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A.P. Temir-ool

Institute of Economics and Industrial Engineering SB RAS
Novosibirsk, Russia

Features of modeling intersectoral relations in the economy of a peripheral region on the example of the Republic of Tyva¹

Abstract

The report shows the specifics of the work on the construction of regional input-output tables on the example of the Republic of Tyva. A detailed description of the most complex, missing in statistics, information arrays necessary for the construction of regional input-output tables is given. Regional peculiarities of the Republic of Tyva, in terms of energy, transport, services and public administration, affecting the formation of the structure of intermediate consumption in these sectors of the economy are presented. The conclusion is made about the limited possibilities of using regional input-output tables to assess multiplicative effects due to short intersectoral relations.

Keywords: regional input-output tables, intersectoral models, small economies, aggregation and granularity, economic forecasting.

А.П. Темир-оол

Институт экономики и организации промышленного производства СО РАН
Новосибирск, Россия

Особенности моделирования межотраслевых связей в экономике периферийного региона на примере Республики Тыва

Аннотация

В докладе показана специфика работ по построению региональных таблиц «затраты-выпуск» на примере Республики Тыва. Дано подробное описание наиболее сложных, отсутствующих в статистике, информационных массивов, необходимых для построения региональных таблиц «затраты-выпуск». Представлены региональные особенности Республики Тыва, в части энергетики, транспорта, услуг и государственного управления, влияющие на формирование структуры промежуточного потребления в этих отраслях экономики. Делается вывод об ограниченности возможностей использования региональных

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таблиц «затраты-выпуск» для оценки мультипликативных эффектов в силу коротких межотраслевых связей.

Ключевые слова: региональные таблицы «затраты-выпуск», межотраслевые модели, малые экономики, агрегирование и детализация, экономическое прогнозирование.

For a comprehensive analysis of the regional economy, there is no need to know the sources of resources and the proportions of the distribution of goods and services, the cost structure by type of economic activity. This information is not directly available in statistics, and it can only be obtained by calculation.

The simplest way to build a first approximation of the basic (reporting) input-output table for the regional economy is to use the average Russian industry indicators of the cost structure and the formation of output to calculate its first quadrant. But the use of aggregated Russian matrices can lead to large deviations of the received intersectoral flows from the actual values due to possible significant differences in the intra-sectoral production structures of the regional economy and the economy of the country as a whole. Therefore, it is necessary to use those Russian tables that are presented in the most detailed nomenclature. At the moment, these are the detailed input-output tables for 2011.

In the early 2000s, such a method was proposed by A.G. Granberg, when regional (in the context of federal districts) tables were calculated from the 1st quadrant of the all-Russian input-output table for 1997 in the context of more than 100 industries by simply multiplying the industry indicators of intermediate consumption by the ratio of regional output volumes to total by country. After the subsequent aggregation of the regional tables obtained in this way, the sectoral coefficients of intermediate consumption by districts turned out to be different due to the different internal production structure of the aggregated industries.

But for some types of economic activity, such a procedure does not give a satisfactory result. This applies to those foreign economic activities that in the detailed Russian table were represented by only one column and one row. For this reason, the regional cost structures for the electric power industry turned out to be exactly the same in the aggregated regional tables, which for obvious reasons does not correspond to reality. These kinds of results require adjustments.

In relation to regional economies, direct knowledge is needed here, for example, the energy industry of the Republic of Tyva is exclusively thermal, and coal and petroleum products are used as fuel in power plants and boilers. Detailed information on the consumption of coal and petroleum products, including separately for the generation of electric and thermal energy, is available in statistical forms in the public domain. As well as the consumption of boiler and furnace fuel for final consumption (not for conversion into electrical or thermal energy) by type of economic activity. Similar adjustments need to be made with regard to transport – all transport in the republic uses only petroleum products as fuel – there is no electric traction, there is no pipeline transport.

An alternative to this approach is a regular survey of a representative group of enterprises of the regional economy – for obvious reasons, an unrealizable option due to the lack of authority and financial resources to carry out such work. In addition, not all participants in economic activity report to the republican statistical office, primarily some of those who receive funding directly from the federal budget – federal structures operating in the region. Indicators of their output volumes can be obtained only by calculation.

Part of the results of economic activity is not distributed by region. The most striking example is the results of financial activity, in some entities the volumes of value added for it are shown as zero or close to it. The results of public administration are not fully distributed either. In this case, indirect data can be used to estimate output volumes – the number of employees or the wage fund obtained by multiplying this number by the average wage for the industry. And the volume of output should be determined based on the average ratio in Russia between the volume of output and the value added – the technologies of financial activity and public administration are approximately the same in all regions.

A distinctive feature of the input-output tables for regions such as the Republic of Tyva, if we take a detailed table as a template for Russia as a whole, is the presence of many zero rows and especially columns. The columns will be zero for those types of activities that are absent in the region and the only source of resources is import. The lines will be zero for those types of activities whose products are neither produced nor consumed in the region. And these zeros are the most accurate information of the regional input-output table.

It is possible to use only a part of such a table for calculating indicators of total costs or multiplicative effects – the square where there are no completely zero columns and rows. And, unlike the all-Russian table, regional multiplicative effects will be much less significant due to the rapid breakage of chains of intersectoral ties. Some of these effects will be ambiguous. For example, if there is an unambiguous positive relationship in terms of heat energy consumption due to an increase in residential and other “heated” funds, then in terms of electricity, the result may be either an increase in own production, or simply an increase in external supplies. Output in the electric power industry will increase in both cases, but in the second – only due to an increase in the volume of work of distribution networks.

It should be noted that the work on the construction of regional input-output tables allows you to adjust the methods of developing tables both for large regions and for the country as a whole. For example, where to attribute the loss of electricity in public networks when using natural indicators to calculate the proportions of the distribution of statistics? Within the framework of Russia as a whole, it seems quite acceptable to switch to the indicator of electricity production minus consumption for own needs and losses in public networks – only this electricity is marketable. For small regions with limited own power generation, this technique does not work, after the “deduction” a negative number will be obtained. Such a result will take place both in the Altai Republic and in the Republic of Tyva (in Tyva, losses in the networks reach a third of the total amount of energy consumed). Hence the conclusion – losses in networks must be attributed to consumers.

The initial regional table obtained by calculation will contain imbalances. Some of them are the import–export balance (for goods), and some need to be eliminated. Proportional change of string elements is the most primitive technique, and it can be used only at the final stage, to eliminate small differences. At the initial stage, it is necessary to adjust the structure, primarily final consumption, with the identification of the reasons for the deviation of the regional structure from the average for Russia. The expected result is an excess of output volumes over the indicators of final consumption for such an activity as public administration. This is a feature of all small economies, especially those with low population density. Balancing in such cases is achieved by increasing the share of this type of activity in the structure of final consumption. Similar justifications can be found for other types of services.

In conclusion, we note that there are certain limitations in the use of regional input-output tables to assess the prospects for economic development. When using multiplicative effects indicators to assess the impact of the development of some industries on the development of others, it should be borne in mind that within the framework of linear ratios between output and costs, which are quite acceptable for the country as a whole, the scale effect is not taken into account at the regional level. It is possible to create a new production of sewing products, here the scale effect is small – the costs are almost proportional to the number of employees, the number of sewing machines, the area of premises – and calculate its impact on the demand for products from other industries. It is possible to organize the production of metals and metal products, using local scrap metal as raw materials. But, perhaps, the entire annual receipt of scrap metal will be enough only for a week of operation of the equipment for its remelting. Such limitations in the interpretation of the results obtained occur primarily for those types of activities that are currently absent in the region.