Economy-wide impacts of the energy price compensation policy

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Acronyms and Abbreviations

CGE : Computable General Equilibrium

SAM: Social Accounting Matrix

GDP: Gross Domestic Product

EVFR: Energy Vulnerability Reduction Fund

EVIS: Energy Vulnerability Information System

GHG: Greenhouse gas emissions

VAT: Value added tax

MDL: Moldovan Lei

TFP: Total factor productivity

ODA: Official development assistance

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Abstract

Rising inflation spurred by rising energy and food prices has increased the risk of energy and income poverty. Demand-side measures in the form of energy subsidies were introduced to support the most vulnerable households. While microanalysis revealed strong positive effects on reducing energy and income poverty, especially for the most vulnerable households and those using gas as a primary energy source, macro analysis in this brief goes beyond to assess the economy-wide effects, such as the impact of subsidies on GDP.

The design of the compensation scheme was guided by the urgency to support the most vulnerable while shielding the economy from the negative impacts of energy crisis. The subsidies were administered through energy companies where households had not been directly compensated via designated income transfers due to the administrative and informative burden that such a programme usually entails and limited time frame, but rather through reduced energy bills.

Employing a Computable General Equilibrium (CGE) model that integrates various household types, this analysis assesses the impacts of price subsidies on GDP and other broader macroeconomic indicators. The findings indicate that elevated energy costs, particularly of natural gas, exert adverse influences on GDP, consumption and unemployment. Furthermore, while the policy of price subsidies has aided Moldova in mitigating the adverse repercussions of price fluctuations, the approach of targeted cash transfers performs more effectively, enabling households to allocate supplementary income in accordance with their individual preferences.

However, current support mechanisms are not able to fully offset the negative effects. This requires determining the ideal subsidy rate (cash transfer income) that assists households in sustaining their consumption at pre-shock levels while also encouraging a shift away from natural gas, which is aligned with the overarching objective of enhancing long-term energy efficiency.

Executive summary

In 2021, natural gas and electricity prices increased by sixth-fold for households in Moldova. In response to the rising inflation, driven mainly by world energy (natural gas) and food commodity prices, the Government of Moldova, with the support of international development partners, designed an Energy Vulnerability Fund to support the most vulnerable households.

From a macroeconomic perspective, implementing such a programme raises several issues. Using subsidies to offset the increase in world commodity prices is costly. The limited fiscal space of the Government can impose hard constraints on the number of households included in the programme. Moreover, the fiscal resources used to support households' heating patterns, i.e. natural gas consumption, might be lacking for their potentially more productive use elsewhere in the economy. Also, large subsidy distribution programmes require an extensive information framework that will ensure that subsidies accrue to those most in need. In addition, how the subsidy is distributed among the households also matters. While current legislation envisages direct and targeted price subsidies, multiple forms of subsidy programmes can be designed, including price caps and temporary tax breaks, vouchers and cash transfers, specifically targeting energy vulnerable consumers. These programmes all differ in design and efficiency, and can deliver the needed support where it is most needed.

This policy brief explores the macroeconomic impacts of the government programme that distributes energy consumption subsidies to limit the impacts of the increasing energy commodity prices (specifically natural gas). An analysis is carried out using a fully-fledged

recursive dynamic Computable General Equilibrium (CGE) model, which explicitly incorporates four distinct households: households with very high energy vulnerability; households with high energy vulnerability; households with medium energy vulnerability; and households with low energy vulnerability.

In addition to the baseline and external price shock scenarios, the effects of a targeted price subsidy and an alternative subsidy scheme consisting of a targeted cash transfer are explored. For both scenarios, the same funding structure of the intervention is maintained, i.e. 42 percent of domestic resources and 58 percent are covered by the official development assistance (ODA). The overall value of the fiscal intervention remains the same. Both interventions aim to offset the negative impacts of the natural gas world price shock.

The results suggest that the increase in the import price of natural gas has severely affected Moldova's economy because of its high dependency on energy imports and the lack of diversification of fuels and other sources of energy. Specifically, higher natural gas price has led to lower GDP, lower private consumption and higher unemployment.

The subsidy policy has helped the country mitigate the negative effects of price shocks. The targeted cash transfer fares better than the targeted price subsidies because cash transfers allow households to allocate additional income according to their preferences. Consequently, they might consume domestically supplied products, which can have a higher multiplier effect.

In addition, neither price subsidy nor the cash transfer of this order of magnitude can fully offset the negative impact of higher natural gas prices. This requires determining an optimal subsidy rate (cash transfer income) in order to help households maintain their pre-shock consumption levels while incentivizing the substitution of natural gas as part of the long-term goal of increasing house energy efficiency.

1. Introduction

This policy brief explores the role of energy consumption subsidies in addressing the Government of Moldova's concerns about raising energy poverty resulting from external price shocks. The limited inherent resilience of the Moldovan economy to shocks in world commodity prices gave rise to energy vulnerability and poverty among households. More specifically, the design and effectiveness of the *Energy Vulnerability Fund* set up by the Government in Moldova with the support of international development partners are evaluated. Energy price subsidies are policy instruments widely used to address social concerns over the affordability of energy consumption, particularly among low-income households. As policy instruments, subsidies can correct market failures or incentivize the use of renewable energy resources. Subsidies can be deployed in several formats, including price caps and temporary tax breaks, vouchers, and subsidies targeting energy-vulnerable consumers. They all differ by design and the capacity to deliver the needed support efficiently.

In 2021, natural gas and electricity prices increased sixfold for households in Moldova. In response to the rising inflation, driven mainly by world energy (natural gas) prices, the Government of Moldova, with the support of its development partners, including Slovakia, Sweden, Switzerland and the United Kingdom, created the Energy Vulnerability Fund.[1] This legislation's main goals include preventing the population's energy vulnerability and increasing access to energy among vulnerable consumers. The law has put forward a classification of households according to their energy vulnerability. Five specific categories of household energy vulnerability are recognized in order to develop a differentiated compensation scheme: consumers with very high, high, average, low, and no energy vulnerability. The level of energy vulnerability is based on households' income level, the number of people living in a household, the number of assets (real estate) owned, the main type of energy sources, and energy-related expenditures. Based on a ratio between energy expenditures and each family's disposable income, households are classified according to the five categories of energy vulnerability.

The proposed legislative framework adopted a combination of short- and medium-term interventions to consistently address all goals. While in the short term, the focus is to ensure that no household is left behind in their demand for energy, supply-side interventions in the medium term, such as effective market mechanisms, diversification of energy resources available and improvements of energy efficiency, are critical. Subsidies are typically temporary measures because they can also potentially impact fiscal balances and economic growth, hence their limited and temporary scope. A disproportionate use of energy subsidies may significantly burden countries' fiscal balances, weaken their prospects of macroeconomic growth, and continue incentivizing wasteful consumption patterns, thus accelerating the increase of GHG emissions. Some evidence suggests that those who also become recipients of these subsidies are not always the ones who need them the most.

The energy compensation policy is expected to target around 47 percent of all households in Moldova eligible for the compensation. As a result, the subsidy payment will lead to a decline in the relative prices of energy (gas and electricity) and increase households' disposable income. Depending on the conditions of the market, this will affect households' consumption and savings choices, and act as a substantial shock to markets. This raises a series of critical questions for policymakers: How would the economy's supply-side respond to a sudden reinforcement of the household's ability to pay? What are the implications in terms of a reallocating factors of production across activities? What is the best financing option for such a policy?

This policy brief aims to answer these questions by exploring the macroeconomic impacts of the recently established scheme of energy price subsidies for vulnerable households.

[1] For more details, see Law no. 241 of 28-07-2022.

The analysis will identify and review the different impact channels through which the energy compensation policy affects a country's GDP, welfare, production and employment patterns. To this end, a dedicated dynamic recursive computable general equilibrium (CGE) model of a small open economy for Moldova is employed.

The remainder of the policy brief is structured as follows: section 2 presents a brief overview of Moldova's energy policy. Section 3 introduces the macroeconomic context and spells out the main questions addressed by the analysis. Section 4 presents an overview of the model and underlying social accounting matrix. Section 5 examines the scenarios under analysis; section 6 presents the study's main findings; and the last section concludes.

2. Energy policy

The economy of the Republic of Moldova remains highly energy- and carbon-intensive, with a large potential to increase energy efficiency, a broader deployment of renewable energy and reduction of air pollution and greenhouse gas (GHG) emissions.[2] Around 90 percent of its national energy needs are covered by energy imports linked with substantial costs and volatility. According to the national statistics, in 2021, the annual energy imports amounted for around US$1.1 billion, or 8 percent of country's GDP.

Moldovans are strongly concerned with the recent gas and electricity price increases and affordability. The recently established Energy Vulnerability Fund contributes to the shifting the policy focus towards targeting support to specifically low-income (or highly energy vulnerable) households that fall below the (energy) poverty line, together with the design of programmes promoting energy savings through energy efficiency interventions, thermal renovation of buildings, diversification of gas supplies, and switches to renewable energy resources.

Limited progress has been achieved on the supply side in the diversification of the supplies of both gas and electricity through an interconnection of the existing gas distribution system with Romania. Similarly, greater efforts are needed in deploying renewable energy, including introducing relevant incentives and support mechanisms.

On the demand side, Moldova has had limited experience with targeted systems of energy price subsidies. Historically, some households in Moldova were eligible for sporadic support distributed by the local authorities. For example, some municipalities have a history of providing subsidies (around US$30–60 per month) to vulnerable groups. Households support schemes are generally non-targeted and based on tax reductions and exemptions. For example, the value added tax (VAT) imposed on gas and electricity is set at 8 percent instead of the standard level of 20 percent. Before establishing the Energy Vulnerability Fund, energy consumption subsidies increased from US$141 million in 2011 to $182 million per year in 2014, i.e. around 2.3 percent of GDP.

Historically, Moldova has benefited from favourable gas and electricity prices negotiated regularly with Gazprom. Yet, low energy prices undermined the Moldova Government's efforts to incentivize reduced energy consumption. Together with several unresolved issues, significant debt accumulation continued marring the more straightforward

[2] Kirchner, R., Chervyakov, D., Kuznetsov, A., Stiewe, C., & von Mettenheim, M. 2021. Berlin Economics. Policy Study 0 1 | 2 0 2 1. Gas price shock in Moldova: Compensation schemes for protecting the population. NULLGerman Economic Team. Moldova. Berlin/Chişinău. www.german-economic-team.com/wp-content/uploads/2021/12/GET_MDA_PS_01_2021_revised.pdf

relationship to Gazprom as gas supplier.[3] As a result, in 2021–2022, Moldova faced a continuous fluctuation of gas prices, increasing from around US$450 per 1,000 m^3, to US$770 per 1,000 m^3, and then dropping to US$650 per 1,000 m^3 in October 2022. Russian Federation remains the only source of natural gas in Moldova. Natural gas remains the key fuel for district heating and combined heat and power systems. Moldovan households are currently faced with gas prices that are six times higher than last year and twice as high as those in Romania, and with a similar trend for electricity prices.

The overall consumption of natural gas in Moldova has been low. In 2018, total natural gas consumption reached 2.9 billion m^3, of which of 1.6 billion m^3 was consumed in Transnistrian region. Households' energy prices, set by the national agency for energy regulation (ANRE), still have not reached their cost covering levels. Energy resources are taxed by a preferential VAT rate. In September 2021, natural gas household tariffs increased by 27 percent to MDL29.27 (US$1.51) per m^3. Tariffs paid by households[4] are set to reflect the level of vulnerability regulated by Decision 814/2022. For natural gas, the price span that households are required to pay per m3 starts with MDL12, charged to the households in the remarkably high vulnerability category, and MDL29.27 charged for non-vulnerable households without any compensatory contribution.

Similarly, with regarding heat, the price that households are required to pay per m3 ranges from MDL1,450/GCal for highly vulnerable households, to MDL3,082/GCal for the least vulnerable who are not receiving any subsidy. The subsidized amount is calculated by the difference between MDL3,082 per m3 and the price assigned for each specific vulnerability category.

3. Macroeconomic context

The baseline for the analysis is taken from the Economic Outlook (International Monetary Fund (IMF), April 2021) for Moldova.[5] The outlook was marked by multiple uncertainties, including the evolution of the COVID-19 pandemic and the local political environment. Given the limited economic activity in 2020 with GDP declining by 7 percent, driven by lower private consumption and five-year low employment levels, a slow recovery is expected (Table 1).

Table 1. Key baseline macroeconomic indicators

	2019	2020	2021f	2022f	2023f	
GDP, % real change	3.6	-7.0	3.8	3.7	3.8	
Consumption, % real change	2.6	-7.0	2.5	2.7	2.7	
Gross fixed investments, % real change		12.9	-2.1	7.8	8.7	8.9
Exports, % real change	7.3	-15.5	6.6	7.1	7.5	
Imports, % real change	6.7	-8.9	5.1	6.3	6.5	
External debt, % GDP	62.0	70.1	74.6	74.0	73.5	
Fiscal balance, % GDP	-1.4	-5.1	-4.0	-2.8	-2.5	
Public and guaranteed debt, % GDP	27.4	35.2	41.3	42.5	43.6	

Source: World Bank (2021)

Note: figures for 2021, 2022 and 2023 are forecasts

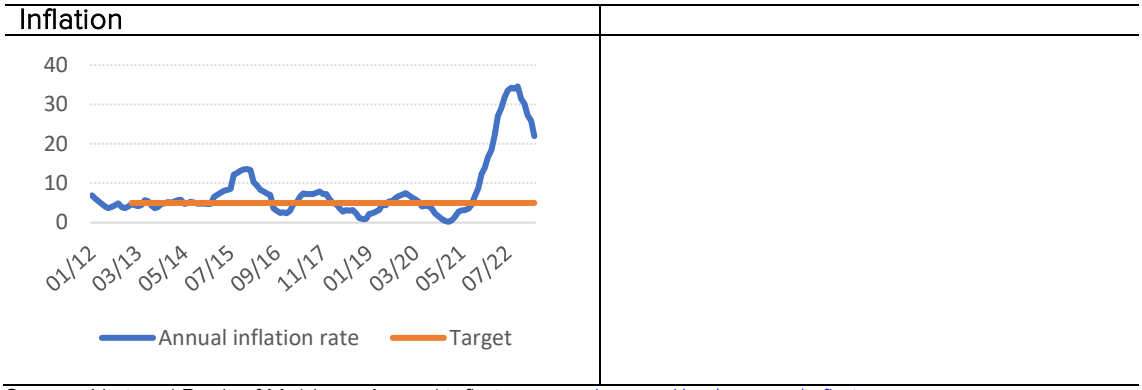
[3] In October 2021, gas-related debt in Moldova reached $709 million and around $7 billion for Transnistrian region. In November 2021, an agreement was signed to settle the US$65.8 million debt.
See:www.euronews.com/2021/11/23/russian-gas-giant-gazprom-threatens-to-cut-supplies-to-moldova, www.themoscowtimes.com/2021/11/09/moldovas-gas-crisis-and-its-lessons-for-europe-a75503

[4] www.legis.md/cautare/getResults?doc_id=134277&lang=ro

[5] The World Bank EBRD-IDA (2021).

The slow rebound in 2021 gave rise to inflation concerns reaching 3.8 % in 2020 and sharply increasing in 2021 (Figure 1)

Figure 1. Evolution of inflation



Source: National Bank of Moldova. Annual inflation. www.bnm.md/en/content/inflation

The country's fiscal stance was challenging due to the efforts to mitigate the impacts of the pandemic and weak labour market conditions. As a result, public debt is expected to increase. The expected budget deficit in 2023 will reach around 6 percent of Moldova's GDP. Poverty, measured by the US$5,50 PPP per day poverty line, is expected to increase.

4. Analytical framework

Our analysis is built on PEP-1-t (dynamic version for a single country) by Decaluwé et al. (2013). It is a recursive dynamic CGE model. The model is calibrated to replicate the base year (2021) Social Accounting Matrix (SAM). In the model, the public investment is quasi-exogenous, and savings are fully endogenous (investment driven). The historical growth rate drives the dynamics of the main variables at 6.7 percent per annum. Labour market variables follow the country's population growth rate, which has been declining at 2.3 percent annually.

Investment levels from the previous period determine the sectoral capital accumulation rates in the current year, considering the prices of capital goods and depreciation. Capital depreciation is set at 5 percent. Modelling of the labour market determines wages, labour allocation across different industries, and unemployment.

The unemployment rate starts at 2.6 percent, as reported by the Statistical Agency for 2021. In the model, unemployment is determined through a wage curve, a functional relationship between unemployment and wages, which determines the wage-employment rate. For the sake of simplicity, current account balance and savings are treated as exogenous variables. Similarly, government spending remains exogenous, leaving the fiscal balance to adjust to the revenues. It should be noted that the model does not fully capture the full pricing framework for energy commodities. A government-owned monopoly company distributes natural gas in Moldova. As a result, households pay regulated prices, which do not necessarily cover the production costs.

The analysis draws on Moldova's estimated SAM, which reflects the base year 2021.[6] The procedure deployed to estimate the SAM builds on available statistics from the aggregated national accounts, generation of income account and government finance statistics, industry production accounts, and external trade. The data were compiled and used to disaggregate the activity, commodity and production factor accounts of the SAM, and domestic institutional sectors. The 2021 SAM can distinguish between 10 different activities and commodities, two types of production factors (labour and capital) and four categories of households (distinguished based on their energy vulnerability). The SAM also includes the main fiscal policy instruments, including VAT, taxes on imports, products and production, income and excise taxes. Table 2 captures the structure of demand and supply

[6] Note that the underlaying SAM was estimated in its aggregated from on a basis of the available statistical evidence.

structure of the economy. Private consumption (83.55 percent) is the main driver of the GDP growth. The supply side is dominated by services that target the domestic market and are produced by local producers, followed by manufacturing (21 percent of GDP). The ratio of imports and domestic production is close to 1, i.e. the competition in the domestic market between imports and domestic production for this sector is critical. The share of value added of energy sector is about 2 percent of GDP, and the supply of energy commodities is dominated by imports (Table 3).

Table 2. Structure of the GDP

	Ratio-to-GDP (%]
Private consumption	83.55
Public consumption	16.76
Investments	26.86
Exports	30.65
Imports	57.82

Source: Author's calculations.

Table 3. Structural indicators

	VA/GDP	Import/XS	Export/XS
Agriculture	0.10	0.04	0.12
Manufacturing	0.21	0.90	0.30
Energy	0.02	1.70	
Services	0.55	0.10	0.15

Private consumption accounts differentiate between four categories of private households, which are classified according to their degree of energy vulnerability (Table 4).

Table 4. Structure of private consumption of each representative household (RH).

	RH1	RH2	RH3	RH4
Agriculture, forestry and fishing	0.0080	0.0117	0.0101	0.0159
Manufacturing	0.4585	0.5475	0.4336	0.5096
Production, transmission and distribution of electricity	0.0367	0.0511	0.0422	0.0485
Gas production	0.0329	0.0451	0.0383	0.0387
Supply of steam and air conditioning	0.0014	0.0049	0.0016	0.0055
Water supply and waste management	0.0147	0.0152	0.0095	0.0088
Construction	0.0092	0.0095	0.0059	0.0055
Private services	0.1922	0.2338	0.1529	0.1770
Social contributions	0.1419	0.0468	0.1762	0.1097
Direct tax	0.0346	0.0114	0.0430	0.0267
Investments and savings	0.0698	0.0230	0.0867	0.0539

Source: Author's calculations.

5. Scenarios

The authors ran a series of scenarios comprising the baseline scenario, an external gas price shock and two alternative policy responses to the external shock.

In the baseline scenario, labour supply increases in line with population growth, and total factor productivity (TFP) is adjusted to mimic IMF GDP projections. The 2021 projections for 2022–2025 were used because they do not include price shocks due to the war in Ukraine.

TFP was maintained at the same level as in the baseline for the external price shock scenario. However, here, changes in the international price of natural gas are introduced

for 2022–2024. Data from the World Bank's commodity price forecasts[7] were used to compute the price changes. This dataset includes observed and projected prices for two categories of goods: energy products and non-energy products. To calculate price changes, price projections before the war in Ukraine and during the war were compared (Table 5).

As shown in Table 5, the price of natural gas on the European market more than doubled in 2022 after the start of the war, which could represent a significant negative shock for an economy like Moldova's, which depends on imported gas.

Table 5.World prices of natural gas

				2023 projections		
Commodity	Unit	2020	2021	2022f	2023f	2024f
Natural gas, Europe	$/MMBtu	3.2	16.1	40.3	19.0	17.0
Natural gas, U.S.	$/MMBtu	2.0	3.9	6.4	2.7	3.7
Liquefied natural gas, Japan	$/MMBtu	8.3	10.8	18.4	18.0	16.0
				2021 projections		
Natural gas, Europe	$/MMBtu	3.2	14.6	12.6	9.2	8.9
Natural gas, U.S.	$/MMBtu	2.0	4.1	4.0	3.9	3.9
Liquefied natural gas, Japan	$/MMBtu	8.3	11.9	11.4	10.0	9.8

Source: World Bank (2023). Commodity Markets.

In the targeted price subsidy scenario, it is assumed that the Government introduces a subsidy on the consumption of natural gas for households in response to rising prices. It is also assumed that gas prices will return to pre-war values by 2025. The model endogenously determines household-specific subsidy rates consistent with the total funds allocated to the compensation policy. However, the model includes assumptions consistent with the fact that the most vulnerable households would receive the highest subsidy rate. The total subsidy to households during the three years (2022–2024) of the Funds' existence amounts to MDL1,750,5, representing 0.72 percent of the 2021 GDP. The Government's contribution to the total fund is 42 percent, while external transfers cover 52 percent. It is assumed that the Government's contribution is drawn from its savings, i.e. the compensation policy will likely reduce its capacity to invest in projects. Since the model assumes that public investment is exogenous, the Government will likely take money from the private sector to maintain the required level of investment.

There are multiple options to deliver subsidies to vulnerable households. These methods typically differ in efficiency costs or incentives that they generate for households. For comparison, the authors explored an alternative intervention design in the form of a cash transfer. In this case, the eligible households receive a respective amount in the form of a cash transfer from the Government. In reality, the amount would be determined by a specific law and maintain the distinction between households that reflects their degree of energy vulnerability. For the modelling scenario, the single household cash transfer is determined endogenously so that the overall amount spent on this intervention remains equal to the scenario with price subsidy. The structure of financing the intervention remains the same as in the case of price subsidy.

[7] World Bank. Commodity Markets. www.worldbank.org/en/research/commodity-markets#1

6. Results

The authors analysed an increase in the world price of natural gas starting in 2022. In 2022, the world natural gas price increased by 219.84 percent relative to the baseline. In the following years, the price increase is 106.52 percent and 91.01 percent for 2023 and 2024, respectively. These price increases were estimated by comparing the world natural gas projections in 2021 and 2023 (Table 5).

An increase in natural gas prices leads to a decline in the country's GDP, as shown in Figure 2. The higher world price of natural gas increases the consumer price of natural gas and draws much of the demand of the households away from other goods. Concurrently, resources are drawn from other sectors to gas distribution, mining and services due to the temporary higher profitability. As a result, both supply and demand for production from the remaining sectors decline.

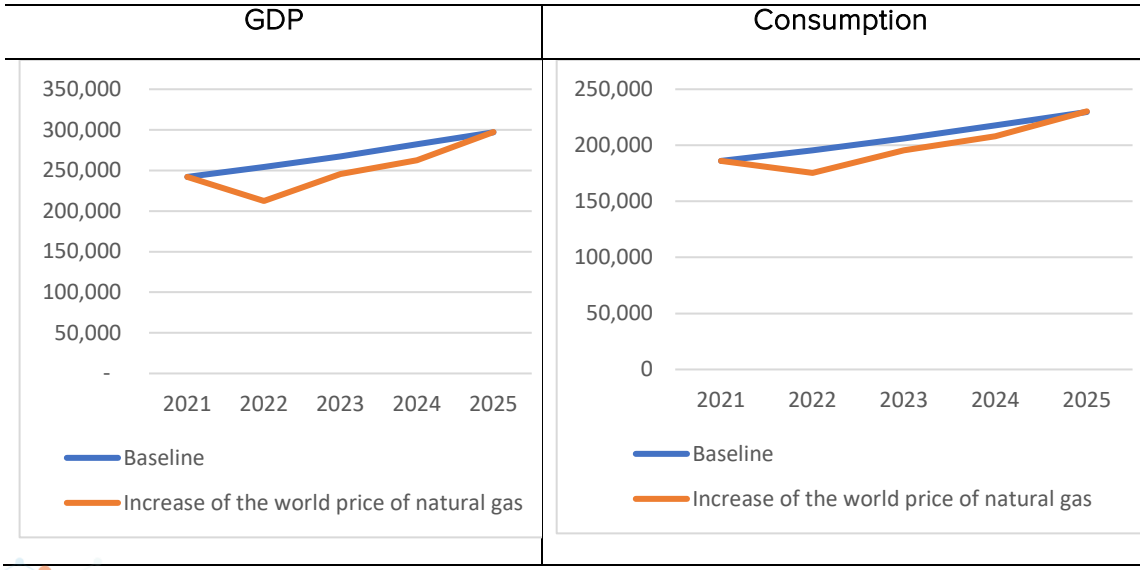
Income of all market agents, and with some exemptions, all households, decline in all scenarios year-on-year. In the targeted cash transfer scenario, it can be observed that the income transfer outweighs the income loss caused by the external price shock for household U3. The year-on-year income growth of all market agents and households is higher than in the baseline. In absolute terms, income remains below its baseline levels for the duration of the intervention.

Households U3 and U2 are better off than the other households given that their income exceeds their baseline levels in 2023 and 2024, respectively. The strongest income growth relative to the baseline is recorded for u3 and the weakest for u2. As a result of the shock, all households reduce their consumption. Income dynamics are also affected by lower economic activity and resulting changes in tax revenues. Incomes and consumption continue rising after the natural gas world prices return to their original levels.

Exports decline for all products, together with a slow strengthening of the real exchange rate. Correspondingly, imports, specifically of agricultural commodities and services, continued increasing.

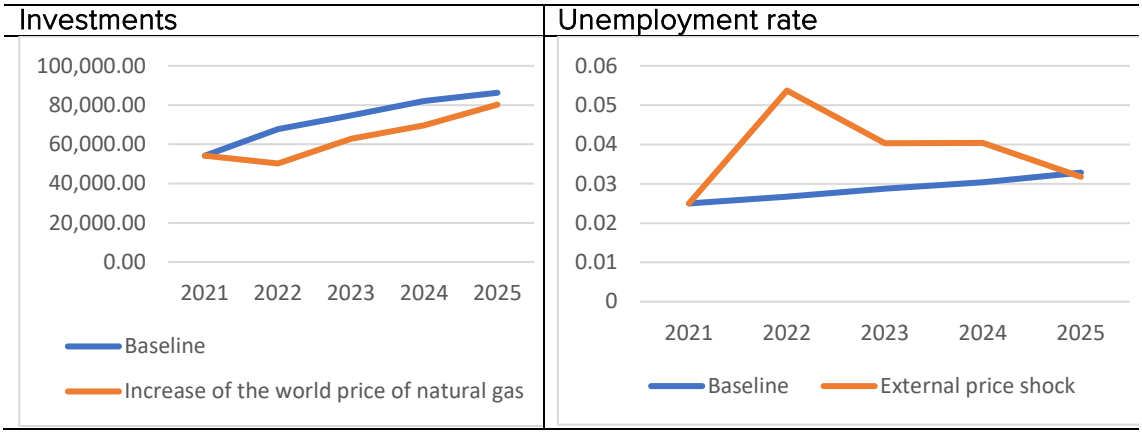
A decline in savings from all agents (firms, households, and the government) during the intervention can be observed. Only government savings continue declining once the world's natural gas prices return to equilibrium levels.

Figure 2. Impact of natural gas price increase on GDP and consumption



Most importantly, investments (Figure 3) decline through the entire simulation period due to the rising prices of investment goods and declining demand. The turning point is 2025, when investments start increasing again. As a result, the GDP declines relative to the baseline scenario. The results also show an increase in unemployment following the price shocks.

Figure 3. Impact of natural gas price increase on investments and unemployment



The two subsequent scenarios explore the impacts of the two distinctive designs of a fiscal intervention, i.e. a targeted price and income support to the households reflecting their energy vulnerability. More specifically, the following two scenarios were rim:

Scenario 1: Increase in the world price of natural gas and targeted price subsidy for natural gas consumption reflecting the energy vulnerability of the households.

Scenario 2: Increase of the world price of natural gas and targeted income transfer reflecting the energy vulnerability of the households.

For both scenarios, the same funding structure of the intervention is maintained, i.e. 42 percent of domestic resources and 58 percent are covered by the official development assistance (ODA). The overall value of the fiscal intervention also remains the same. Both interventions aim to offset the negative impacts of the natural gas world price shock. Nevertheless, the results suggest that the impact of the intervention remains small. Energy consumption price subsidies may also divert consumption away from or toward other products, depending on their degree of substitutability.

The results show that subsidy policy has mitigated the negative effect of the increased price of natural gas. If the goal is to increase GDP, then future subsidies should explore the targeted income transfer. It fares better than the targeted price subsidies in terms of GDP (Figure 4), consumption (Figure 5), investment (Figure 6) and unemployment (Figure 7). This is expected given that a cash transfer allows households to allocate additional income according to their preferences. Consequently, they might consume domestically supplied products, which can have a higher multiplier effect.

Figure 4. Impact of scenarios on GDP

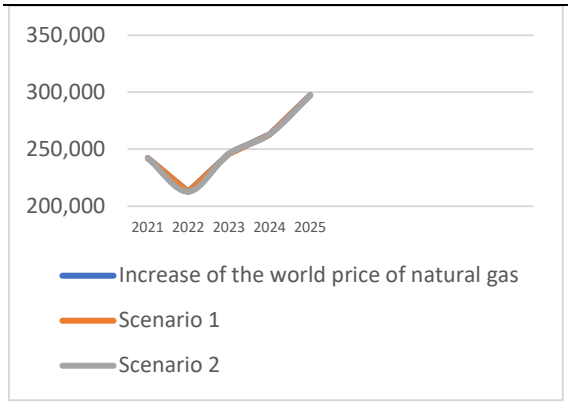
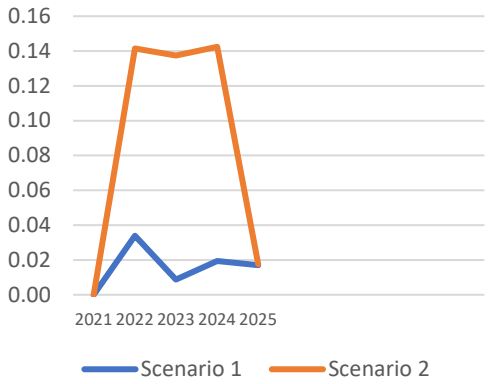
GDP	GDP impact
	

Figure 5. Impact of scenarios on consumption

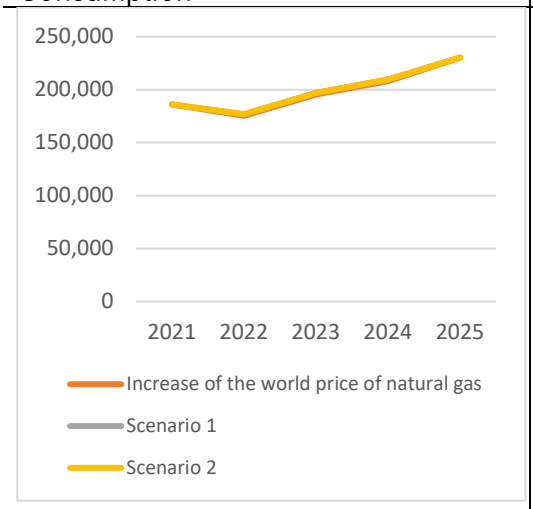
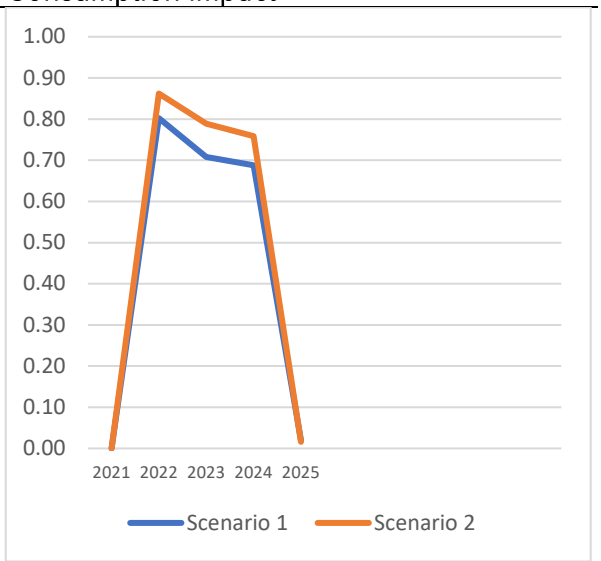
Consumption	Consumption impact
	

Figure 6. Impact of scenarios on investment

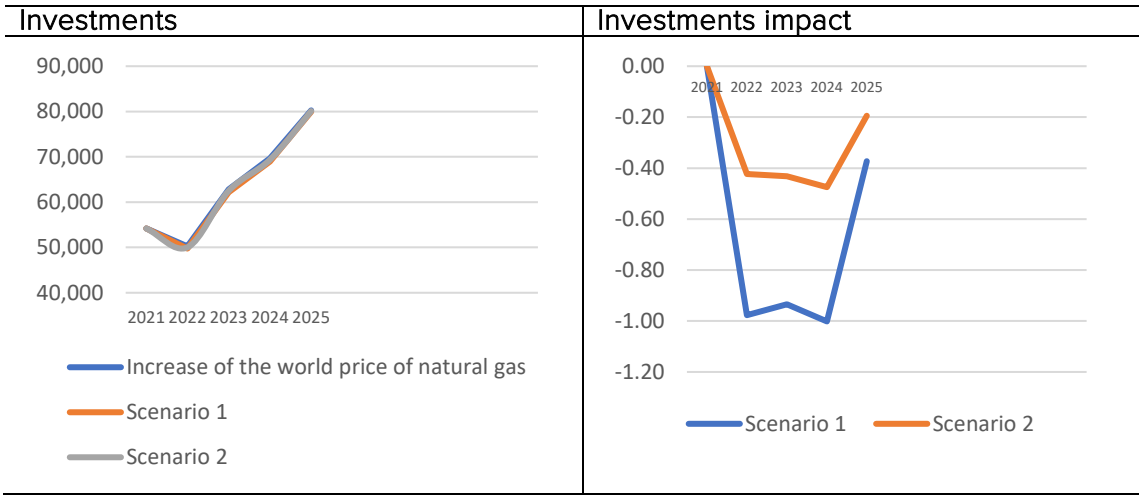


Figure 7. Impact of scenarios on unemployment

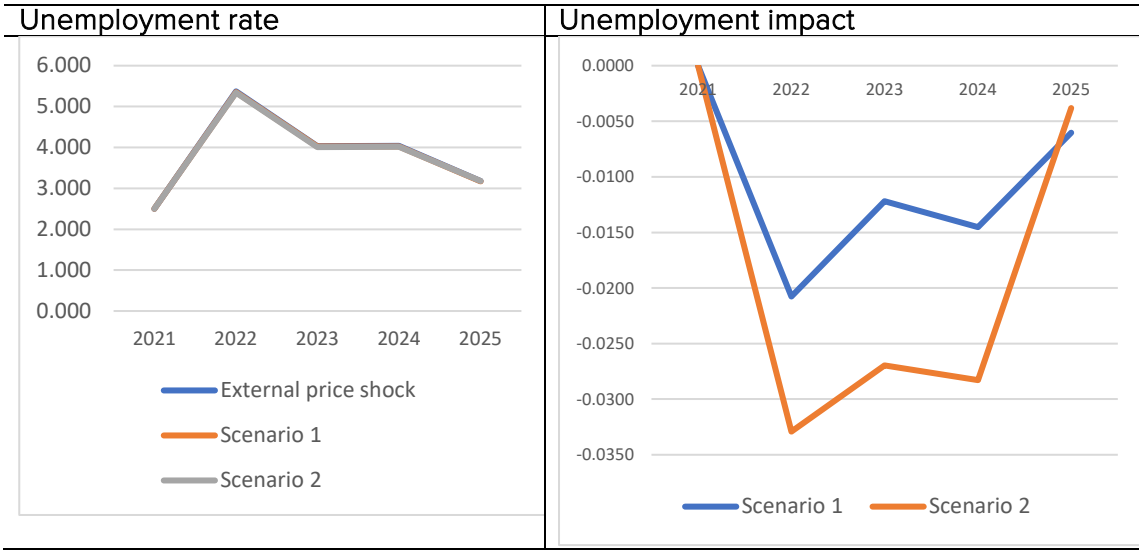


Figure 8 shows the impacts on households' income. According to the estimated SAM, households generate their income from diverse sources incl. labour, capital and transfers from the Government and abroad. The results suggest that both scenarios offset the impact of external price shock. Cash transfer, however, seems more effective by offsetting larger share of the income lost due to the price shock. Several factors might be driving these results, including changes in demand by preference mentioned earlier. Although the price support contributes to the decline of natural gas prices, the price subsidy also alters the relative prices. As a result, households adjust their consumption and do not fully benefit from the support.

Figure 8. Impact of scenarios on households' income

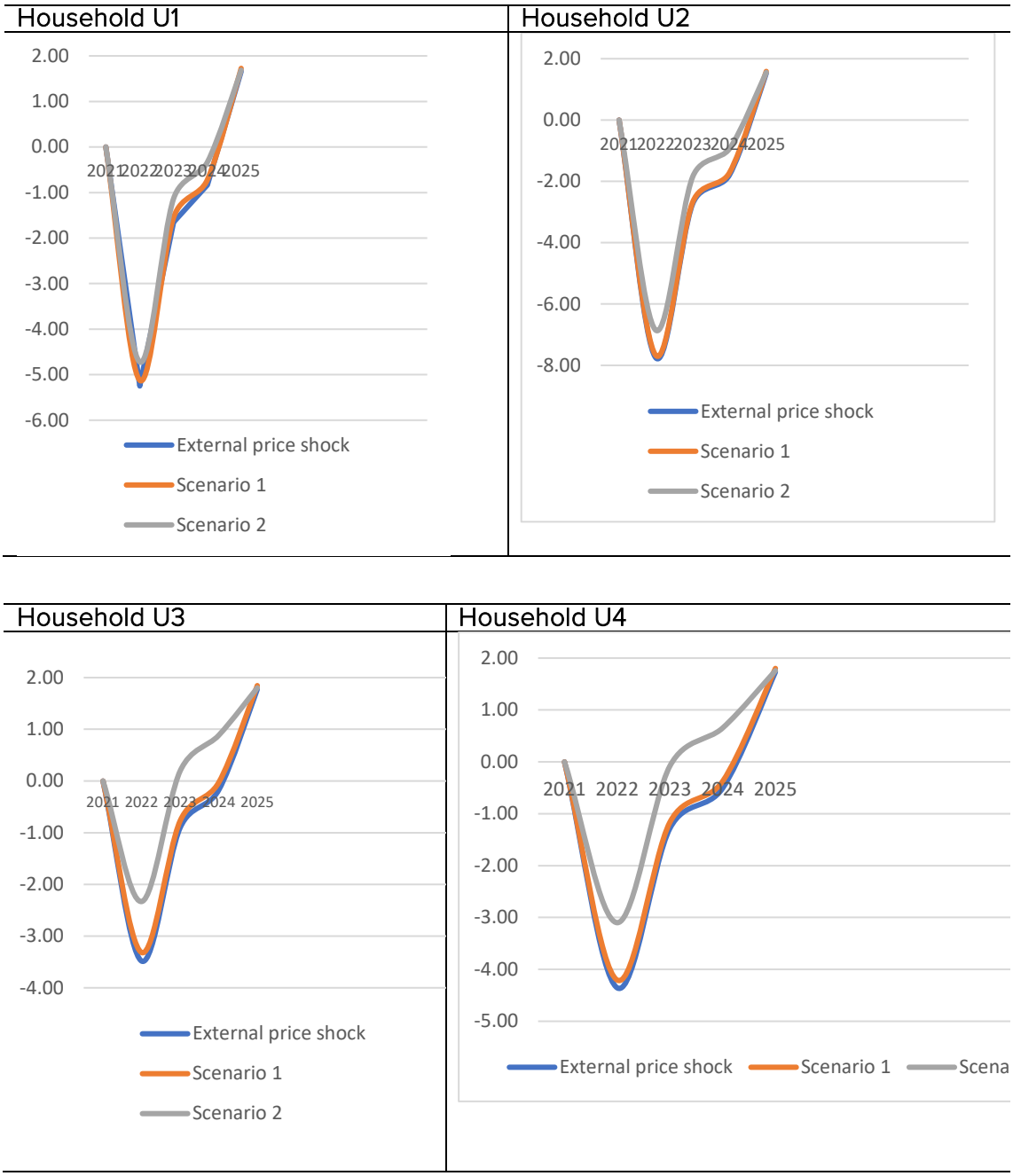


Table 6 presents the estimated multipliers for both subsidy schemes. In line with previous results, fiscal multipliers are relatively higher in targeted cash transfer than in targeted price subsidy. However, a degree of caution is required in using the estimated values of fiscal multipliers as a measurement of the impacts of fiscal policies. There is a circularity problem with these estimates.

Table 6. Estimated values of multipliers

	2022	2023	2024
Fiscal intervention (MDL billion)	1,757.50	1,757.50	1,757.50
Fiscal multipliers (%)			
Scenario 1: External price shock and targeted price subsidy	0.041	0.012	0.029
Scenario 2: External price shock and targeted income transfer	0.171	0.192	0.213

Note: Funding structure for both scenarios: 42 percent covered using domestic resources and 58 percent using Overseas Development Assistance.

The context for interpreting the results is crucial for drawing policy conclusions. Although the model offers a unique framework to study the transmission of external price shocks through the markets, the analysis carried out here is not without its limits. Major values of elasticities and assumptions regarding the production and consumption nesting are the key parameters that determine the strength of the pass-through effect and the overall macroeconomic impact. However, the authors conducted a credible sensitivity analysis elasticity parameter.

7. Conclusions

An increase in energy prices can harm the domestic economy, particularly for countries with limited alternatives to cover their energy needs from other sources. Specifically, Moldova's economy is characterized by high energy intensity. The contribution of this policy brief is threefold. First, the analysis developed a fully-fledged framework for assessing the impacts of the transition of Moldova's energy sector, addressing both the micro and macro levels. Second, it quantified the macroeconomic impacts of the two designs of energy consumption subsidies. And third, it identified different transmission channels through which the change in world prices of natural gas passes towards the domestic economy.

The analytical framework at the macroeconomic level consists of a recursive dynamic structural economic model, calibrated to the SAM for Moldova from 2021. The SAM was estimated using the available data. Such modelling framework is essential to analyse pass-through effects of the external shocks and their impacts on key structural economic indicators.

The first impact channel leads through a direct interaction with domestic price system. This channel is modelled by describing the substitution patterns between the domestic and imported varieties of goods. Households are assumed to consume a composite good consisting of imported and domestically produced varieties. As a result, the consumer price is a weighted index of both imported and domestically produced goods prices. The higher the households' capacity to substitute imported goods for domestically produced, the less vulnerable the domestic economy is and the more resilient the domestic economy becomes in terms of containing external price shocks. The ability to substitute away of imported product varieties depends on the domestic economy's productive capacities, which are described by substitution patterns between production factors and intermediate inputs.

The second impact channel leads through appreciation of the real exchange rate. The real exchange rate increased along with Moldova's purchasing power. A stronger exchange rate reinforces imports, replacing domestic production and resulting in lower GDP relative to the baseline levels.

The third impact channel works through investments and savings balance. All scenarios scenario presented lead to a decline in government savings. Price subsidies and cash

transfers, partially funded by government savings, subsidise consumption. The crowding out effect leads to lower investments in the next period and hence lower GDP.

Overall, the results suggest the following key messages:

- The increase in the import price of natural gas has severely affected Moldova's economy due to its high dependency on energy imports and lack of diversification among the fuels and sources.
- The subsidy policy has helped to mitigate negative effect of price shocks. The targeted cash transfer is better than the targeted price subsidies. Although the difference is not significantly higher, the cash transfer reflects the households' preferences, including using the additional income for savings.
- Neither price subsidy nor the cash transfer of this order of magnitude can fully offset the negative impact of higher natural gas prices. This calls for finding an optimal subsidy rate (cash transfer income) to help households maintain their pre-shock levels of consumption while incentivizing substitution away from natural gas as part of the long-term goal of increasing energy efficiency.

This is a short- or medium-term analysis of energy price subsidies aiming to reduce energy poverty incidence in Moldova. In the longer term, energy price subsidies may constitute an incentive or deterrent to innovation, technological development and productivity growth, and affect individuals' decisions in the allocation of factors and distribution of consumption over time. Through their impacts on relative prices and investment decisions of the firms, energy price subsidies may have significant adverse effects on allocating resources across sectors and economic agents, as the resulting price signals may not reflect the overall social costs of energy use.

The Government's limited fiscal space might be another factor to consider. Its use for energy subsidies might reduce ability of the government to meet other immediate fiscal needs. The United Nations Secretary-General's SDG Stimulus to Deliver Agenda 2030 lays out a blueprint to provide the means to implement energy subsidies by providing liquidity to support recovery in the near term, enhance debt relief for vulnerable countries, and better leverage lending.

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Appendix

Table A1 : Social accounting matrix (SAM) accounts

Agriculture, forestry and fishing Mining and quarrying Manufacturing Production, transmission and distribution of electricity Gas production; distribution of gaseous fuels through pipelines Supply of steam and air conditioning Water supply and sewerage Construction Private services Public administration	Activities (10)
Agriculture, forestry and fishing Mining and quarrying Manufacturing Production, transmission and distribution of electricity Gas production; distribution of gaseous fuels through pipelines Supply of steam and air conditioning Water supply and sewerage Construction Private services Public administration	Products (10)
Labour Capital	Factors (2)
Households (HHs) with very high energy vulnerability HHs with high energy vulnerability HHs with medium energy vulnerability HHs with low energy vulnerability Firm Government Rest of world	Institutions (7)
Other tax Value-added tax Tax on imports Excise Subsidies on products Taxe on production Subsidies on production Direct fax	Taxes (8)
Gross fixed capital formation Changes in stocks	Capital accumulation (2)

Sensitivity analysis

The authors increases (+35 percent, High) and decrease (-35 percent, Low) the elasticity parameters in the production function, exports, imports to see how sensitive the results are.

Table A2 shows that it might be possible to see the difference in terms of magnitudes, but the key message is the same: the increase of the import price of natural gas has severely affected the Moldova's economy, and the subsidy policy has helped to mitigate negative effect of price shocks. The targeted cash transfer fares better than the targeted price subsidies.

Table A2: Sensitivity results

	GDP (MDL million)				
Low (-35%)	2021	2022	2023	2024	2025
Baseline	242,078.6	245,097.9	255,823.6	266,171.0	279,840.7
External price shock	242,078.6	196,498.2	232,691.9	246,797.9	284,234.2
Scenario 1	242,078.6	196,643.3	232,826.4	247,023.2	284,525.1
Scenario 2	242,078.6	196,911.6	233,212.5	247,367.0	284,421.9
High (+35%)	2021	2022	2023	2024	2025
Baseline	242,078.6	259,434.4	274,309.3	291,380.2	306,362.1
External price shock	242,078.6	224,520.7	254,078.7	272,208.3	304,681.7
Scenario 1	242,078.6	224,573.1	254,063.9	272,171.0	304,590.9
Scenario 2	242,078.6	224,754.1	254,330.0	272,464.6	304,648.5