degree of attention paid by countries. A series of analyses are made to find out the interactive relationship between planning research investment and macro development. The results of this study have implications. For example, the two groups of countries proposed in this study could make judgments about macro development based on quantitative data and can provide policy recommendations for increasing investment in planning-related research.

By analyzing the relationship between planning research intensity and urbanization, it is found that the investment intensity of planning research has a time feature with the process of urbanization and has different interactions with urbanization in different stages of urbanization development, which is reflected in different groups of countries. When urbanization develops to a certain stage, research on planning appears immediately. There is a temporal connection between the two, which can be summarized into different categories according to different interactions. The study found that the investment of planning research can be generally divided into two groups, namely, the group where both the urbanization rate and the per capita amount of urban planning literature increase simultaneously, named the Stand group, and the group where the urbanization rate increases while the per capita amount of urban planning literature stagnates, named the Lay group.

Coincidently, the former group are almost developed countries, while the latter are almost developing countries. The crossing point of the two groups is the time when the urbanization rate is at roughly 70%, which is the turning point. It is proposed that with the improvement of urbanization rate, it is possible to increase the investment of planning research before the turning point and become a Stand group member. On the other hand, it may go the way of the Lay group. Therefore, urbanization rate of 70% is considered as turning point, which determines the differentiation of the two communities. By combining
with the above features, this study suggests that countries should invest before urbanization rate of 50% and pay attention to the quality and quantity of planning research investment. In terms of total amount analysis, data from 1950 to present are used in this study, but in correlation analysis, static data in 2019 are used. In the future, if possible, data in different years should be used to continue dynamic correlation analysis, which can better explain the interactive correlations.

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