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ENEPO – WP8

- Deliverable 17: A recursive dynamic extension of the CGE model
- Contribution to Management Report for reporting period ending October 31, 2007

During the reporting period, we developed a recursive dynamic version (D17) of the computable general equilibrium (CGE) model that we had previously used in a comparative static framework to simulate the income and growth effects of migration and remittances in our sample countries (D16). Our objective was to assess whether the dynamic version would generate additional insights over the comparative static version that would more than compensate for the additional effort required. To this end, we applied the recursive dynamic version to the Moldovan dataset that we had generated for D16. Based on the insights gained from this exercise, we will decide whether to use the recursive or the comparative static version of our CGE model for our planned overview paper comparing migration experiences in our sample countries (D18).

The attached "list file" (a type of output generated by the GAMS software for computable general equilibrium modelling) includes our GAMS code for the dynamic version of our model as well as illustrative simulation results for Moldova and diagnostic output (D17). We adapted the GAMS code from similar work that was recently carried out by Manfred Wiebelt at the Kiel Institute for the World Economy; ultimately, the code is based on work by Hans Loefgren at the International Food Policy Research Institute (IFPRI) during the early 2000s.

Ours is a standard neoclassical model that is solved for each time period from 2004 (our base year for which we had data) to 2010. The link between individual years is generated mainly by current investment adding to the capital stock for the following year. There is no intertemporal utility maximization.

Table 1 briefly summarizes our illustrative simulation results. Our first scenario describes in a highly stylized fashion how current trends in migration and output growth might continue. There is an empirical puzzle in that fixed investment has been less than spectacular, but GDP has grown by more than 5 percent in almost every year since 2001. At the same time, labor emigration has caused the domestic labor force to decline by approximately 3 percent year after year. Therefore, measured total factor productivity at the sectoral level must have been growing fast; possible reasons include the elimination of underemployment through labor emigration and a very gradual establishment of market-supporting institutions following systemic transformation in the early 1990s and, particularly, the privatization of agriculture during the late 1990s.

Therefore, our first scenario assumes that total factor productivity grows by 3 percent annually, along with an annual decline in the domestic labor force of 3 percent and 15 percent annual growth in workers' remittances. As expected, the large inflow of remittances leads to a Dutch-disease-type effect with a real appreciation of the Moldovan currency, falling exports, and fast-growing imports. Private consumption, at 6 percent per year, grows twice as fast as GDP (which is largely driven by TFP growth of 3 percent). Household expenditures grow at 6 to 8 percent per year for all household groups except for public transfer recipients, whose expenditures still grow at almost 3 percent per year.

Our second scenario illustrates a hypothetical world without additional labor emigration (for example, because Russia or the EU effectively limit illegal access to their labor markets).

Table 1. Moldova: Illustrative Stylized Scenarios for Labor Migration and Output Growth, 2004-2010

	Scenario 1 Base case	Scenario 2 No migration
Assumptions		
Annual growth rate of labor stock (percent)	-3.0	0.0
Annual growth rate of self-employment in agriculture (percent)	-1.0	0.0
Annual growth rate of non-agricultural self-employment (percent)	-1.0	0.0
Annual growth rate of workers' remittances	15.0	1.0
Annual growth rate of economy-wideTFP (percent)	3.0	1.0
GDP and components		
GDP	3.1	3.2
Private consumption	6.5	2.7
Fixed investment	-2.2	-5.2
Exports	-3.2	2.2
Imports	4.5	1.8
Real Exchange Rate	-3.6	0.2
Household expenditures (by main income source; annual change, percent)		
Farmers	6.9	1.3
Other rural households	6.2	3.2
Non-rich urban households	7.4	3.9
Rich urban households	7.6	4.2
Public sector employees	8.1	3.9
Transfer recipients (mainly old-age pensioners)	2.9	0.6

Measured TFP growth is assumed to fall to 1 percent annually because underemployment is no longer relieved through emigration. As a result, private consumption grows only at 3 percent per year, or half as fast as in the first scenario. GDP growth remains broadly unchanged; investment falls sharply while both exports and imports increase and the real exchange rate remains broadly constant. Subsistence farming households as well as transfer recipients experience below-average increases in household expenditures.

While these simulations are plausible and informative, broadly the same results have been obtained earlier with the comparative-static version of our model. It is true that the dynamic version offers a richer description of the process of fixed capital formation. However, the assumptions needed (e.g. on depreciation rates, profit rates by sector, etc.) are far-reaching and cannot be based solidly on empirical evidence, given restrictions on data availability in all our sample countries. As a result, these assumptions mainly reflect current practice in similar literature. For our planned summary paper on the effects of migration and remittances in all our sample countries (D18), it would not be helpful, therefore, to go through the additional technical effort of implementing the dynamic version of our CGE model for all countries. We will use the comparative-static version in D18 and focus our research efforts on carefully modelling the incidence of remittances at the household level and the resulting general equilibrium effects.