

War, energy poverty, and capabilities: the case of Georgia in the South Caucasus between 2006 and 2009

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ABSTRACT

What are the consequences of a war on the daily life of a society, in particular on its access to energy and thus on energy poverty and its correlates in terms of well-being? Georgia, a country in the South Caucasus, offers its experience as it faced a war from Russia in August 2008 and earlier, different episodes of Russian-provoked conflicts after its secession from the Soviet Union in 1991. Two years before and one year after the 2008 war, several thousand Georgians were interviewed in a multi-scope survey. In this quasi-experimental design, these panel data make it possible to 'follow' respondents in 2006 and 2009 and their perceptions of their economic and material situation, their energy access problems, as well as their general and mental health, and the extent of social support they receive or do not receive. A panel analysis on these developments is contextualised with information on public policies. The results indicate that severe energy poverty is more prevalent in rural areas where the population mainly relies on firewood for heating and cooking. Furthermore, capabilities predict energy poverty dynamics better than socio-demographic variables.

1. Introduction

In August 2008, Georgia, a country in the South Caucasus, faced a war from Russia, and before that, several conflicts initiated by Russia. How has this affected people's daily lives, particularly in terms of access to energy and energy poverty?

This paper focuses on energy poverty, defined as "the inability to attain a socially and materially necessitated level of domestic energy services" (Bouzarovski and Petrova, 2015:31), a condition that is associated with discomfort and difficulties such as inadequate housing, health problems, and various forms of material deprivation. As explained below, the prevalence of energy poverty was high in Georgia in the early 2000s, suggesting that a large proportion of households were severely energy poor. Energy poverty was related to a combination of low income for a large proportion of the population, of low energy efficiency of buildings, and of a lack of access to reliable energy infrastructure.

The different dimensions of energy poverty are often related to the capability approach (CA) as shown by a bibliometric analysis (Barreno-Alcalde et al., 2024). The CA was developed by Sen (1992) and

Nussbaum (2000) (for a summary, see also Robeyns, 2005). It focuses on peoples' opportunities to live a good life according to their own criteria, thus going beyond an analysis of material aspects of well-being. The capability approach thus helps to analyse the complex relationship between energy and social systems (Hillerbrand, 2018).

Therefore, the two research questions of this study are as follows. First, we explore the extent to which the Georgian population's opportunities for a good life in different areas of daily life are related to their energy poverty, as estimated by their perceptions of their budget and their household's difficulties in accessing energy services. Second, we examine the drivers of changes in energy poverty from 2006 – before the August 2008 war – to 2009.

Our research strategy is presented in Figure A1 in Appendix. Our analysis is based on a multi-scope survey that investigated the living conditions of several thousand Georgians in 2006 and 2009, allowing us to assess energy poverty in Georgia, its correlates and its evolution. Our contributions to the energy policy literature are: 1) to describe the correlates of energy poverty in a lower middle-income and post-communist country; 2) to assess the impact on energy poverty of economic difficulties caused by Russian sanctions, exacerbated by a military

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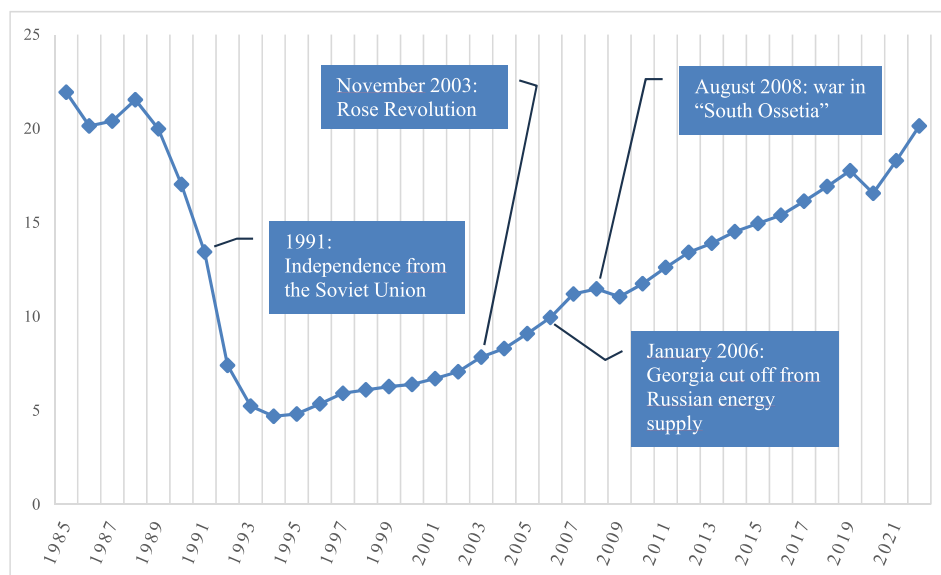


Fig. 1. Gross Domestic Product (constant 2015 trillion US\$), Georgia.

Source: World Bank Group (2024b)

conflict and the global financial crisis of 2008; 3) to show the important role of capabilities in predicting the prevalence and the dynamics of energy poverty; 4) and to propose methods for identifying energy-poor households based on people's capabilities that can be used in a context where detailed statistics are unavailable.

Section 2 of this paper presents the general context and the drivers of energy poverty in Georgia during the period under study. The conceptual framework we use follows in section 3, which focuses on the capability approach, its application to energy poverty and the relationships between capabilities and war. Section 4 presents the data and methods used in this research, and section 5 presents our results. A conclusion and policy recommendations follow in section 6.

2. Contextual factors and drivers of energy poverty in Georgia

2.1. Contextual factors

A first contextual factor is the general political and economic situation: it can affect energy poverty if there is a major downturn (impact on household income) or if prices increase significantly (higher budgets needed for energy). Georgia's history in recent decades has been marked by frequent conflict and political instability. Following its secession from the Soviet Union in 1991, the country has experienced several episodes of Russia-provoked conflicts involving different regions of the country. The conflict of the early 1990s resulted in 300 000 people being forcibly displaced from their homes (out of a total population of 4.9 million in 1993), and the Russian military intervention in August 2008 resulted in a further 138 000 people being displaced (out of a population of 3.8 million in 2008). Approximately 108 600 people returned to their places of origin while about 30 000 remained and faced possible long-term displacement by 2009 (UNHCR, 2009).

Macroeconomic challenges faced by the Georgian economy included a decline in the country's real GDP, which was divided by 4.6 between 1988 and 1994, with a slow recovery from 1994 onwards – the real GDP in 2009 was about half the level of GDP in 1988 (Fig. 1). Annual inflation peaked at over 15 000 % in 1994 (de Castello Branco, 1996) and industrial output fell by more than half in the early 1990s.

Following the Rose Revolution in November 2003, the new government implemented reform programmes that led to rapid economic growth, improved governance, and better living conditions. At the same time, however, the country faced economic sanctions from Russia in the

form of energy sanctions, trade sanctions and sanctions on Georgian migrants (Newnham, 2015), aimed at weakening the pro-Western government. In 2007, Georgia's GDP grew by 12 %, and gross national income per capita was around 1990 US\$ (The World Bank, 2009).

A second contextual factor concerns energy markets. As they determine both the availability and the cost of different energy sources to households, their potential impact on energy poverty can be huge. Georgia's primary energy supply was – and still is – dominated by imports, with 99 % of natural gas and oil products consumed domestically being imported (IEA, 2020). The domestic coal, oil, and gas production was minimal between 2006 and 2009. Hydropower accounted for 49 % of domestic energy production in 2006 and 56 % in 2009, while bioenergy contributed 40 % in 2006 and 32 % in 2009. Overall, the country remained heavily dependent on energy imports, which accounted for 71 % of total energy supply in 2006 and 63 % in 2009 (IEA, 2023).

Until 2006, Georgia was dependent on Russia for almost all its gas consumption and for a quarter of its electricity consumption (Newnham, 2015). From 2004 on, Moscow began imposing energy sanctions on Georgia, which led to massive gas price increases (up 500 %, from 50 US\$ to 235 US\$ per thousand m³ (MCM) between 2004 and 2006) (Margvelashvili et al., 2019). As the Georgian government sought to avoid price increases for households, this resulted in gas costs being borne directly by the state budget, representing 10 % of the government budget for 2007 (Newnham, 2015). The winter of 2006 became a prime example of Russia's use of energy as a political weapon, as it has also been observed for other countries, such as Ukraine and Lithuania (LaBelle, 2020). Following the sabotage of the two alternative branches of the main gas pipeline and the blowing up of the electricity import transmission tower on Russian territory, Georgia was completely cut off from Russian energy supply on the coldest day of January 2006. Georgia had no gas reserves and was in an energy blockade for two weeks in an extremely cold winter (Margvelashvili et al., 2019).

Since 2007, Azerbaijan has been Georgia's main gas supplier through the South Caucasus Pipeline, which transports gas from the Shah Deniz field in Azerbaijan through Georgia and on to the Georgian-Turkish border. Georgia can purchase up to 5 % of the transported gas per year at a preferential rate and receives up to 500 000 MCM of additional

gas (valid until 2026).¹ To provide affordable energy to households, the government's policy is to take advantage of the relatively cheap natural gas Georgia has access to as a transit country, and to supply this 'social' gas to the residential sector and to thermal power plants (IEA, 2020).

A third contextual factor relevant to Georgia are territorial inequalities such as climate, availability of energy sources, and income. In terms of geography and climate, Georgia has regions with mild climates along the Black Sea and high mountainous regions.² The harsh weather conditions in the mountainous regions, which also lack access to reliable energy infrastructure, put their populations at high risk of energy poverty. Georgia is divided into nine territorial regions, two autonomous republics and one temporary administrative-territorial unit created in the former Autonomous Region of South Ossetia. The country is monocentric, with huge differences between Tbilisi and other urban areas in terms of population, economy, income,³ access to and quality of basic communal infrastructure and energy services. As in many transition countries, significant income disparities exist between urban and rural areas (Macours and Swinnen, 2008). The rural population, which represented 46 % in 2006 and 40 % in 2020 (World Bank Group, 2024c) is particularly at risk of energy poverty (Bouzarovski et al., 2024).

2.2. Energy poverty drivers

Boardman (2010) has identified three main energy poverty drivers: household income, the energy efficiency of dwellings and the cost of energy. We slightly adapt the analysis of energy poverty drivers by considering the specificities of household energy use together with energy prices.

- (1) Income levels in Georgia were generally low and poverty rates were high between 2006 and 2009, contributing to an overall high risk of energy poverty in the population. In 2006, when the first wave of the GGP survey was conducted, the average monthly income per household was 382 GEL (214 US\$)⁴ and the monthly income per capita was 103 GEL (57.6) US\$ (GEOSTAT, 2024a). The official unemployment rate was 13.6 % (World Bank Group, 2024d) and the share of the population below the absolute poverty line was 36.9 % (GEOSTAT, 2024b).

In 2008, the country was severely affected by the Russian war in the Tskhinvali region/"South Ossetia" (the former South Ossetian Autonomous Oblast), which resulted in significant economic damage and thousands of new internally displaced persons⁵ (IDPs). At that time the effects of the global financial crisis also began to be felt (The World Bank, 2010). The official unemployment rate rose to 20.7 % in 2009

¹ Host Government Agreement between and among the Government of Georgia and State Oil Company of the Azerbaijan Republic BP Exploration (Azerbaijan) Limited, TotalFinaElf E&P Caucasian Gas SA, LUKAgip N.V, Statoil Azerbaijan a.s., Natfiran Intertrade Co (NICO) Limited, Turkish Petroleum Overseas Company Limited. (2002).

² A map presenting the different climates on the Georgian territory can be found at <https://climateknowledgeportal.worldbank.org/country/georgia>.

³ In 2007, households' monthly income in urban areas (128.3 GEL per adult equivalent) was almost twice the level of income in rural areas (66.7 GEL per adult equivalent). Income disparities were huge between regions, ranging from 45.8 GEL in Shida Kartli to 175.5 GEL in Tbilisi (The World Bank, 2009: 34).

⁴ Average exchange rates: 1 GEL = 0.5618 USD in 2006, 1 GEL = 0.5988 USD in 2009.

⁵ Internally displaced persons (IDPs), according to the United Nations Guiding Principles on Internal Displacement, are "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border." (Source: UNHCR, 2024).

(World Bank Group, 2024d). However, the monthly income per household increased to 584 GEL (349.7 US\$) (GEOSTAT, 2024a) and the share of the population below the absolute poverty line decreased by 4 points compared to 2006 (GEOSTAT, 2024b). This can be partly explained by the introduction of targeted social assistance for the extreme poor at the end of 2006.

The Social Service Agency (SSA) was established in 2006 to administer social benefits, including scholarships, pensions, targeted social assistance, and health insurance (UNEP-LEAP, 2020). Targeted social assistance schemes included electricity subsidies for the socially vulnerable population below a certain rating score. These assistance schemes benefited the entire population in need and registered in a special database. Energy vouchers were introduced later, in 2011.⁶

- (2) The overall energy efficiency of Georgian dwellings is typically low, mainly due to the age of the housing stock. In 2017 the National Statistical Office reported that 89 % of the dwellings in Georgia had been built before 1990 (GEOSTAT, 2017: 20). From the 1960s on, the country began an intensive construction of multi-family buildings called 'khrushchovkas'. Their design and construction criteria were based on the government's policy of providing a minimum standard of living for the population. Buildings constructed during this period are of poor quality, as comfort and sanitary criteria were minimal. In 2005, in urban areas, 67 % of households lived in flats in multi-apartment houses, while in rural areas, 93 % of households lived in detached houses (Economic Commission for Europe, 2007: 21).

Special groups in terms of settlement were Internally Displaced Persons (IDPs) from Abkhazia and "South Ossetia" who were relocated following the Russian wars of the 1990s and of 2008. In 2013, it was estimated that a bit less than half of IDPs (113 210 persons) were concentrated in so-called Collective Centres. Originally designed as non-residential buildings (schools, kindergartens, hospitals, hostels, research institutes), they lacked basic utilities such as sewage, gas networks and water supply. IDPs displaced after the 2008 war were compactly resettled and housed in specially built collective settlements along the East-West highway (Ministry of Economy and Sustainable Development Georgia and The World Bank, 2015).

- (3) Regarding households' energy use, no official statistics are available for the period 2006–2009, as the first energy balances were published in 2013. In the decade 2000, almost the entire population had technical access to electricity (World Bank Group, 2024a). However, power cuts and blackouts were common, especially in rural areas. Household energy tariffs were regulated by the National Energy and Water Supply Regulatory Commission and remained among the lowest in Europe, at around 0.07 US\$ per kWh between 2006 and 2009 (Legislative Herald of Georgia, 2024).

Regarding the energy sources used for heating, despite lack of data for this period, it can be assumed on the basis of more recent data that in large urban areas, gas and, to a much lesser extent, electricity were the main fuels used for heating, while in rural areas biomass was the main

⁶ Decree of the Government of Georgia on Implementing Measures to Compensate Electricity Costs for the Population (available in Georgian language only). <https://www.matsne.gov.ge/ka/document/view/2359411?publication=0>.

Table 1

The effects of war on selected capabilities.

Capability	Aspects of Nussbaum's (2000: 78–80) definition	Sources mentioning the consequences of war on these capabilities	
		In Georgia	In contexts other than Georgia
Bodily health (capability 2)	Being able to have good health	- Some settlements for IDPs are not providing social infrastructure such as pharmacies, health facilities, hospital, dispensary or ambulance station (Tarkhan-Mouravi, 2009:23). "(...) considering unhealthy life style, low quality of life, continuous stress caused by an uncertain future, and the impact of traumatic memories among IDPs, aggravated by a frequent lack of access to quality medical services, morbidity is expected to be much higher among IDPs than among the general population. Particularly inadequate living and sanitary conditions in many collective centres would be conducive to a number of health conditions (TB, infectious hepatitis, other contagious diseases, cardiovascular disease, depression). Moreover, internally displaced women may face elevated risks of STIs and pelvic inflammatory disease (PID)." (Tarkhan-Mouravi, 2009:29)	War reduces the "financial and human resources available for addressing the health needs of populations" (Ghobarah et al., 2004: 5).
Emotions (capability 5)	Being adequately nourished	To be able to cope with limited financial resources, displaced people rely on home-grown food (Seguin et al., 2017: 36).	Displacement can expose people to malnutrition and to bad food, water, and sanitation (Ghobarah et al., 2004: 7).
	Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by overwhelming fear and anxiety, or by traumatic events of abuse or neglect.	- The (2008) war had long-term effects on people's "level and quality of functioning, mental health, interpersonal relationships, and self-perception." (Khechuashvili, 2014: 53). - A study conducted among Georgian IDPs in 2003, correlates "psychosomatic illness and depression with feelings of despondency and passivity, leading to an inability to interact socially and become economically self-reliant." (The World Bank, 2013: 31). "The stress of 'living in limbo', hoping to return to their places of origin but unsure if they will ever do so, can be particularly exaggerated for those who live in insecure residences and face possible eviction or further dislocation and resettlement." (The World Bank, 2013: 31). - Displaced persons had limited access to mental health services (Seguin et al., 2017: 36). - War disrupted social relationships, resulting in "fractured communities" (The World Bank, 2013: 9). - Displacement has resulted in the loss of "meaningful intracommunity social contacts and ties by which employment was traditionally found", affecting access to informal employment opportunities, for which interpersonal connections are required (The World Bank, 2013: 9).	- The experience of displacement, the loss of everything, and the "fracture of social worlds" results in emotional distress (Burgess and Fonseca, 2020: 15). - Displacement, often combined with other stressors, contributes to a high prevalence of mental disorders (White and Van der Boor, 2021: 1).
Affiliation (capability 7)	Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction.	- War disrupted social relationships, resulting in "fractured communities" (The World Bank, 2013: 9). - Displacement has resulted in the loss of "meaningful intracommunity social contacts and ties by which employment was traditionally found", affecting access to informal employment opportunities, for which interpersonal connections are required (The World Bank, 2013: 9).	For some IDPs, poverty limited peoples' "ability to adapt to the new community, due to constraints in resources such as housing, food and childcare" (Burgess and Fonseca, 2020: 16).
Play (capability 9)	Being able to laugh, to play, to enjoy recreational activities.	"(...), in order to develop, children also need opportunities for leisure, relaxation, sports and creative self-realisation, and the lack of such opportunities may lead to academic under-achievement, social passivity or delinquency. Practically all IDP children in collective centres complain about the lack of recreational or sports facilities." (Tarkhan-Mouravi, G., 2009: 33–34) "(...) the refugees lacked much of the leisure-related equipment that was owned by prosperous (by local standards) city families." (Voskanyan et al., 2003: 9)	"Play is one of the most immediate victims of war. Even before the first casualties appear, children are rushed to safety, which curtails their opportunities to play outdoors, meet with peers and engage in any unattended, carefree activity of their own." (Glos, 2023: 28) "The mass trauma of war also affects children's play, tormenting their games with turbulent memories and emotions or, in the most serious cases, depriving them of the ability to play." (Glos, 2023: 30)

(continued on next page)

Table 1 (continued)

Capability	Aspects of Nussbaum's (2000: 78–80) definition	Sources mentioning the consequences of war on these capabilities	
		In Georgia	In contexts other than Georgia
Control over one's material environment (capability 10B)	Being able to hold property (both land and movable goods), not just formally but in terms of real opportunity; and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure."	• "Georgian IDPs face poverty, poor living conditions and infrastructure, and a lack of access to land, markets, employment opportunities, and financial services" (Seguin et al., 2017: 36) • "IDP accommodations often have inadequate or unreliable utilities, which further impedes efforts to successfully operate a business. Even when an IDP is presented with a livelihood opportunity, their extreme poverty can inhibit their ability to make a success of it, or even to take advantage of it." (The World Bank, 2013: 18). • "In the NCL^a settlements, the size and quality of land and kitchen gardens mean that few IDPs are able to earn an income; agricultural activities are largely subsistence in nature". (The World Bank, 2013: 22). • "OCL^b IDPs experienced regular power outages, electrical fires, leaking roofs, and broken utilities." (The World Bank, 2013: 15). • "In 1996, a law provided IDPs with the right to use allocated land, but IDPs were restricted from building any permanent structures" (Tsikitishvili et al., 2005: 9). This has limited their opportunities to develop economic activities. • IDPs face barriers to land acquisition, such as being registered with a temporary address, the fact that when IDPs who have acquired land stop using it, it is returned to the local administration, and a limited ability to purchase land due to "the lack of any real estate that could serve as collateral when credit is needed." (Tarkhan-Mouravi, 2009: 27).	• "The material effects then affect human opportunities to realize their central capabilities. Central human capabilities, Martha Nussbaum (2011) argued, include life, bodily health, sense imagination and thought and control over one's environment. (...) Job opportunities which provide income may no longer be available. Injuries may make humans unable to do previous jobs." (Bocquillon et al., 2024: 270)

^a NCL are New Case Load IDPs (IDPs from the war of 2008).

^b OCL IDPs are Old Case Load IDPs (IDPs from the wars of the 1990s).

fuel used for heating⁷ and access to natural gas was low. The gas tariff was around 0.15 US\$ per m³ in 2006 and increased up to 0.20 US\$ for households in 2007 (Civil Georgia, 2006).

Georgia has no district heating infrastructure, having dismantled it in the 1990s after the collapse of the Soviet Union (Bouzarovski et al., 2024). Fuelwood consumption, which still plays an important role for heating today (Kvaratskhelia and Dubois, 2023) increased from 15 620 TJ in 2006 to 15 994 TJ in 2009 (IEA, 2023). Most of the fuelwood was obtained illegally, a phenomenon that had its roots in the 1990s, when Georgia faced a severe economic crisis. In a context of limited stocks and rising prices of heating fuels, large areas of forest were cleared for fuelwood production. Illegal logging continued at least until 2016.⁸ Around 80 % of fuelwood consumption takes place in rural areas, where more than 40 % of the Georgian population lives (IEA, 2020). As in other Eastern European countries (Stojilovska et al., 2023), fuelwood is used for heating and cooking (Antadze, 2024), wood being mostly burned in inefficient stoves, resulting in serious health impacts due to indoor air pollution.

⁷ A report on Georgian households' energy consumption in 2017 shows that ten years after the period we consider, 17.1 % of urban households had an individual central heating system with natural gas while 80.8 % of urban households and 98.4 % of rural households had individual heating facilities (electricity, natural gas, wood etc.) (GEOSTAT, 2017:38).

⁸ In a report based on 2016 data, illegal logging was estimated at 75 % of the total yearly harvest (UNECE, 2020).

3. Conceptual framework

3.1. Energy poverty and capabilities

The concept of 'energy poverty' (rather than 'fuel poverty') encompasses a broader set of issues than the latter – such as access to energy sources, access to cooking and heating facilities, and infrastructure – and a broader set of consequences, including education and economic development more generally (Bouzarovski and Petrova, 2015: 32).

Analyses of energy poverty in terms of capabilities focus on domestic energy services, such as space heating, cooking meals, and refrigerating food (Melin et al., 2021), which are essential to achieving goals of value to individuals. Energy services themselves are made possible through the access to domestic energy supply, which itself depends on the availability of energy sources and of energy supply infrastructure, as well as on the affordability of these energy sources (Day et al., 2016).

Three elements stand out in this conceptualisation. First, while it seems to focus mainly on the causal relationship leading from energy sources to capabilities, it also recognises the existence of reverse causal relationships. Second, this relationship allows for different "routes" to the realisation of capabilities people value, thus suggesting that there is no single method of enhancing capabilities through the access to energy services. Third, this understanding of the relationship between energy poverty and capabilities can be adapted to different local circumstances and contexts of energy use.

In line with Nussbaum (2000), the "energy poverty-capability" literature recognises that the realisation of capabilities is shaped by factors external to individuals, such as policies and decisions related to infrastructure. It recognises that "individuals have different abilities to

convert the same bundle of resources (...) into important and worthwhile achievements” (Chipango, 2021: 452). For example, people with disabilities may require greater amounts of domestic energy services to achieve a given level of capabilities (Groves et al., 2020). Age, gender, family role and social capital may also influence the relations between energy poverty and well-being (Pellicer-Sifres et al., 2021). Differences in “conversion factors” also have the potential to make people “more vulnerable to losing real opportunities to live flourishing lives should they face energy challenges like rising energy prices or lower levels of energy efficiency in the home” (Groves et al., 2021: 5). Finally, as Groves et al. (2020) point out, the relationship between energy poverty and capabilities cannot be predicted in terms of timing, as a degradation in one aspect may have either a sudden impact on the other, or the relations may develop slowly.

Because the relationships between energy poverty and capabilities are bidirectional, influenced by the external context and conversion factors (Groves et al., 2021:5), and uncertain in their development over time, it is difficult to speak of causal relationships. Rather, there is a co-occurrence of difficulties associated with energy poverty and limitations in capabilities. Bartiaux et al. (2018, 2019, 2021) have empirically analysed these relationships in European countries using both qualitative and quantitative methods, with different approaches to operationalising Nussbaum’s capabilities. The methodology used here relies on a similar quantitative approach, complemented with a panel analysis.

3.2. Capabilities and war

Only few sources explicitly mention capabilities in their analysis of the effects of war (Tsikitishvili et al., 2005; Burgess and Fonseca, 2020; White and Van der Boor, 2021; Glos, 2023; Bocquillon et al., 2024). The literature we analyse in this section therefore includes a larger set of sources that examine the effects of war on people’s physical and mental health, their social relations and other aspects related to Nussbaum’s essential capabilities. Some sources focus on specific populations, such as women (Abdullah et al., 2010; Seguin et al., 2017), the victims of trauma (Lengfelder, 2021), or internally displaced persons (Saxon et al., 2017).

In the Georgian context, displacement has affected many people, not only in the short-term but also in the long-term, following the wars of the early 1990s and of 2008. With displacement people lost everything, found themselves in new places and had limited resources to start their lives from scratch (Khechuashvili, 2014). IDPs often had to deal with poor housing conditions, living in collective centres which were often in a very bad shape, or in private accommodations, without a durable housing situation, resulting in situations of poverty for up to twenty years (The World Bank, 2013). Overall, these wars have affected people through “multiple traumatic events and stressors over many years” (Saxon et al., 2017: 276). Table 1 presents various effects of war on Nussbaum’s capabilities which have been analysed in the literature.

Table 1 suggests that more systematic analyses of the evolutions of capabilities in contexts of war would be useful to assess the effects of war on people’s ability and opportunities to live their lives in a way they value.

Overall, the literature suggests that capabilities are interrelated with energy poverty in several ways and that war strongly impacts capabilities. However, the relations between war, capabilities, and energy poverty have not been analysed so far in the literature. Therefore, three methodological challenges need to be addressed in this research. A first challenge lies in the multi-dimensionality of both energy poverty and capabilities. A second challenge lies in the fact that energy poverty analysis requires contextualisation because it manifests in different ways depending on local specificities such as heating or cooling needs, or the availability of energy sources (Dubois, 2020). A third challenge lies in the use of quantitative methods to analyse the topic, as this requires panel data on representative samples and rich datasets to allow the

construction of relevant and context-specific indicators.

4. Data and methods

4.1. Data

In addition to data from Georgian institutions and international agencies, we use data from the Generation and Gender Programme (GGP) (United Nations, 2005). This programme coordinates multi-scope surveys with a consistent methodology and a similar questionnaire. These surveys are carried out in many countries, mainly in Europe, and are based on a large and representative sample of respondents aged 18 to 80. They provide extensive information on household and family characteristics, daily life, and related opinions: as Bartiaux et al. (2019: 233) put it, this programme “in contrast to other surveys (e.g. EU-SILC and European Social Survey), was the only one supplying information about a broad range of capabilities, allowing a robust analysis of capabilities in the categories of energy conditions.”⁹ The GGP surveys have a panel design, collecting information on the same people at three-year intervals.

In Georgia, the Generations and Gender Surveys (GGS) were conducted in 2006 and 2009. The first wave included 10 000 respondents and the second 8292 respondents. For the second wave, the aim was “[t]o conduct as many repeated interviews as possible of 10,000 respondents at GGS Wave 1” (Badurashvili, 2019: 6).

The data for Georgia contain geographical variables such as the type of area (rural/urban/capital), the region (11 regions, one of which is the capital Tbilisi), and a code for census units (114 different codes in the data file). In the second wave, there is no information on whether the respondent has moved since 2006 but a variable indicates whether the respondent was interviewed in the first wave: 86.7 % of the respondents in Wave 2 were interviewed in Wave 1 (i.e. 7191 respondents), while the remaining 13.3 % (i.e. 1101 respondents) were not.¹⁰ Therefore, the sample used for the panel (or longitudinal) analysis in section 5.2 most likely includes only those who did not move between 2006 and 2009 as the interviewers were able to re-contact them. Therefore, displacements between 2006 and 2009 (possibly due to the war) cannot be considered in our analysis.

Wave 1 and Wave 2 databases can be easily merged thanks to a unique identification number. To ensure good statistical representativeness, the GGP provides users with weights for each wave of the survey and recommends their use, which has been done in this research when analysing one wave of the survey at a time (i.e. in the cross-sectional analyses reported in section 5.1).

The panel (or longitudinal) analysis required a more sophisticated method to overcome inconsistencies in the data (see below in the methods section). Indeed, additional checks with the merged database reveal inconsistencies for some of the 7191 respondents who are supposed to be ‘followed’ across the two waves thanks to their ID number. Therefore, for the panel analysis of section 5.2, we decided to select the 6121 respondents for whom the following criteria were met:

⁹ Note that there are no other multi-scope and large-scale surveys in Georgia before 2009 (e.g. the Household Budget Surveys started in 2009).

¹⁰ According to the survey presentation (Badurashvili, 2019: 6), “Attrition between two waves did not exceed 17 % - of which 3 % were refusals; 0.6 % were absence of individual (military service, prison, sailor etc.); 0.4 % were illness of respondent that made impossible the interview; 4 % were deaths of respondents between the two waves; 4 % were temporary away respondents; 5 % were new addresses of respondents that could not be obtained.” But during Wave 1, “contact details mainly fix and mobile telephone numbers of the respondent were collected for following contacts.” (Ibidem: 8) It is therefore possible (but unlikely) that some respondents who moved after Wave 1 and relocated themselves before Wave 2 were reinterviewed.

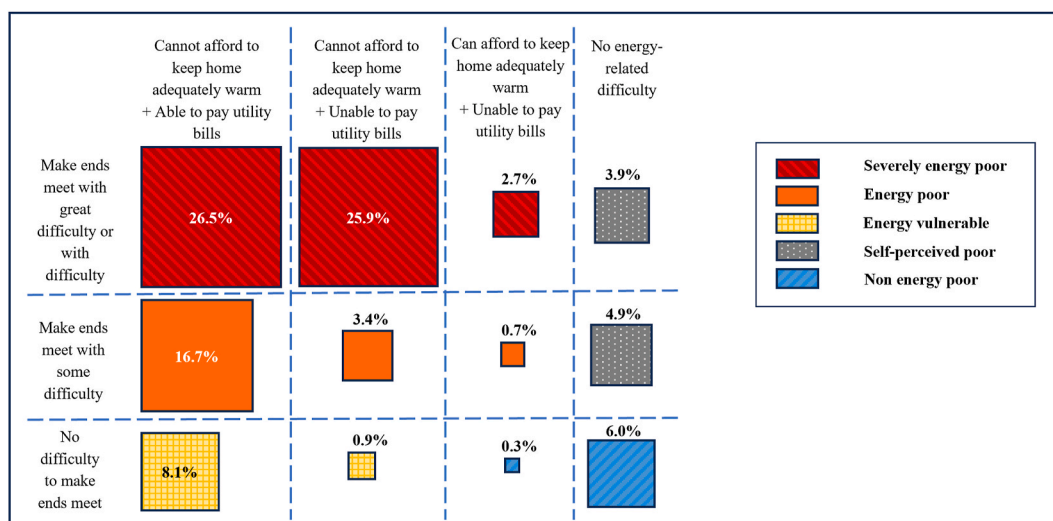


Fig. 2. Characteristics of energy poor households in 2006.

Source: Authors' elaboration, figures based on GGP data, Civil Georgia, 2006.

- 1 Being interviewed at both waves
- 2 Having the same gender recorded in both waves
- 3 Having the same year of birth ± 1 year
- 4 Having the same highest level of education ± 1 level (there are 7 ISCED¹¹ levels).

It is difficult to understand these numerous inconsistencies. The military conflicts of August 2008 led to massive displacement and a slightly different geographical coverage resulting in the loss of only a few dozen respondents from Wave 1.

4.2. Methods

This study aims to answer the two research questions presented in the introduction. The approach is exploratory, identifying the respective role of capabilities and socio-economic characteristics. Therefore, no hypotheses are made, e.g. about effect size and direction of each capability on energy poverty.

4.2.1. Energy poverty measurement

Since energy poverty is a multifaceted issue and requires contextualisation, using multiple indicators helps recognizing the diversity of household energy services that should be considered. In this research, as in others (Phimister et al., 2015; Bartiaux et al., 2019; Hearn et al., 2022), the measurement of energy poverty is based on households' self-reported income and situation regarding energy issues. Our variable is constructed from responses to three questions: 1) the household is able to make ends meet (6 categories, from very difficult to very easy), 2) the household can afford to keep the home adequately warm (2 categories, yes or no), and 3) in the last twelve months, the household was unable to pay utility bills, such as for electricity, water, gas (2 categories, yes or no). Note that this variable is slightly different from 'arrears on utility bills in the last twelve months', a variable used in several quantitative surveys on energy poverty (e.g. Thomson and Snell, 2013; Castaño-Rosa et al., 2020).

It is important to differentiate between degrees of energy poverty to make comparisons between groups and to investigate whether capabilities are deployed differently across these groups. As Fitzpatrick puts it, "we need to conceive of a 'poverty of capabilities' that encompasses both

absolute and relative definitions" (Fitzpatrick, 2014: 23). Therefore, as in other studies (Belaïd, 2018; Chaton and Lacroix, 2018), we introduce a gradient between 'severe energy poverty' and 'energy poverty' according to the degree of financial difficulties perceived by the respondent. Finally, three other categories of our variable are created by combining the presence (or absence) of energy problems and financial difficulties.

Fig. 2 displays the combinations of these difficulties or their absence that make up the five categories of our typology of energy poverty status calculated for each respondent.

It is worth highlighting the high levels of energy access problems and perceived financial difficulties, in both 2006 and 2009. In 2006, 81.5 % of Georgian households "could not afford to keep their home adequately warm" (79.7 % in 2009) and 33.9 % could not pay their utility bills in the last 12 months (34.1 % in 2009). Self-perceived financial difficulties are also widespread: in 2006, 59.0 % of Georgian households found it very difficult or difficult to make ends meet, and 25.7 % found it fairly difficult. The corresponding figures for 2009 were 61.2 % and 23.5 % respectively.

4.2.2. Capability proxies

The two GGP surveys allow to analyse five capabilities defined by Nussbaum (2000: 78–80): Health (Capability 2), Emotions (Capability 5), Affiliation (Capability 7), Play (Capability 9), Control over One's Material Environment (Capability 10B). Each capability, or rather the restriction thereof, is operationalised by several proxy variables following Bartiaux et al. (2018)'s approach. These proxies were chosen based on the literature and on the availability of the variables. In the panel analysis, one or two proxy variables per capability were selected based on Georgian expert knowledge and statistical criteria (proportion of missing values and Cramer's V for the relationship with energy poverty status). Nussbaum's definition and the selected proxies are reported in Table A1 in the Appendix for the five capabilities analysed below in their relation to the energy poverty status of the survey respondents (see section 5).

4.2.3. Empirical analysis

We analyse the relationships between energy status, capabilities, and their evolution between 2006 and 2009 in two main steps. We first present cross-sectional analyses for both GGP surveys to describe these relationships in detail (section 5.1). Causality is not searched for, as previous qualitative research has found that the relationship between a capability and energy poverty status can be bidirectional (Middlemiss

¹¹ ISCED is the reference international classification for organising education programmes and related qualifications by levels and fields.

et al., 2019, for the capability ‘affiliation’) or even in vicious circles (Bartiaux et al., 2021).

We then analyse the evolution of capabilities and energy poverty status, if any, at the individual level using a longitudinal approach (section 5.2). Panel analysis of energy poverty, as initiated by Phimister et al. (2015), is still rare. Given the above-mentioned inconsistencies in the Georgian panel data, the two-step Heckman model is applied, as explained below.

Before explaining our modelling strategy, it is important to recall that the analysis of the panel data may only compare the non-migrants between Wave 1 (2006) and Wave 2 (2009). It is therefore possible that migrants have changed energy poverty status differently from the non-migrants. The panel analysis data cannot therefore be representative of the whole population but only, at best, of the non-migrant population in 2009.

4.2.4. The two-step Heckman model

Our modelling strategy is driven by two objectives: to assess whether the sample selection identified in the data section introduces bias, and to determine whether capabilities are independent of or mediate socio-economic characteristics.

There is indeed some concern regarding the selection of individuals for interview in Wave 2, as explained earlier in the data section. Given the possible bias in the selection of the last set of respondents among the potential 7191 respondents in Wave 2, we decided to apply the two-step Heckman model (Heckman, 1979) with, for the first (selection) equation, a logit model that includes an instrument, and, for the second (main) equation, an ordered logit model on energy poverty as measured in Wave 2, with the inverse Mill’s ratio (IMR) extracted from the first equation to control for potential selection bias in the second equation to correctly predict energy poverty in Wave 2 that would be observed in the absence of selection.

Since we suspect that non-random selection (due to sample selection in Wave 2) is correlated with the outcome variable (energy poverty in Wave 2), then estimating the main equation without correcting for selection could produce biased and inconsistent parameter estimates. The IMR corrects for this bias by capturing the probability of being included in Wave 2 and incorporating it as an additional explanatory variable in the ordered logit model for energy poverty. If the coefficient of the IMR is statistically significant, it indicates that the process that determines selection into Wave 2 is correlated with unobserved factors that also influence energy poverty. If it is not significant, then selection bias is likely not a major concern in estimates of energy poverty in Wave 2 and its determinants.

The selection equation takes the form of a logit model (the probit model was tested and led to the same results, showing robustness against change in model specification):

$$\ln \left[\frac{S_{IX}}{1 - S_{IX}} \right] = \beta_0 + \beta_1 I_i + \beta_j X_j \quad (1)$$

where s defines the probability of selection for Wave 2, I the instrumental variable (Census units, a good proxy for interviewers’ effect), X the determinants which will be described below.

The main equation takes the form of an ordered logit model:

$$f(p_{m,c2009}^{c2009}) = \beta_0 + \beta_1 m + \beta_2 c2006 + \beta_j X_j \quad (2)$$

where p defines the odds of being in category c in 2009 as opposed to being in higher levels of energy poverty, m is the IMR, $c2006$ is the energy poverty category in 2006, and X is the same set of determinants as in the selection equation. The p^{c2009} are defined as follows for each level of energy poverty c in 2009:

$$\text{Severe energy poverty: } f(p_{m,x}^1) = \ln \left[\frac{p_{m,x}^1}{p_{m,x}^2 + p_{m,x}^3 + p_{m,x}^4 + p_{m,x}^5} \right]$$

$$\text{Severe energy poverty or energy poverty: } f(p_{m,x}^2) = \ln \left[\frac{p_{m,x}^1 + p_{m,x}^2}{p_{m,x}^3 + p_{m,x}^4 + p_{m,x}^5} \right]$$

Severe energy poverty or energy poverty or self-perceived poverty:

$$f(p_{m,x}^3) = \ln \left[\frac{p_{m,x}^1 + p_{m,x}^2 + p_{m,x}^3}{p_{m,x}^4 + p_{m,x}^5} \right]$$

Severe energy poverty or energy poverty or self-perceived poverty or

$$\text{energy vulnerability: } f(p_{m,x}^4) = \ln \left[\frac{p_{m,x}^1 + p_{m,x}^2 + p_{m,x}^3 + p_{m,x}^4}{p_{m,x}^5} \right]$$

The logit model includes an instrument, the geographical location of sampling clusters. The rationale is that given that interviewers were allocated to each sampled Census unit, the Census units are a good proxy for interviewer’s effect. The assumption is that the logit model would capture well the mistakes made by some interviewers in identifying the respondents from Wave 1 to be interviewed in Wave 2.

However, the effect of the inverse Mill’s ratio is not significant in either of the two ordered logit models that are presented in Table 5. This could mean that the instrument (Census unit location) does not capture well the bias introduced by interviewers or generally by variations in the respondent identification procedures. This is unlikely since the logit model showed very significant Census unit’s effect: the likelihood ratio test comparing results with and without census units shows a $\chi^2(112) = 509.62$, Prob > $\chi^2 = 0.0000$. The most likely explanation is therefore that the selection bias on the main equation is minor.

The main equation includes the energy poverty status as measured in Wave 1 (c2006) and several socio-economic characteristics (urban/rural area of residence, household type, marital status, gender, birth year in 5-year groups, education level), all captured in Wave 1. To identify the role of capabilities as compared to socio-economic characteristics, we run two models, one without covariates capturing capabilities (model 1) and the other with these covariates (model 2). Capabilities are captured in Wave 1 by self-perceived health status, experience of sadness episode, reliance on people for support, ability to afford to invite family/friends, animal protein consumption, ownership of a colour TV, and house-ownership.

5. Results

5.1. Cross-sectional analysis: energy poverty and capabilities in 2006 and 2009

5.1.1. Overview: energy poverty status in 2006 and 2009

In Georgia in 2006, more than half (55.24 % [54.26–56.22])¹² of households experienced severe energy poverty, i.e. they found it very difficult or difficult to make ends meet, and had one or more energy difficulty: they were “unable to pay utility bills in the last 12 months, such as electricity, water, gas” and/or were unable to “afford to keep the home adequately warm”. A higher share of these households was located in rural areas and a smaller one in the capital, Tbilisi (Table 2). A further fifth of households (20.74 % [19.95–21.55]) were defined as energy poor because they experienced the same energy-related problem(s) but rated their financial situation as “rather difficult”. Their distribution across area types was rather similar to that of all households, with slightly fewer households in energy poverty in the capital than overall. This pattern across areas also holds for energy vulnerable households, but with a much lower prevalence, as 8.95 % [8.41–9.53] of households were in such a situation: they could not afford to keep their dwelling adequately warm, but they were not experiencing financial difficulties (they reported that it was easy – or rather easy or very easy – to make ends meet). On the contrary, households that reported financial difficulties, but no energy problem, are described as self-perceived poor and

¹² All numbers in square brackets are 95 % confidence intervals. See Table 2 for details.

Table 2

Energy poverty status in 2006 and in 2009, by area type in 2006.

Type of area	2006				2009			
	Rural	Urban	Capital	Total	Rural	Urban	Capital	Total
In severe energy poverty	61.23 [59.79–62.64]	53.11 [51.30–54.92]	47.12 [45.18–49.06]	55.24 [54.26–56.22]	65.29 [63.75–66.80]	56.17 [54.19–58.12]	45.02 [42.91–47.15]	57.45 [56.38–58.51]
In energy poverty	21.54 [20.36–22.76]	22.02 [20.56–23.56]	17.86 [16.42–19.40]	20.74 [19.95–21.55]	17.81 [16.62–19.07]	20.92 [19.35–22.57]	14.66 [13.22–16.24]	17.93 [17.12–18.77]
In self-perceived poverty	5.10 [4.50–5.79]	8.82 [7.85–9.91]	14.97 [13.63–16.41]	8.72 [8.18–9.29]	5.23 [4.56–5.99]	8.19 [7.17–9.35]	17.94 [16.36–19.64]	9.34 [8.73–9.98]
In energy vulnerability	9.73 [8.90–10.64]	9.60 [8.58–10.73]	6.82 [5.91–7.87]	8.95 [8.41–9.53]	8.40 [7.55–9.33]	8.88 [7.82–10.08]	5.38 [4.49–6.43]	7.77 [7.22–8.37]
In energy richness	2.40 [1.99–2.89]	6.44 [5.60–7.39]	13.23 [11.97–14.61]	6.35 [5.89–6.85]	3.27 [2.74–3.89]	5.84 [4.98–6.85]	16.99 [15.45–18.66]	7.52 [6.97–8.10]
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
N	4488	2916	2543	9947	3740	2443	2108	8291
Total	45.12 [44.15–46.10]	29.32 [28.43–30.22]	25.56 [24.72–26.43]	100.0	45.11 [44.04–46.18]	29.47 [28.50–30.46]	25.42 [24.50–26.37]	100.0

Source: GGP surveys, *Civil Georgia*, 2006, 2009.

represented 8.72 % [8.18–9.29] of all households. They were proportionally more often located in the capital. Finally, the energy-rich households had neither financial nor energy problems and represented a minority of households (6.35 % [5.89–6.85]), most of which were located in the capital.

In 2006, half or almost half of the households in severe energy poverty (50 %) and energy poverty (47 %) or energy vulnerability (49 %) were located in rural areas: access to heating is thus primarily a problem in rural areas. On the contrary, a high proportion of the self-perceived poor households (44 %) and energy rich households (53 %) lived in the capital, Tbilisi. This may be related to the fact that the capital offers better paid jobs and better opportunities for people than the rest of Georgia.

In 2009, the proportion of households in severe energy poverty slightly increased, from 55.24 % [54.26–56.22] in 2006 to 57.45 % [56.38–58.51] in 2009: this increase was more pronounced in rural areas – where nearly two thirds of respondents were in severe energy poverty – and less so in cities, whereas in the capital, less than half were in severe energy poverty. The proportion of households in energy poverty decreased from 20.74 % [19.95–21.55] in 2006 to 17.93 % [17.12–18.77] in 2009, especially in rural areas and in the capital. Apart from an increase in the proportion of energy-rich households in Tbilisi (from 13.23 % [11.97–14.61] in 2006 to 16.99 % [15.45–18.66] in 2009), there was little change in the other three categories, which together still accounted for a quarter of households.

5.1.2. Sociodemographic profiles by energy poverty status in 2006 and 2009

Table 3 shows the socio-demographic characteristics of the five groups of households according to their energy poverty status. This status is clearly associated either with variables related to the respondent (his/her gender, marital status, education) or with characteristics of the household (namely the living arrangements) or with the dwelling.¹³

More specifically, the proportion of female respondents is slightly higher in the most deprived category of the typology, in both 2006 and 2009, as they represent more than 55 % of this category of those in severe energy poverty. This most deprived category is also characterised by an older average age of respondents, a higher proportion of widows (12 %), and a slightly larger minority with a lower level of education (lower secondary or less). It is worth noting that a high level of education of the respondent does not protect households from being energy

poor as in 2006, these respondents represented 20 % of households in severe energy poverty and 30 % of households in energy poverty. Only the richest households are characterised by a majority of respondents with the highest qualifications (first and second stage of tertiary education, i.e. Bachelor's and Master's degrees).

Comparing the figures for 2006 and 2009, there has been an increase in the proportion of married respondents, of those living with a spouse and child(ren), and those with a higher education – perhaps related to the difficulties mentioned in the data section of organising a panel survey in a country facing a difficult economic and military situation.

Almost half of the respondents in all groups defined by their energy poverty status live with their spouse and at least one child. In all five groups there are around 10 % of three-generation families. Respondents living alone or heading a single-parent family are a minority, with higher proportions found in households in severe energy poverty (8 % and 10 % respectively in 2006).

Around 60 % of the households in (severe) energy poverty or in energy vulnerability live in a detached house, compared to 47 % for those who consider themselves as poor and 31 % of the energy rich. More than nine out of ten households in each category of our typology own their dwelling.

The average household size is always more than four persons in both 2006 and 2009. The dwellings are smaller (3.5 rooms on average) for households in severe energy poverty and for the energy rich at both surveys. On the contrary, the average total net income increases substantially, rising in 2006 from 282 GEL (158 US\$) for the most deprived households in terms of access to affordable warmth to 1271 GEL (714 US \$) for the energy rich households. Between 2006 and 2009, the average total net income decreased for all categories of households except for the most disadvantaged, reducing the gap between the two extreme categories from 4.5 to 3.5 times.

5.1.3. Energy poverty status and capability deployment

Opportunities for a good life were generally low in Georgia in 2006, all the more so when access to energy was limited. Table 4 shows strong associations between the energy poverty status and several areas of daily life, pointing to capabilities related to health and nutrition, leisure, and the material environment. For mental health and emotions, and affiliation and social support, the restrictions are less pronounced and the associations with the energy poverty status are still significant, but less so, as shown by Cramer's V. Bearing in mind the caveat about panel data (see section 4.1 above), this table also shows that between 2006 and 2009 the situation tends to have worsened in terms of health and nutrition, especially for households in (severe) energy poverty; there is little variation in terms of emotions and sense of belonging, while the material situation has improved, especially for some appliances, in particular a colour TV, but less so for other assets such as a car or a home

¹³ χ^2 or F very significant ($p < 0.001$) in all associations between the energy poverty status and all variables presented in Table 3, except for this association with the gender of the respondent in 2006 ($p = 0.053$).

Table 3
Socio-demographic characteristics by household energy poverty status (%)^a.

Types of households	In severe energy poverty		In energy poverty		In self-perceived poverty		In energy vulnerability		In energy richness		Total	
	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009
Marital status of respondent												
Never married	29.83	24.02	36.45	28.33	34.68	23.51	38.38	28.68	39.56	34.13	33.01	25.87
Married	56.35	61.80	56.71	62.85	58.29	69.12	55.89	65.12	55.70	59.94	56.51	62.79
Divorced	1.64	1.51	(1.11)	(1.62)	(1.38)	(0.90)	(1.46)	(0.62)	(1.74)	(1.60)	1.50	1.41
Widowed	12.18	12.66	5.72	7.20	5.65	6.46	4.26	5.58	(3.01)	(4.33)	8.98	9.93
Gender of respondent												
% of female	55.13	55.85	52.06	52.09	52.36	54.01	51.57	52.02	52.85	51.69	53.79	54.39
Mean age of household's respondent												
	47.36	48.96	40.96	44.47	41.60	44.92	39.76	41.88	36.39	39.67	44.16	46.53
Highest education level of respondent												
ISCED 0–1 - pre-primary education & primary level ^b	6.02	3.61	1.99	(1.68)	(2.08)	(1.16)	(1.46)	(0.93)	(0.63)	(0.00)	4.09	2.56
ISCED 2 - lower secondary level	12.17	10.58	6.50	6.79	4.73	5.95	5.61	(4.50)	(4.44)	(1.60)	9.27	8.32
ISCED 3 - upper secondary level	37.70	36.95	41.15	29.93	34.49	26.65	34.98	28.11	25.20	22.12	37.10	32.93
ISCED 4 - post secondary non-tertiary	24.22	26.37	19.63	22.53	19.84	22.77	20.52	21.89	16.48	14.26	22.06	24.09
ISCED 5–6 - first and second stage of tertiary	19.89	22.49	30.73	39.07	38.87	43.47	37.44	44.57	53.25	62.02	27.48	32.11
Type of household												
Living alone	7.97	7.24	2.95	2.76	(3.34)	(2.84)	(1.68)	(2.95)	(2.38)	(3.05)	5.61	5.38
Single parent	10.12	11.46	5.71	8.28	7.15	6.58	4.49	5.91	(3.80)	4.82	8.04	9.50
Living with parents	14.94	11.65	23.87	16.08	20.07	13.16	25.36	17.42	25.52	19.26	18.84	13.61
Single parent living with parents	1.60	1.53	1.69	(1.55)	(0.69)	(1.94)	(1.12)	(0.47)	(1.11)	(1.44)	1.47	1.48
Couple with no children	9.99	9.82	5.57	7.67	7.38	9.68	6.85	5.91	7.77	7.70	8.42	8.96
Couple with children	42.99	45.05	45.42	46.84	47.64	50.58	44.22	48.68	43.90	48.64	44.07	46.44
Couple with parents	1.35	1.28	1.50	2.62	(1.50)	(1.55)	(3.25)	(1.87)	(2.06)	(2.25)	1.61	1.66
Couple with parents and children	9.10	9.61	11.38	12.11	10.96	11.90	11.11	14.77	11.09	10.75	10.04	10.76
Other types	1.95	2.35	1.89	2.09	(1.27)	(1.81)	(1.91)	(2.02)	(2.38)	(2.09)	1.90	2.21
Household's ownership status towards the dwelling												
Owner	93.03	92.63	95.10	95.02	93.55	92.38	95.17	95.50	93.05	95.18	93.70	93.45
Tenant or subtenant, paying rent	0.69	1.24	(0.24)	(1.68)	(1.27)	(1.94)	(0.79)	(1.55)	(1.42)	(1.61)	0.70	1.44
Accommodation is provided rent-free	6.28	6.13	4.65	3.30	5.18	5.68	4.04	(2.95)	5.53	(3.22)	5.60	5.12
Type of dwelling where respondent lives												
Detached house	64.66	63.92	59.62	62.34	47.06	36.90	62.63	62.79	30.90	31.89	59.76	58.61
Semi-detached or attached row house	4.00	5.96	5.09	4.57	3.58	8.90	5.16	5.74	5.23	(4.33)	4.37	5.85
Apartment/room in a building of less than 4 floors and with or without elevator	5.04	6.36	6.06	7.67	9.11	11.23	5.39	6.05	9.19	9.46	5.90	7.26
Apartment/room in a building with 4 floors or more and no elevator	13.85	13.90	15.71	15.20	24.45	22.71	13.36	14.42	25.20	23.56	15.83	15.72
Apartment/room in a building with 4 floors or more and with elevator	11.10	9.84	12.36	10.22	14.99	20.26	11.90	11.01	27.26	30.77	12.80	12.55
Other, specify	1.24	(0.02)	(1.07)	(0.00)	(0.58)	(0.00)	(1.35)	(0.00)	(2.06)	(0.00)	1.21	(0.01)
Mean household size including respondent												
	4.08	4.10	4.42	4.33	4.32	4.29	4.40	4.60	4.31	4.16	4.21	4.20
Mean number of rooms												
	3.42	3.40	3.97	3.95	3.40	3.28	4.44	4.44	3.50	3.49	3.63	3.58
Average net income of all household members during last 12 months												
	282.03	303.20	519.03	470.97	646.06	522.11	558.84	553.28	1270.74	1073.19	446.98	421.88
Total												
Percentages	55.24	57.46	20.74	17.93	8.72	9.34	8.95	7.77	6.35	7.50	100.00	100.00
Sample size	5495	4763	2063	1486	867	774	890	644	632	623	9947	8291

^a Figures in parentheses refer to subsamples smaller than 30.

^b In 2009, only the ISCED 1 (primary level) is considered.

Source: GGP surveys, *Civil Georgia, 2006, 2009*.

computer.

5.2. Panel analysis

Based on the sample of individuals who are included in the two rounds of the panel, the evolution of the energy poverty status is shown in Fig. 3. While a majority of severely energy poor people remain in the same situation (42 % of the total), and 10 % remain in the same other categories, there is a significant mobility between categories for the other groups: 22 % improved their situation while 26 % have a worsened energy poverty status.

The logit model for energy poverty in 2009 reveals that, apart from the energy poverty status and the area of residence, few socio-economic variables as measured in 2006 have any effect before introducing capabilities: birth year (but only for the youngest, born after 1979) and first stage of tertiary education. Individuals belonging to these categories have higher chance of moving up in energy poverty status.

However, after introducing capabilities, these positive effects reduce and become much less significant (see Table 5).

To test for collinearity between covariates, we run a series of models removing one covariate at a time, apart from energy poverty status and area of residence. None of the excluded covariates has an impact on the effect of energy poverty status, area of residence, or each of the capabilities, except for education, which is clearly not independent from area of residence. We therefore checked for possible interaction effects between education and area of residence using bootstrap standard errors (3000 replications). The results show no change in the effect of other covariates and some categories show standard errors that are too wide to be interpreted (because there are very few respondents with less than secondary education categories in urban areas). Nevertheless, the difference between the capital city and the rest of the country, and the effect of first stage of tertiary education, still stand out (in particular, tertiary educated in rural or urban areas do not show difference with those in the capital city). In sum, the selected covariates can therefore be

Table 4

Proxies for five capabilities in Georgia by household energy poverty status (%).

	In severe energy poverty		In energy poverty		In self-perceived poverty		In energy vulnerability		In energy richness		Total		Cramer's V	
	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009
Capability 2: Health and nutrition														
In (very) bad health	27.84	31.42	10.23	14.19	14.53	17.18	6.07	6.99	(2.53)	(4.01)	19.47	23.04	0.145	0.149
Long-standing illness or chronic condition ^a	34.29		18.23		20.18		13.92		11.41		26.45		0.203	
Health-related limitation or disability ^a	11.96		4.02		4.84		(3.15)		(1.90)		8.26		0.151	
Household cannot afford eating meat, chicken, or fish every other day	84.11	86.88	58.70	60.36	55.59	50.52	48.65	41.46	18.83	21.51	69.04	70.29	0.411	0.467
Capability 5: Emotions														
Felt often or most of the time depressed during the previous week	8.59	12.07	2.62	5.38	(2.42)	6.47	(2.92)	(4.19)	(1.27)	(3.37)	5.84	9.08	0.105	0.101
Thought often or most of the time my life had been a failure during the previous week	17.42	17.93	5.04	6.80	5.31	7.37	(3.26)	4.66	(1.90)	(4.01)	11.54	12.87	0.161	0.135
Felt often or most of the time fearful during the previous week	8.77	10.89	3.35	4.84	(1.96)	5.30	(2.81)	(2.79)	(1.58)	(2.25)	6.06	8.01	0.106	0.095
Had often or most of the time crying spells during the previous week	9.30	12.11	3.73	5.92	3.58	5.43	3.82	4.96	(2.06)	(3.85)	6.69	9.20	0.093	0.091
Felt often or most of the time sad during the previous week	20.95	22.49	8.68	10.03	9.45	12.44	5.62	7.92	6.33	8.67	15.10	17.15	0.125	0.117
Capability 7A: Affiliation														
Experience a general sense of emptiness	19.13	20.30	8.68	10.36	6.24	8.40	8.64	8.99	5.22	6.58	14.01	15.50	0.143	0.139
Feel often rejected	10.57	11.17	4.51	3.57	4.84	4.92	3.37	(3.42)	(3.01)	(3.21)	7.69	8.02	0.129	0.127
I don't have many people I can count on completely	33.03	31.56	19.10	21.32	22.84	22.51	18.99	17.24	19.62	16.05	27.14	26.60	0.138	0.143
I can't lean on plenty of people in case of trouble	25.50	26.20	12.65	14.79	14.07	15.78	11.22	11.78	9.34	8.03	19.53	20.70	0.156	0.233
I don't have enough people I feel close to	11.67	11.38	4.70	4.91	6.12	6.73	3.93	(4.34)	(3.65)	(3.38)	8.54	8.64	0.159	0.147
Felt often or most of the time lonely during the previous week	11.72	12.74	3.93	4.10	3.58	3.88	(2.25)	(3.88)	(3.96)	(2.73)	8.05	8.92	0.121	0.118
I miss having people around	14.90	15.28	7.90	8.82	6.34	6.21	4.83	9.32	(4.59)	5.78	11.15	12.10	0.149	0.134
Capability 9: Play														
Household cannot afford paying for a week's annual holiday away from home	98.67	98.68	93.21	91.93	85.12	81.65	78.54	83.07	43.74	40.45	91.07	90.29	0.486	0.522
Household cannot afford having friends or family for a drink or meal at least once a month	84.19	83.10	65.44	57.07	61.94	52.58	39.62	30.54	19.94	19.71	70.29	66.73	0.417	0.454
Would like but cannot afford colour TV	44.84	27.84	22.09	9.68	16.26	5.43	16.18	(4.50)	(4.27)	(0.32)	32.49	18.61	0.220	0.201
Capability 10B: Control over one's material environment														
Not homeowner	6.97	7.37	4.90	4.98	6.45	7.62	4.83	4.50	6.95	4.82	6.30	6.55	0.062	0.046
Would like but cannot afford car/van available for private use	67.52	66.60	66.72	65.81	68.36	65.89	61.69	59.47	56.17	49.12	66.18	64.52	0.149	0.173
Would like but cannot afford washing machine	69.09	72.01	46.90	47.44	49.37	38.63	35.17	32.30	21.08	18.14	56.69	57.35	0.236	0.281
Would like but cannot afford home computer	65.19	70.23	71.56	65.95	64.94	54.65	69.55	56.74	53.57	37.50	66.14	64.50	0.233	0.289
Would like but cannot afford telephone (whether fixed/mobile)	46.92	30.02	27.55	12.58	22.38	10.47	16.40	6.82	6.34	4.81	35.46	21.37	0.234	0.187

(continued on next page)

Table 4 (continued)

	In severe energy poverty		In energy poverty		In self-perceived poverty		In energy vulnerability		In energy richness		Total		Cramer's V	
	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009
Would like but cannot afford refrigerator	41.78	45.43	21.52	20.73	21.25	12.53	13.69	12.25	7.29	5.30	31.09	32.34	0.197	0.245
Total														
Percentages	55.24	57.46	20.74	17.93	8.72	9.34	8.95	7.77	6.35	7.50	100.00	100.00		
Sample size	5495	4763	2063	1486	867	774	890	644	632	623	9947	8291		

^a Figures for 2009 are not shown because 68 % of the respondents did not answer these two questions.

Source: GGP surveys, [Civil Georgia, 2006](#), 2009.

Table 5

Ordered logit model for energy poverty status in 2009 - Controlled for attrition.^a

	Without capabilities		With capabilities	
Typology EP in 5 categories, 2006				
Energy Poverty and ends of month (very) difficult	0.318 [0.26–0.38]	***	0.379 [0.31–0.46]	***
Energy Poverty and ends of month rather difficult	0.840 [0.69–1.03]		0.831 [0.68–1.02]	
Energy vulnerable: energy poverty and ends of month (very/rather) easy	1.537 [1.23–1.92]	***	1.322 [1.05–1.67]	*
Energy rich: neither energy nor financial difficulties	2.771 [2.13–3.61]	***	2.215 [1.67–2.94]	***
Type of settlement (rural/urban/capital)				
rural	0.627 [0.53–0.74]	***	0.670 [0.57–0.78]	***
urban	0.690 [0.59–0.80]	***	0.710 [0.61–0.83]	***
Household type Respondent				
living alone	0.663 [0.46–0.95]	*	0.813 [0.56–1.18]	
single parent	0.923 [0.66–1.30]		1.004 [0.71–1.42]	
living with parents	0.916 [0.72–1.16]		0.943 [0.75–1.19]	
single parent living with parents	0.587 [0.35–0.99]	*	0.675 [0.40–1.15]	
couple with no children	0.994 [0.81–1.22]		1.032 [0.83–1.28]	
couple with parents	1.279 [0.84–1.94]		1.277 [0.83–1.98]	
couple with parents and children	0.956 [0.80–1.15]		0.929 [0.77–1.12]	
other types	1.011 [0.64–1.61]		1.073 [0.70–1.65]	
marital status Respondent				
never married	0.925 [0.78–1.10]		0.935 [0.78–1.12]	
divorced	0.802 [0.49–1.30]		0.775 [0.48–1.26]	
widowed	1.033 [0.73–1.46]		1.054 [0.74–1.50]	
Gender Respondent				
female	0.896 [0.79–1.01]		0.935 [0.83–1.06]	
Birth Year Respondent				
1926–1933	0.681 [0.48–0.96]	*	0.820 [0.57–1.18]	
1934–1938	0.814 [0.61–1.08]		0.929 [0.69–1.24]	
1939–1943	0.869 [0.65–1.16]		0.972 [0.72–1.32]	
1944–1948	1.017 [0.77–1.34]		1.079 [0.81–1.43]	
1949–1953	0.858 [0.68–1.09]		0.869 [0.68–1.11]	
1954–1958	1.015 [0.82–1.25]		1.017 [0.82–1.26]	
1964–1968	1.020 [0.81–1.29]		0.994 [0.80–1.24]	

Table 5 (continued)

	Without capabilities		With capabilities	
1969–1973	1.129 [0.90–1.41]		1.067 [0.85–1.33]	
1974–1978	1.263 [0.99–1.61]		1.183 [0.93–1.50]	
1979–1983	1.436 [1.11–1.85]	**	1.335 [1.03–1.73]	*
1984–1988	1.515 [1.09–2.11]	*	1.436 [1.02–2.03]	*
Highest Education Level of Respondent				
iscd 0 - pre-primary education	0.716 [0.07–6.95]		0.886 [0.06, 14.20]	
iscd 2 - lower secondary level	0.984 [0.59–1.63]		0.905 [0.53–1.53]	
iscd 3 - upper secondary level	1.295 [0.80–2.09]		1.114 [0.68–1.82]	
iscd 4 - post secondary non-tertiary	1.491 [0.91–2.43]		1.259 [0.76–2.08]	
iscd 5 - first stage of tertiary	2.291 [1.41–3.73]	***	1.777 [1.07–2.95]	*
iscd 6 - second stage of tertiary	1.490 [0.02,123.21]		1.641 [0.03,104.90]	
General health status				
very good			1.254 [1.02–1.55]	*
good			1.117 [0.98–1.27]	
bad			0.809 [0.68–0.96]	*
very bad			0.676 [0.47–0.97]	*
Experience Respondent previous week: I felt sad				
sometimes			0.930 [0.83–1.05]	
often			0.723 [0.59–0.89]	**
most of the time			0.619 [0.35–1.10]	
Current experience: Plenty of people I can lean on in case of trouble				
Yes			0.864 [0.76–0.98]	*
No			0.928 [0.80–1.08]	
Can household afford having friends or family for a drink or meal at least once a month				
No			0.782 [0.69–0.88]	***
Can household afford eating meat, chicken or fish every second day				
No			0.775 [0.67–0.85]	***
Colour TV				
No			0.752 [0.67–0.85]	***
Home owner				
No			0.679 [0.52–0.88]	**
Inverse Mill's Ratio: precision	1.020		0.828	
census unit	[0.76–1.36]		[0.62–1.11]	
cut1	–0.148		–0.033	
cut2	[–0.72 - 0.42]		[–0.63 - 0.56]	
	0.858		0.989	

(continued on next page)

Table 5 (continued)

	Without capabilities	With capabilities
cut3	[0.28–1.43] 1.527	[0.39–1.58] 1.666
cut4	[0.96–2.10] 2.490	[1.08–2.26] 2.638
	[1.91–3.07] 6121	[2.04–3.23] 6121
Number of observations	6121	6121
Log-likelihood	–6704.5975	–6639.8273
LR $\chi^2(13) = 129.54$ Prob > χ^2 = 0.0000		

^a ***p < .001, **p < .01, *p < .05.

- Robust estimates of standard errors (bootstrap method, 3000 replications).
- The 2006 to 2009 selection (attrition) effect controlled through the instrumental variable (postal code) is not significant, as shown by non-significance (p > .05) of the Inverse Mill's Ratio.

deemed fairly independent from one another, even regarding area of residence and education, acknowledging that, expectedly, most well-educated respondents are to be found in the capital city and urban areas.

The most important effect is that of energy poverty as measured at Wave 1, in 2006. In both models presented in Table 5, a gradient is clearly measured showing that the poorer (richer) in 2006, the poorer (richer) in 2009. Fig. 4 presents the predictive results of energy poverty in 2006 on energy poverty in 2009. All things being equal (including capabilities), the severe energy poor (category 1) have a 71 % risk of remaining in the same category, and only 17 % chance of becoming energy poor (category 2), and less than 3 % of becoming energy rich (category 5). At the other end, the energy rich (category 5) have a 30 % chance to fall into severe energy poverty (category 1), and less than 25 % in energy poverty (category 2), while they have about 13 % chance of remaining energy rich (category 5). In other words, energy poverty status in 2006 and 2009 are highly correlated, but not inversely. The chances to fall into a poorer category are higher than to climb into a richer category. There is high mobility between categories, even though only three years separate the two panels.

Reading: all other things being equal, the chance to fall into the

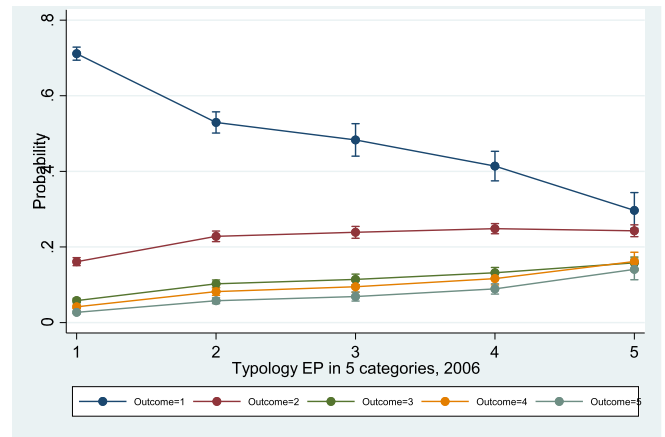


Fig. 4. Predictive energy poverty status in 2009 by energy poverty status in 2006, adjusted for socio-economic covariates and capabilities.

lowest energy poverty status (“severe energy poverty”) in 2009 is 71.1 % when belonging to the lowest energy poverty status (“severe energy poverty”) in 2006, against only 30.4 % when belonging to the highest energy poverty status (“energy rich”) in 2006.

Energy poverty status and other covariates show similar directions of effects in the two models, but odds ratios show lower effects (closer to value 1, corresponding to the null hypothesis) in model 2. This indicates that a substantial part of these covariates’ effects goes through capabilities. In other words, capabilities in 2006 act as mediators between socio-economic characteristics in 2006 and the change (if any) in the energy poverty status between 2006 and 2009, as shown in Fig. 5. The causal relationships shown and their unidirectionality are hypothetical and should be tested by further research.

To note, in model 2 controlling for capabilities, household type, marital status, and gender do not show significant effects and the confidence intervals are fairly narrow around value 1, indicating the null effect. Birth year seems to have a positive effect on energy poverty only for the youngest generations (born after 1979) but with large confidence

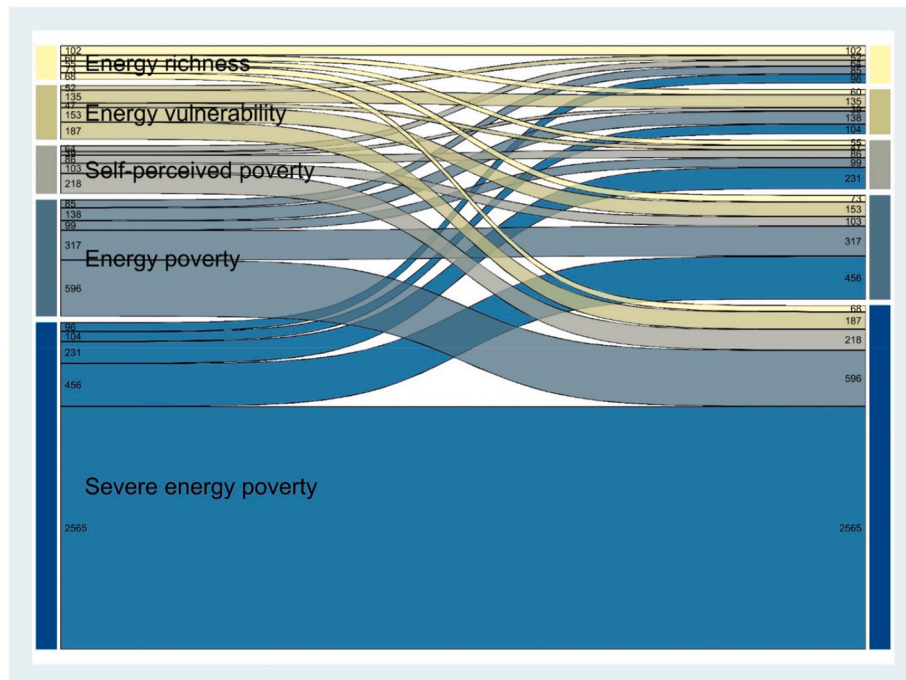


Fig. 3. Sankey diagram of energy poverty status in 2006 and in 2009 (weighted, limited to the panel included in the model).

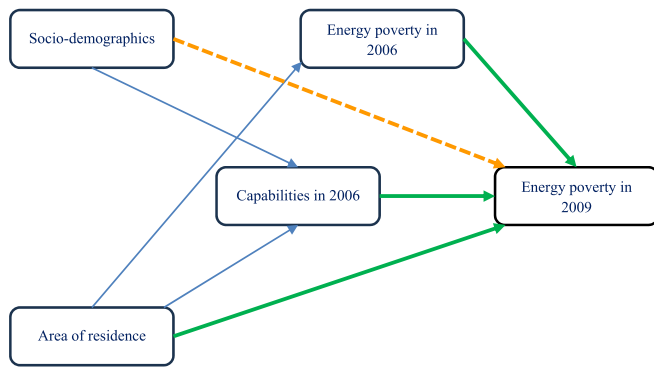


Fig. 5. Relationships between socio-demographic characteristics, capabilities and energy poverty.

interval (from very close to 1 to close to 2). This is also the case for the first stage of tertiary education. We cannot exclude the possibility that these effects would disappear with better measures of capabilities. The only covariate that remains highly significant ($p < 0.001$) with narrow confidence intervals is type of settlement: respondents living in rural or urban areas have a 20 %–40 % lower chance to get themselves up the energy poverty scale than respondents living in the capital city.

The predictive results (Fig. 6) show that living in the capital city reduces the probability of falling into severe energy poverty (category 1) by about 8 percentage points compared to the rest of the country (Fig. 6, top left graph, Outcome 1). The impact of living in the capital on becoming energy rich in 2009 (category 5) is slightly higher the richer the respondent was in 2006 (Fig. 6, lower middle graph, Outcome 5). The most negative capability factors are self-perceived health (the lower the health, the lower the chance to get out of energy poverty), and sadness (10 %–40 % less chance when often sad), although having a lot of people to get support seems to also have a negative, albeit not pronounced impact. The capability factors that capture economic and social opportunities (invitation, animal protein, TV) lead to 15 %–50 % higher chance of moving up the energy poverty scale. Homeownership, counter-intuitively, has a negative impact, between 10 % and 50 %.

6. Conclusion and policy implications

This research on Georgia between 2006 and 2009 is the first one, to our knowledge, to assess the relations between energy poverty and capabilities in a context of major crisis. It also contributes to the literature on energy poverty in post-communist countries (Jigla et al., 2020) and on severe energy poverty (Teschner et al., 2020).

Our results show that fifteen years after the end of the Soviet Union, most people in Georgia faced multiple difficulties in their daily lives, with more than half of households living in severe energy poverty. The socio-economic context was indeed difficult during the study period (2006–2009): high unemployment, low salaries, energy as part of the ‘battlefield with Russia’ (Margvelashvili et al., 2019: 44), not to mention the 2008 Russian war in Georgia, which resulted in thousands of new IDPs and significant economic damage. Energy poverty was particularly severe in rural areas, as compared to Tbilisi, suggesting the existence of territorial inequalities that may be linked to the widespread use of wood as a heating fuel in rural areas.

We show that in this context, many households faced a high risk of worsening energy poverty, with households that were already the most energy poor in 2006 falling into energy poverty traps. The capability approach using quantitative methods has proven relevant for understanding energy poverty and its dynamics, the capability variables providing more robust predictions of energy poverty dynamics than the socio-demographic variables traditionally used in energy poverty analyses. While the energy poverty status in 2006 was a strong predictor of the energy poverty status in 2009, peoples’ capabilities in 2006 were strongly related to their ability to escape energy poverty or, on the contrary, to the risk of worsening their energy poverty status and of falling into severe energy poverty in 2009.

Two limitations should be noted. First, our findings are based on very rich data from the international Generation and Gender Programme. However, the questionnaire suffers from some blind spots that may be due to a Western European and urban lens. For example, there are no data on food production in the household, in a vegetable garden or in a poultry yard – an information that would be relevant in the Georgian context – in contrast to three variables on dishwasher ownership.

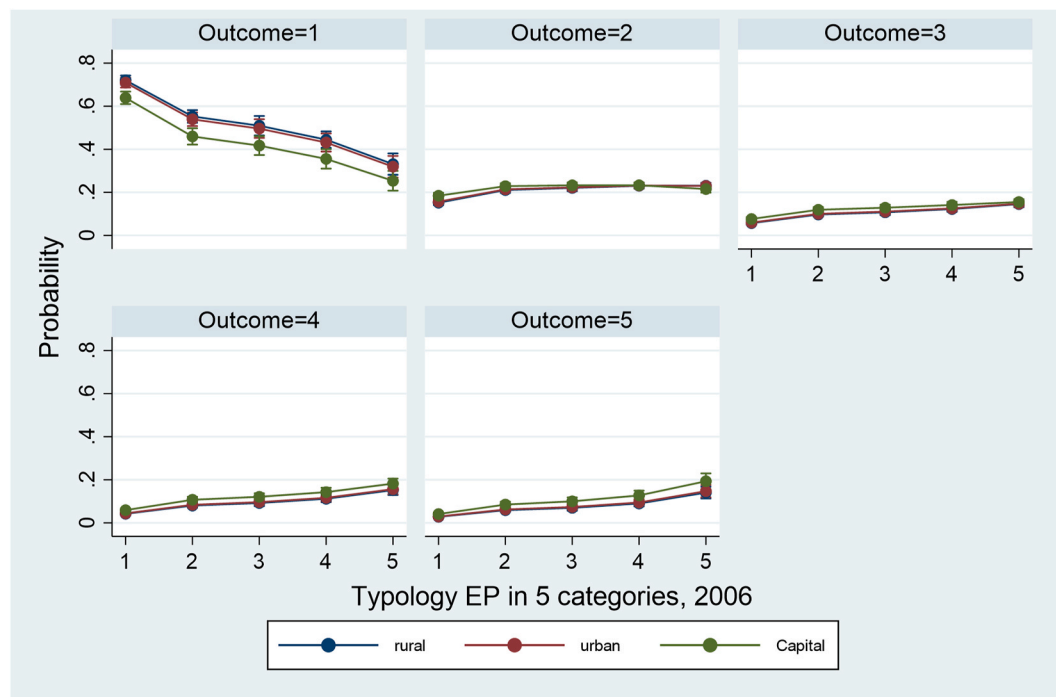


Fig. 6. Predictive energy poverty status in 2009 by energy poverty status and area of residence in 2006, adjusted for socio-economic covariates and capabilities.

Second, conducting a panel study to compare the daily lives of the population in terms of their access to energy over a three-year period is indeed helpful, and the GGP data are quite relevant in this regard. However, in addition to the difficulties of organising a panel survey after the 2008 war, it is very challenging to assess the statistical representativeness of the Wave 2 sample: although the general trend is a worsening of the energy poverty status, [Table 3](#) suggests a very slight improvement in incomes of the most energy-poor group, but is this due to selection bias or is it a real improvement? Furthermore, in the panel analysis, it is most likely that only the stayers are surveyed. What are the implications for the analysis? Have the migrants improved their situation (e.g. by leaving a rural area to live in the capital) or are these migrants IDPs with a more disadvantaged situation than the stayers?

These questions can be extended when panel analysis is used to examine the impact of a major problem in the intervening period: a war in the case of Georgia or, in other countries, an extreme weather event caused by climate change, such as floods or severe droughts. These major events often cause large displacements of people, making them even more difficult to track in a panel survey. As a result, a panel study may lose the people who have suffered most from the dramatic event and thus lose some of its relevance.

Based on our research, our policy recommendations for tackling energy poverty in Georgia in the years 2006–2009 would be: (1) to introduce energy vouchers (heating allowances) for the beneficiaries of targeted social assistance to reduce the burden of energy bills. This was implemented in 2011 (see [section 2.2](#)); (2) to prioritise the rural population and to target mountain settlements and households dependent on firewood; (3) to develop long-term measures to alleviate energy poverty, such as (a) investing in alternative energy sources for rural households, (b) promoting the use of efficient wood stoves and boilers, (c) introducing solar water heaters for the rural population, and (d) establishing energy efficiency funds to help households renovate their homes and integrate energy efficiency into post-war reconstruction to provide adequate housing for IDPs.

Since 2009, the Georgian government has implemented several measures. Access to gas has increased, and today almost 90 % of the population has access to natural gas. However, due to affordability, firewood is still the main heating fuel in rural areas. The central government and municipalities now implement various support schemes for energy poor households, such as subsidies and monetary payments to cover energy bills. Although these are important to alleviate energy poverty in the short term, they do not address the causes of energy poverty. Low energy efficiency, underheating and the use of firewood in inefficient stoves remain major problems.

Today, energy poverty is explicitly mentioned in various policy documents and legislation. However, Georgia is lacking statistical data on energy poverty ([Kvaratskhelia and Dubois, 2023](#)). [Bouzarovski et al. \(2024: 189\)](#), claiming that no data currently exist on “objective” energy poverty indicators such as “bill arrears” and “poor housing”, or on “subjective” data such as “adequate warmth”, assess energy poverty based solely on household budgets surveys. Our contribution emphasizes the value of the (less recent) GGP data. By highlighting the relations between energy poverty and various capabilities, it suggests that alternative approaches could be implemented for the practical identification of energy poor households, which is essential for implementing policy measures ([Dubois, 2012](#)). This identification could be based on capabilities such as health, protein intake, social relations, and tenancy.

In the longer term, the heavy reliance on fuelwood in rural areas and underheating should be a concern for policymakers. Not only does the massive use of wood degrade forests and soils, with further impacts on climate change and erosion from flooding, it also causes energy scarcity for the most vulnerable populations. This raises questions about the future energy supply for the rural population. Government policies to replace firewood with natural gas need to be supported by additional measures, as poor households cannot afford to purchase gas heaters or boilers. On the other hand, increased reliance on gas weakens both

Georgia’s climate change mitigation goals and its energy independence and security. Therefore, renewable energy technologies (especially solar water heaters) and energy efficiency improvements in buildings should be prioritised and energy poor households should be supported to renovate their homes.

In addition, to reduce the need for energy subsidies or energy vouchers in the future, the ongoing construction of housing for IDPs should be based on energy efficiency requirements, and all appliances provided to IDPs in new housing should be energy efficient.

Furthermore, as our results confirm – like in other contexts ([Bartiaux et al., 2021](#)) – capabilities and energy poverty are interrelated: public policies that promote employment opportunities, food production (including at the household level) and public health are therefore recommended.

Georgia’s experience with building reconstruction, internal displacement and post-conflict resettlement can be paralleled with the war in Ukraine, although infrastructure and buildings in Ukraine are now more severely damaged than in Georgia then, both in terms of intensity and spatial extent. Despite differences in the energy mix, energy markets, and import/export opportunities of the two countries, both have a high proportion of inefficient Soviet-era buildings that could be replaced with efficient buildings in post-war reconstruction, “implementing the Build Back Better principle” ([Naumenkova et al., 2024: 199](#)) with long-term benefits in terms of reduced energy poverty and improved household welfare.

More generally, energy is at the heart of the conflicts in both Georgia and Ukraine, with energy sanctions, (threats of) destruction of (nuclear) infrastructure, while climate change is fuelled by the use of fossil fuels. The new paradigm of ‘war ecology’ ([Charbonnier, 2022](#)), with a parallel to ‘war economy’, calls for rapid energy sufficiency, which would integrate private efforts and geopolitical objectives of security and independence. In this context, the fight against energy poverty and, in Georgia, its corollaries of inefficient fossil energy use and deforestation, should clearly be a priority.

CRediT authorship contribution statement

Ute Dubois: Writing – review & editing, Writing – original draft, Visualization, Supervision, Investigation, Conceptualization. **Tutana Kvaratskhelia:** Writing – review & editing, Writing – original draft, Investigation. **Françoise Bartiaux:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Philippe Bocquier:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

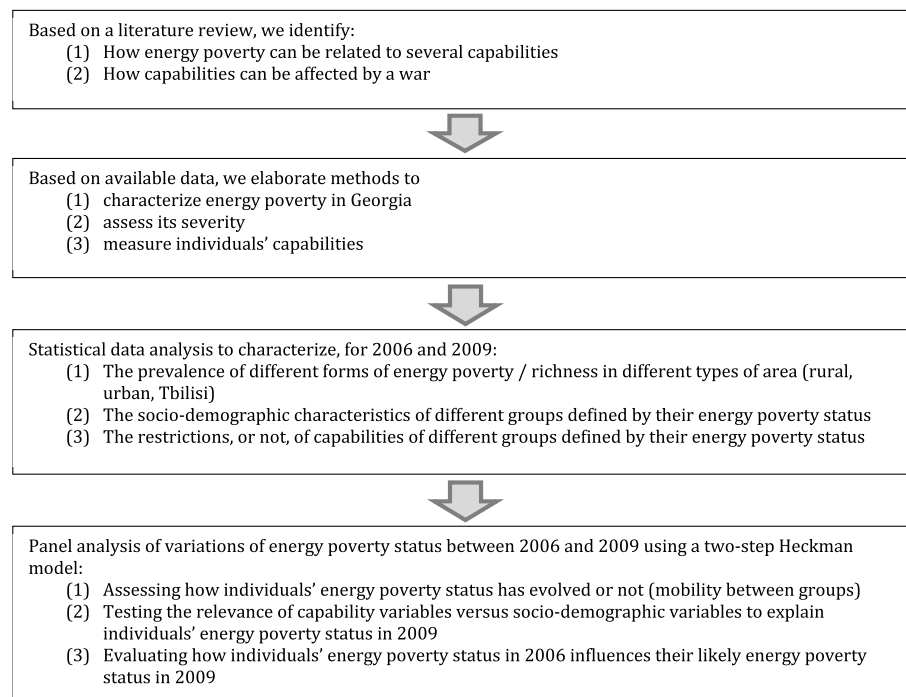


Fig. A1. Research strategy.

Table A1

Definition and proxies of analysed capabilities

Capability	Nussbaum's definition*	Proxies**
2. Bodily Health (renamed as Capability 2: Health and nutrition)	"Being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter."	– In (very) bad health – Long-standing illness or chronic condition – Health-related limitation or disability – Household cannot afford eating meat, chicken, or fish every other day
5. Emotions	"Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by overwhelming fear and anxiety, or by traumatic events of abuse or neglect. (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development.)"	– Felt often or most of the time depressed during the previous week – Thought often or most of the time my life had been a failure during the previous week – Felt often or most of the time fearful during the previous week – Had often or most of the time crying spells during the previous week – Felt often or most of the time sad during the previous week – Experience a general sense of emptiness – Feel often rejected – I don't have many people I can count on completely – I can't lean on plenty of people in case of trouble – I don't have enough people I feel close to – Felt often or most of the time lonely during the previous week – I miss having people around – Household cannot afford paying for a week's annual holiday away from home – Household cannot afford having friends or family for a drink or meal at least once a month – Would like but cannot afford colour TV – Not homeowner
5. Affiliation A.	"Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction; to be able to imagine the situation of another and to have compassion for that situation; to have the capability for both justice and friendship. (Protecting this capability means protecting institutions that constitute and nourish such forms of affiliation, and also protecting the freedom of assembly and political speech.)"	
9. Play	"Being able to laugh, to play, to enjoy recreational activities."	
10. Control over One's Environment. B. Material	"Being able to hold property (both land and movable goods), not just formally but in terms of real opportunity; and having property rights on an equal basis with others; having the	

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Table A1 (continued)

Capability	Nussbaum's definition*	Proxies**
	right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure."	– Would like but cannot afford car/van available for private use – Would like but cannot afford washing machine – Would like but cannot afford home computer – Would like but cannot afford telephone (whether fixed/mobile) – Would like but cannot afford refrigerator

* Source: Nussbaum (2000: 78–80).

** Proxies in bold are selected for the panel analyses.

Data availability

The authors do not have permission to share data.

References

- Abdullah, H.J., Ibrahim, A.F., King, J., 2010. Women's voices, work and bodily integrity in pre-conflict, conflict and post-conflict reconstruction processes in Sierra Leone. *IDS Bull.* 41 (2), 37–45.
- Antadze, N., 2024. What energy poverty looks like: methodological insights from a study in the republic of Georgia. In: *Living with Energy Poverty*. Routledge, pp. 78–90.
- Badurashvili, I., 2019. Generations and Gender Survey Georgia Wave 1 & Wave 2. Study Documentation & Wave 2 File and Variables Descriptions. Available on Generations and Gender Survey Georgia Wave 1 & Wave 2. (Accessed 6 September 2021).
- Barreno-Alcalde, S., Diez-Martin, F., Escamilla-Solano, S., 2024. The multidisciplinary nature of the capability approach: emerging trends and future research directions through a bibliometric analysis. *Sage Open* 14 (3), 21582440241284951. <https://doi.org/10.1177/21582440241284951>.
- Bartiaux, F., Day, R., Lahaye, W., 2021. Energy poverty as a restriction of multiple capabilities: a systemic approach for Belgium. *J. Human Dev. Capab.* 22 (2), 270–291. <https://doi.org/10.1080/19452829.2021.1887107>.
- Bartiaux, F., Maretti, M., Cartone, A., Biermann, P., Krasteva, V., 2019. Sustainable energy transitions and social inequalities in energy access: a relational comparison of capabilities in three European countries. *Global Transitions* 1, 226–240. <https://doi.org/10.1016/j.glt.2019.11.002>.
- Bartiaux, F., Vandeschrick, C., Moezzi, M., Frogneux, N., 2018. Energy justice, unequal access to affordable warmth, and capability deprivation: a quantitative analysis for Belgium. *Appl. Energy* 225, 1219–1233. <https://doi.org/10.1016/j.apenergy.2018.04.113>.
- Belaïd, F., 2018. Exposure and risk to fuel poverty in France: examining the extent of the fuel precariousness and its salient determinants. *Energy Policy* 114, 189–200. <https://doi.org/10.1016/j.enpol.2017.12.005>.
- Boardman, B., 2010. *Fixing Fuel Poverty: Challenges and Solutions*. Earthscan, London.
- Bocquillon, P., Doyle, S., James, T.S., Mason, R., Park, S., Rosina, M., 2024. The effects of wars: lessons from the war in Ukraine. *Policy Stud.* 45 (3–4), 261–281. <https://doi.org/10.1080/01442872.2024.2334458>.
- Bouzarovski, S., Brajković, J., Robić, S., Brown, C., Vuchkova, I., 2024. Energy poverty in the energy community region: interrogating policy formulation and coverage. *Eur. Urban Reg. Stud.* 31 (2), 184–199. <https://doi.org/10.1177/09697764231162229>.
- Bouzarovski, S., Petrova, S., 2015. A global perspective on domestic energy deprivation: overcoming the energy poverty–fuel poverty binary. *Energy Res. Social Sci.* 10, 31–40. <https://doi.org/10.1016/j.erss.2015.06.007>.
- Burgess, R.A., Fonseca, L., 2020. Re-thinking recovery in post-conflict settings: supporting the mental well-being of communities in Colombia. *Glob. Public Health* 15 (2), 200–219. <https://doi.org/10.1080/17441692.2019.1663547>.
- Castano-Rosa, R., Solís-Guzmán, J., Marrero, M., 2020. Energy poverty goes south? Understanding the costs of energy poverty with the index of vulnerable homes in Spain. *Energy Res. Social Sci.* 60, 101325. <https://doi.org/10.1016/j.enbuild.2019.03.039>.
- Charbonnier, P., 2022. The birth of war ecology. *Géopolitique, Rés. Énergie, Environ. Nat.* 2 (1), 70–76.
- Chaton, C., Lacroix, E., 2018. Does France have a fuel poverty trap? *Energy Policy* 113, 258–268. <https://doi.org/10.1016/j.enpol.2017.10.052>.
- Chipango, E.F., 2021. Beyond utilitarian economics: a capability approach to energy poverty and social suffering. *J. Human Dev. Capab.* 22 (3), 446–467. <https://doi.org/10.1080/19452829.2021.1871594>.
- Civil Georgia, 2006. Gas consumer price increases. <https://civil.ge/archives/110474>. (Accessed 29 July 2024).
- Day, R., Walker, G., Simcock, N., 2016. Conceptualising energy use and energy poverty using a capabilities framework. *Energy Policy* 93, 255–264. <https://doi.org/10.1016/j.enpol.2016.03.019>.
- de Castello Branco, M., 1996. Georgia: from hyperinflation to growth. *IMF Surv.* September 23, 1996, 1–2. <https://www.imf.org/external/pubs/ft/survey/pdf/092396b.pdf> (accessed 22 April 2025).
- Dubois, U., 2012. From targeting to implementation: the role of identification of fuel poor households. *Energy Policy* 49, 107–115. <https://doi.org/10.1016/j.enpol.2011.11.087>.
- Dubois, U., 2020. Introduction: energy poverty and its drivers in post-communist Europe—the visible, the measurable, and the hidden. In: *Perspectives on Energy Poverty in Post-communist Europe*. Routledge, pp. 1–22.
- Economic Commission for Europe, 2007. Country Profile on the Housing Sector. Georgia. https://unece.org/DAM/hlm/documents/Publications/CPGeorgia_final_050907.pdf. (Accessed 29 July 2024).
- Fitzpatrick, T., 2014. *Climate Change and Poverty: a New Agenda for Developed Nations*. Policy Press.
- GEOSTAT, 2017. Energy consumption in households. National Statistics Office of Georgia, Tbilisi. https://www.geostat.ge/media/20691/energoresurserbi_2017.pdf. (Accessed 5 July 2024).
- GEOSTAT, 2024a. National statistics office of Georgia. Distribu. Ave. Monthly Income Total Popula. <https://www.geostat.ge/en/modules/categories/50/households-income>. (Accessed 29 July 2024).
- GEOSTAT, 2024b. National statistics office of Georgia. Share Popula. under Absol. Poverty Line. <https://www.geostat.ge/en/modules/categories/192/living-conditions>. (Accessed 29 July 2024).
- Ghobarah, H.A., Huth, P., Russett, B., 2004. The post-war public health effects of civil conflict. *Soc. Sci. Med.* 59 (4), 869–884. <https://doi.org/10.1016/j.socscimed.2003.11.043>.
- Glos, A., 2023. Children's right to play in times of war. *Bioethics* 39 (1), 26–40. <https://doi.org/10.1111/bioe.13232>.
- Groves, C., Shirani, F., Pidgeon, N., Cherry, C., Thomas, G., Roberts, E., Henwood, K., 2020. 'The bills are a brick wall': narratives of energy vulnerability, poverty and adaptation in South Wales. *Energy Res. Social Sci.* 70, 101777. <https://doi.org/10.1016/j.erss.2020.101777>.
- Groves, C., Shirani, F., Pidgeon, N., Cherry, C., Thomas, G., Roberts, E., Henwood, K., 2021. A missing link? Capabilities, the ethics of care and the relational context of energy justice. *J. Human Dev. Capab.* 22 (2), 249–269. <https://doi.org/10.1080/19452829.2021.1887105>.
- Hearn, A.X., Mihailova, D., Schubert, I., Sohre, A., 2022. Redefining energy vulnerability, considering the future. *Front. Sustain. Cities* 116. <https://doi.org/10.3389/frsc.2022.952034>.
- Heckman, J.J., 1979. Sample selection bias as a specification error. *Econometrica: J. Econom. Soc.* 153–161. <https://doi.org/10.2307/1912352>.
- Hillerbrand, R., 2018. Why affordable clean energy is not enough. A capability perspective on the sustainable development goals. *Sustainability* 10, 2485. <https://doi.org/10.3390/su10072485>.
- IEA, 2020. *Georgia 2020. Energy Policy Review*. International Energy Agency.
- IEA, 2023. International energy agency. Energy Statistics Data Browser. <https://www.iea.org/data-and-statistics/data-tools/energy-statistics-data-browser?country=%5Bobject%20Object%5D&energy=Balances&year=2009>. (Accessed 29 July 2024).
- Jigla, G., Sinea, A., Dubois, U., Biermann, P., 2020. *Perspectives on Energy Poverty in Post-communist Europe*. Routledge, New York, NY, USA.
- Khechushvili, L., 2014. Comparative study of psychological well-being and posttraumatic growth indicators in IDP and non-IDP citizens of Georgia. *Educ. Sci. Psychol.* 32 (6), 52–58.
- Kvaratskhelia, T., Dubois, U., 2023. Understanding energy poverty in Georgia. World Experience for Georgia. Tbilisi. https://weg.ge/sites/default/files/final_understanding_energy_poverty_in_georgia.pdf. (Accessed 6 January 2024).
- LaBelle, M.C., 2020. *Energy Cultures: Technology, Justice, and Geopolitics in Eastern Europe*. Edward Elgar Publishing.
- Legislative Herald of Georgia, 2024. Ordinance of the Georgian national energy and water supply regulatory commission on the electricity tariffs. <https://matsne.gov.ge/ka/document/view/1359286?publication=0>. (Accessed 29 July 2024). <https://matsne.gov.ge/en/document/view/1359286?publication=0>.
- Lengfelder, C., 2021. Displaced, traumatised and human development deprived. Preprint. <https://doi.org/10.13140/RG.2.2.30425.44644>.
- Macours, K., Swinnen, J.F., 2008. Rural–urban poverty differences in transition countries. *World Dev.* 36 (11), 2170–2187. <https://doi.org/10.1016/j.worlddev.2007.11.003>.
- Margvelashvili, M., Mukhigulishvili, G., Kvaratskhelia, T., 2019. Georgia: energy as battleground with Russia. *Nat. Endow. Democracy* (2019) War by other means. Kremlin's Energy Policy as a Channel of Influence. Comparative case studies from Ukraine, Moldova, Georgia, Romania, Hungary. Chapter 3, 44–53. https://expertforum.ro/en/files/2019/04/NED-Report_cover.pdf.
- Melin, A., Day, R., Jenkins, K.E., 2021. Energy justice and the capability approach –Introduction to the special issue. *J. Human Dev. Capab.* 22 (2), 185–196. <https://doi.org/10.1080/19452829.2021.1909546>.

- Middlemiss, L., Ambrosio-Albalá, P., Emmel, N., Gillard, R., Gilbertson, J., Hargreaves, T., Mullen, C., Ryan, T., Snell, C., Tod, A., 2019. Energy poverty and social relations: a capabilities approach. *Energy Res. Social Sci.* 55, 227–235. <https://doi.org/10.1016/j.erss.2019.05.002>.
- Ministry of Economy and Sustainable Development, Georgia and The World Bank, 2015. Georgia. Urban strategy. Priority Area III: Housing. Final report. December 2015.
- Naumenkova, S., Tishchenko, I., Mishchenko, V., Mishchenko, S., 2024. Rethinking energy poverty alleviation through energy efficiency: evidence from Ukraine. *Environ. Econ.* 15 (2), 198–214. [https://doi.org/10.21511/ee.15\(2\).2024.14](https://doi.org/10.21511/ee.15(2).2024.14).
- Newnham, R.E., 2015. Georgia on my mind? Russian sanctions and the end of the 'Rose Revolution'. *J. Eurasian Stud.* 6 (2), 161–170. <https://doi.org/10.1016/j.euras.2015.0>.
- Nussbaum, M.C., 2000. *Women and Human Development: the Capabilities Approach*. Cambridge University Press, Cambridge.
- Nussbaum, M.C., 2011. *Creating Capabilities: The Human Development Approach*. Harvard University Press, Cambridge, MA.
- Pellicer-Sifres, V., Simcock, N., Boni, A., 2021. Understanding the multiple harms of energy poverty through Nussbaum's theory of central capabilities. *Local Environ.* 26 (8), 1026–1042. <https://doi.org/10.1080/13549839.2021.1952968>.
- Phimister, E., Vera-Toscano, E., Roberts, D., 2015. The dynamics of energy poverty: evidence from Spain. *Econ. Pol. Energy Environ.* 4 (1), 153–166. <https://doi.org/10.5547/2160-5890.4.1.ephi>.
- Robeyns, I., 2005. The capability approach: a theoretical survey. *J. Hum. Dev.* 6 (1), 93–117. <https://doi.org/10.1080/146498805200034266>.
- Saxon, L., Makhashvili, N., Chikovani, I., Seguin, M., McKee, M., Patel, V., et al., 2017. Coping strategies and mental health outcomes of conflict-affected persons in the Republic of Georgia. *Epidemiol. Psychiatr. Sci.* 26 (3), 276–286. <https://doi.org/10.1017/S2045796016000019>.
- Seguin, M., Lewis, R., Razmadze, M., Amirejibi, T., Roberts, B., 2017. Coping strategies of internally displaced women in Georgia: a qualitative study. *Soc. Sci. Med.* 194, 34–41. <https://doi.org/10.1016/j.socscimed.2017.10.014>.
- Sen, A., 1992. *Inequality Reexamined*. Oxford University Press, Oxford.
- Stojilovska, A., Dokupilová, D., Gouveia, J.P., Bajomi, A.Z., Tirado-Herrero, S., Feldmár, N., et al., 2023. As essential as bread: fuelwood use as a cultural practice to cope with energy poverty in Europe. *Energy Res. Social Sci.* 97, 102987. <https://doi.org/10.1016/j.erss.2023.102987>.
- Tarkhan-Mouravi, G., 2009. *Assessment of IDP Livelihoods in Georgia: Facts and Policies*. United Nations High Commissioner for Refugees.
- Teschner, N., Sinea, A., Vornicu, A., Abu-Hamed, T., Negev, M., 2020. Extreme energy poverty in the urban peripheries of Romania and Israel: policy, planning and infrastructure. *Energy Res. Social Sci.* 66, 101502. <https://doi.org/10.1016/j.erss.2020.101502>.
- The World Bank, 2009. *Georgia Poverty Assessment*. Report No. 44400-GE. Human Development Sector Unit. South Caucasus Country Unit. Europe and Central Asia Region. April 2009.
- The World Bank, 2010. *Georgia Programmatic Poverty*. Technical Note #1: Poverty and Crisis Impact. The World Bank, Washington DC. <https://documents1.worldbank.org/curated/en/320291468244166670/pdf/705840ESW0v100000Crisis0Impact0Note.pdf>.
- The World Bank, 2013. *Supporting the livelihoods of internally displaced persons in Georgia. A review of current practices and lessons learned*. Soc. Dev., 79174. Europe and Central Asia. May 2013.
- Thomson, H., Snell, C., 2013. Quantifying the prevalence of fuel poverty across the European Union. *Energy Policy* 52, 563–572. <https://doi.org/10.1016/j.enpol.2012.10.009>.
- Tsikitishvili, G., Dershem, L., Kechankmadze, V., 2005. *Social Capital and Employment Opportunities Among Internally Displaced Persons (IDPs) in Georgia*. Report for the World Bank. The Institute for Polling and Marketing, Tbilisi. May 2005.
- UNECE, 2020. *Overview of the state of forests and forest management in Georgia*. United Nations Economic Commission for Europe. United Nations, Geneva, 2020.
- UNEP-LEAP, 2020. Resolution No. 145 of 2006 of Georgian Government on Social Assistance. United Nations Environment Programme - Law and Environment Assistance Platform. <https://leap.unep.org/en/countries/ge/national-legislation/re-solution-no-145-2006-georgian-government-social-assistance>. (Accessed 29 July 2024).
- UNHCR, 2009. *Protection of internally displaced persons in Georgia: a gap analysis*. UNHCR, the UN Refugee Agency. <https://www.unhcr.org/media/protection-internally-displaced-persons-georgia-gap-analysis-july-2009> (Accessed 6 July 2024).
- UNHCR, 2024. IDP definition. UNHCR, the UN refugee agency. <https://emergency.unhcr.org/protection/legal-framework/idp-definition>. (Accessed 22 July 2024).
- United Nations, 2005. *Generations & Gender Programme: Survey Instruments*. UN, New York and Geneva.
- Voskanyan, A., Beghloyan, M., Tarkhnishvili, L., Jorbanadze, R., Roberts, K., 2003. Life and leisure among young adult war refugees in the South Caucasus. *World Leisure J.* 45 (3), 4–12. <https://doi.org/10.1080/04419057.2003.9674320>.
- White, R.G., Van der Boor, C., 2021. Enhancing the capabilities of forcibly displaced people: a human development approach to conflict-and displacement-related stressors. *Epidemiol. Psychiatr. Sci.* 30. <https://doi.org/10.1017/S2045796021000263>.
- World Bank Group, 2024b. GDP (constant 2015 US\$) – georgia. <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?locations=GE&skipRedirection=true>. (Accessed 6 July 2024).
- World Bank Group, 2024c. Rural population (% of total population) – georgia. <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?end=2023&locations=GE&skipRedirection=true&start=1960&view=chart>. (Accessed 6 July 2024).
- World Bank Group, 2024a. In: Access to electricity (% of population) - georgia. <https://data.worldbank.org/indicator/EG.ELC.ACCTS.ZS?locations=GE&view=chart>. (Accessed 22 April 2025).
- World Bank Group, 2024d. Unemployment, total (% of total labor force) (national estimate) - Georgia. <https://data.worldbank.org/indicator/SL.UEM.TOTL.NE.ZS?locations=GE>. (Accessed 6 July 2024).