

# Dynamic Planning Model for Donetsk and Luhansk<sup>1</sup>

I. D. Wheat<sup>a</sup> O. Kononets<sup>b</sup> D. Hutsul<sup>d</sup> V. Nazarenko<sup>c</sup>  
M. Paletska<sup>d</sup> O. Petrovskyy<sup>c</sup> V. Surovets<sup>c</sup> D. Yermolova<sup>c</sup>

<sup>a</sup> University of Bergen, Norway      <sup>b</sup> Ministry for Development of Economy, Trade, and Agriculture, Ukraine  
<sup>c</sup> National University of Kyiv-Mohyla Academy, Ukraine      <sup>d</sup> Ivan Franko National University of Lviv, Ukraine

## Extended Abstract for a Work-in-Progress Session, ISDC 2021

Historically, the Donetsk and Luhansk oblasts in southeastern Ukraine have been the drivers of a highly productive regional economy, with a combination of manufacturing (coal mining, heavy machinery, and chemicals) and agriculture (grains, seeds, meat, and dairy). In 2013, the last full year prior to the Russian-sponsored rebellion, Donetsk and Luhansk contributed significantly to the national economy of Ukraine: 15 percent of jobs, 25 percent of exports, and nearly 15 percent of GDP.



Fig 1. Donetsk and Luhansk

Since then, the region has been divided between a government-controlled area (GCA) and a rebel-controlled area, as displayed in the map in Figure 1. The continued fighting is now the longest European military conflict since the Second World War, with a death toll amounting to 13,000 and internally displaced persons numbering 1.5 million. Our modeling project is focused on the economic recovery and development of the GCA within the region, where production and employment are one-third of their 2013 levels.<sup>2</sup>

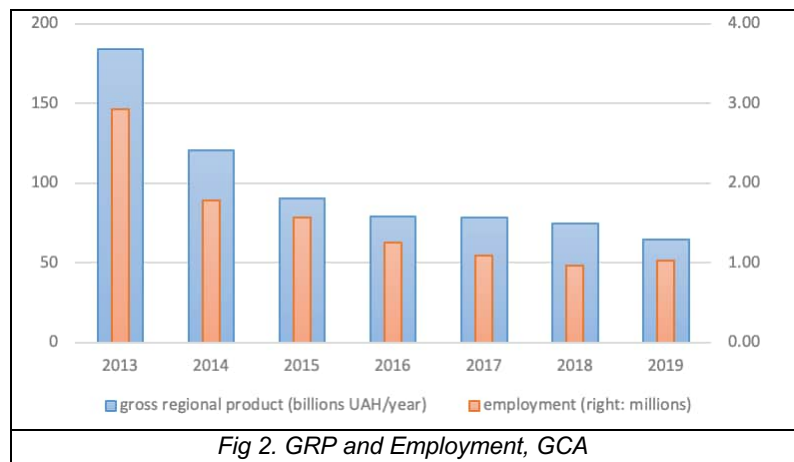


Fig 2. GRP and Employment, GCA

**The Dynamic Problems.** There are multiple interrelated dynamic problems. Most obvious in the economic statistics are the sharp and sustained declines in real gross regional product (GRP) and employment in the government-controlled area (see Figure 2). The initial sharp drop in 2014 reflects the separation of economic activity in the region. But the aftershock set in motion further declines throughout the region.

To an extent, this reflects physical damage to some facilities, but it mostly reflects abandonment of operations and loss of markets in the context of danger and insecurity. The displacement of the labor force mirrors the pattern in Figure 2 and has been declining about 1 percent annually after the sharp fall during the initial military crisis. Our model-based analysis makes clear that attracting investment is necessary to restore, modernize, and maintain property, plant, and equipment (PPE), but that will not be sufficient to restore the regional economy. Without a turnaround in the labor force trends and a successful effort to recover and extend lost export markets, new PPE will begin to rust. Of course, incentives for investors and workers depend on their assessment of risks associated with external and internal threats to security and the quality of life for those choosing to live and work there. Moreover, quality of life means more than good-paying jobs in communities where infrastructure and basic services have deteriorated markedly; e.g., in some areas, there are hazardous water quality problems, and the transportation for both goods and people needs repair, re-routing, and modernization.

<sup>1</sup> This project is an extension of a nine-year Norwegian-funded collaboration involving two universities in Ukraine and one in Norway, including work with economists at the central bank of Ukraine. Now we are working with government ministries responsible for economic policies in the war-torn eastern region of the nation. The modeling team consists of more than a dozen individuals from the three universities, the government, and private advisers to the government. About half are co-authors of this paper.

<sup>2</sup> The References include documentation of physical and economic damage and human casualties and hardship in the region.

**Government Commitment.** The requirements for addressing these problems are beyond the fiscal capacity of Ukraine’s public and private sectors, and efforts to engage the international community have been underway for some time. Outside help, however, must be motivated by inside determination. In late December 2020, the President and Cabinet of Ministers made a commitment to the economic development of the Donetsk and Luhansk regions and charged the Ministry of Reintegration with developing a strategic plan for marshalling inside and outside resources for that task.<sup>3</sup> Specific legislative proposals are expected by late summer and implementation will extend over the 2022-30 period. That near-term timeline sets the schedule for our modeling work.

**Explanatory Model.** Our modeling team organized in January, and the collaboration was formalized by an exchange of documents between the Ministry of Reintegration and the System Dynamics Group at the University of Bergen in Norway. Given the dynamic complexity of numerous issues, there is a need for a systemic assessment of planned policy initiatives. The general purpose of our modeling work is to help policy makers who are responsible for those assessments.

We have built an explanatory model that represents the structure of the regional economy that emerged from the crisis period of 2014-2015. When shocked by such an exogenous force, the model replicates the economic collapse and the stagnant recovery. Moreover, it simulates a ‘base case’ scenario—how the regional economy is expected to perform during this decade in the absence of effective new policies (Figure 3).

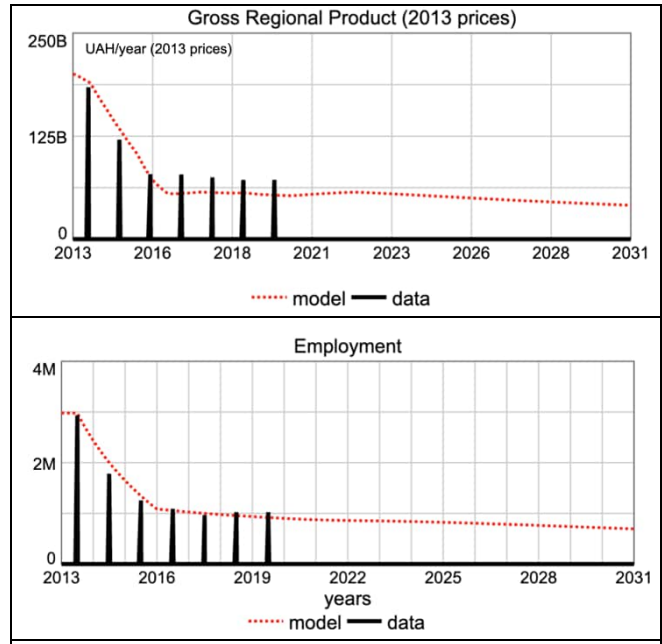


Fig 3. Model Behavior and Historical Data

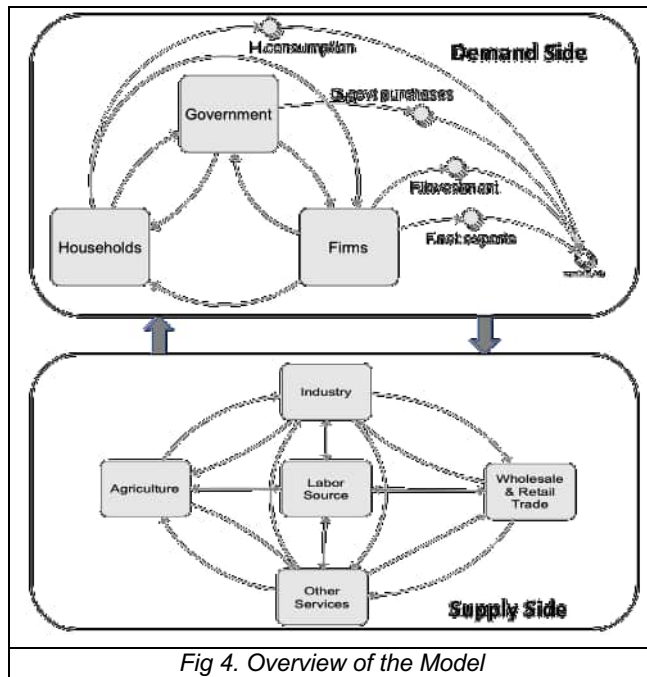


Fig 4. Overview of the Model

An overview of the model structure is displayed in Figure 4. It consists of two groups of activities: spending on the Demand Side and producing on the Supply Side. The Supply Side is disaggregated into four producer sectors—agriculture, industry, wholesale & retail trade, and services—that interact based on input-output principles. They obtain production inputs from intermediate transactions and imports. Each sector contributes to the gross regional product that generates income for the Demand Side.

The Demand Side also consists of interacting sectors: business firms (including foreign trade), households, and government. The output of the Demand Side—aggregate demand—is the input to the Supply Side. The model is mostly calibrated with regional data, but some parameters are estimated from national data. The online version of the model includes an interface with simulation controls and structural descriptions *within* each sector, in English and Ukrainian.<sup>4</sup>

**Policy Model.** We are entering the policy design and testing phase of our work. At the conference, we will discuss policy initiatives implemented in the model and identify obstacles to implementation in the real world.

<sup>3</sup> <https://www.kmu.gov.ua/en/news/uryad-shvaliv-koncepciyu-ekonomichnogo-rozvitku-doneckoyi-i-luganskoyi-oblastej>

<sup>4</sup> <https://exchange.iseesystems.com/public/redact/donbas2>

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