EXAMPLES OF INNOVATIVE FINANCING SCHEMES

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EurObserv'ER

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Examples of innovative financing schemes

CASE STUDIES INNOVATIVE FINANCE SCHEMES

Under the current macro-economic trends, the so far abundant support system for renewables (mainly in the form of feed-in-tariffs and quota systems) has been drastically modified. In many EU countries, companies are trying to find alternative ways to secure financing for their renewable energy projects. Therefore, new ways of attracting private capital for the realisation of green energy goals have to replace the old schemes.

Some new forms of financing are coming together with the EU Cohesion Policy2014-2020 (project guarantees, packaging of small project for micro-financing schemes at the regional level, preferential loan instead of subsidies etc.). Advanced financial structures are likely to play an increasingly important role in the allocation of risk and reward among different investor classes. The finance and investment gap needs to be filled by the private sector. The challenge is to identify the appropriate policy options and financial tools to attract and scale-up private investments. There are, however, already innovative and promising business and financial models to promote the deployment of RES in the EU.

The aim of the EurObserv'ER case studies is to find such examples and describe them so as to put forward the best practices and the replicability of the future promising financing mechanisms. EurObserv'ER will aim at choosing only the most promising ones and try to describe them in order to promote replicability in other geographical areas. The selection criteria for the choice of case studies should ensure (i) diversity across regions and RES, (ii) diversity across finance instruments/mechanisms, (iii) success of approach and its potential to be replicated, (iv) and a wide range of the "size" of actors/investors and the resulting RES investments (capacity).
The current selection also takes into account the fact that there were already some case studies published in 2014, 2015, 2018 and 2019.
These are also available for download on the project website : www.eurobserv-er.org

THE RENTAL OF SOLAR INSTALLATIONS TO RESTART A STRUGGLING SECTOR

A DECLINING MARKET LOOKING FOR A REVIVAL

For several years, European solar thermal activity has been in decline and is struggling to survive. However, this sector offers various technical solutions in order to produce domestic hot water alone or in combination with heating for individual or collective applications, and both with a very efficient CO_2 emissions balance.

The segment of medium or small collective applications (hotel, hospital, housing, etc.) is particularly in difficulty. The obstacles to a wider diffusion of solar technologies in these fields of application are not technological but rather financial. Furthermore, the possibilities of solar thermal seem to be largely ignored. Being a popular and growing segment during the 2000s, this market slowly declined over the following decade, in particular because of strong competition from other technologies (including renewables such as heat pumps) as well as by the handicap of a relatively low gas price on international markets. Construction professionals have turned away from solar thermal solutions, resulting in a sharp drop in activity and a decrease in the networks of installers qualified in this technology.

Several European countries have tried to stop the decline in activity by setting up financial support for investment or by introducing some pushes for solar into new buildings thermal regulations. However, overall these actions failed to relaunch the market, as in France where the collective solar installations market fell from more than 90,000 m^2 in 2008 to less than 25,000 m^2 in 2019.

THE RENTAL PRINCIPLE AS AN APPROACH

To tackle the obstacle of investment cost, the company Eklor invest has launched an innovative rental offer for solar thermal installations of 50 to 500 m^2. The company has notably experimented with this formula on the Ile d'Oléron. The idea is to provide a turnkey solution, where all the steps are integrated into a rent offered to customers. Eklor's approach is supported by the French Energy Transition Agency (Ademe). Designed to adapt to a very diverse range of customers, Eklor has studied four consumption profiles for its offer. Initially, the community of communes of Oléron had solicited various professionals and had identified a potential for around twenty projects. However, payback times of around 15 years had failed to convince investors to take the plunge in investing. Of these, six had a consumption profile large enough to make a rental profitable from Eklor invest's point of view.

In 2019 a campsite, a hotel and a residential building were equipped with solar thermal installations. At the end of these experiments, a typical profitable installation profile was defined, between 50 and 500 m^2 of solar collectors. For a surface of 500 m^2, the average cost of the heat produced is of the order of 8 c€ / kWh, i.e. a threshold which is competitive with gas energy solutions which remains the main reference for the equipment of this type of installations. The standard contract offered by Eklor is based on a ten-year lease, with a price for the hot water which should not exceed the energy savings made on the customer's other energy sources. The rental price includes equipment, installation, remote monitoring and maintenance of the installation. In the event of solar production being lower than that one forecasted in the contract, a refund will be proposed. Finally, at the end of the contract several proposals are possible. The first option is to stop the installation and dismantle it, an option the cost of which is included into the rent. The second possibility is the to extend the contract for a period of five years under conditions which can be reassessed. The last

possibility is the purchase of the solar installation by the customer up to 15% of its initial price. This option can be interesting because Eklor Invest ensures a lifespan well over twenty years for a well-maintained equipment.Today this rental solution is only developed for the production of hot water because it allows to benefit from the financial support of the Heat Fund program (main French support program for heat energy production from renewable sources). After the first experimentations in l'Ile d'Oléron, two other projects are underway in Les Deux-Sèvres department for a municipal swimming pool as well as a hospital. The company wants to convince other medical-social establishments, collective housing, and even public buildings to carry on its development.

AN APPROACH THAT ECHOES THAT OF ESCOS

This type of economic model, where the customer no longer needs to invest in his renewable production device is to be compared with the third-party investor model ESCO (Energy Service Company). In this model, the initial investment is made by a company separate from the manufacturer or the supplier of solar equipment. This company will take charge of the entire process to offer a service for the sale of final energy to the manufacturer for its production site. This mechanism already exists for certain types of energy such as biomass, cogeneration and renewable electricity. On the solar heat for industrial process niche, it is less developed but is progressing. The third-party investor then bears the cost of feasibility studies, installation, commissioning, operation, maintenance, and dismantling. It is therefore, from the consumer's point of view, an energy supplier. Such a project requires bringing the heat to the exact point where it is consumed in the industrial process. The installation is therefore fully integrated into the production chain. This type of intervention requires an in-depth feasibility study and a high level of technical know-how on the part of the third-party investor and this also implies a differentiated approach from one site to another. Furthermore, this is a capital intensive activity, meaning that the initial cost of the project is significant for the third party investor. Thus, it must have three characteristics: it must have strong technical expertise, strong financial expertise and be able to unlock enough equity for such projects. The main risk for the third-party investor is the early exit from the contract of the manufacturer, or his bankruptcy. The contract can therefore provide for compensation in this case. If the third-party investor goes bankrupt, the manufacturer is protected by several safeguards. Indeed, for each project, a project company is created by the third-party investor. It owns the assets of the plant and independently manages the energy supply contract. Thus, even in the event of the bankruptcy of the parent company, the manufacturer always has an interlocutor and an entity with which the legal links are preserved.

THE LIMITS OF THE MODEL AND ROOMS FOR IMPROVEMENT

Eklor's approach to renting solar installations for projects in residential or commercial buildings faces several risks that are slowing its development. First of all, one of the recurring weaknesses of solar thermal is its time to payback. Although it is sustainable and profitable over the long term, it is sometimes difficult to convince investors who expect returns on investment in only a few years. It is in this context that tools like the Heat Fund prove to be very useful because the assistance provided reduces the cost of solar hot water and therefore its return time. However, it is always difficult for a consumer to commit to a long term contract for the supply of energy. For its part, the supplier carries the risk of his client's bankruptcy in the case of a professional, or the departure of tenants in the case of rented buildings.
In addition, the solar thermal sector suffers from a bad image in France due to counter-references that arose at the turn of the 2010s. This increases investment costs because the sector has not yet been able to convince the banking sector. One of the only solutions at the moment is word of mouth between actors on recent successful achievements. Of course, the increase in the price of fossil fuels via a higher carbon tax would make this type of project more viable in all sectors, but it requires strong commitments from public authorities. In a period of economic crisis like the one that occurred in 2020, the implementation of such a tax is difficult to program, at least in France. ◻

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VIRTUAL ENERGY COMMUNITIES AND FLEXIBILITY SERVICES – THE CASE OF THE SONNENCOMMUNITY

DECENTRALISED ENERGY AND VIRTUAL ENERGY COMMUNITIES

The importance of the involvement of consumers as prosumers or co-investors in RES for the energy transition has increased persistently in the EU. According to the Renewable Energy Directive (RED II) that entered into force in December 2018, prosumers have the right to generate renewable energy on their premises, including for their own consumption, and store or sell their excess production of renewable electricity. The traditional concept of decentralized energy has been the production of RES electricity for self-consumption and sale of excess electricity into the grid. Numerous new and more sophisticated business models and mechanisms appeared, which provide new opportunities to advance decentralised energy.[1] These include, e.g., cooperatives or local energy communities. Their geographical focus, however, makes these not suitable for all consumers.

1. See, e.g., Consumer Stock Ownership Plans for RES investments or landlord-to-tenant electricity, both presented in previous EurOserv'ER case studies.

Technical advancements, such as digitalisation, smart meters, or block chain, enable alternative and more flexible approaches, such as so-called virtual energy communities (Cali and Fifield, 2019). Compared to local energy communities and cooperatives, they enable prosumers to share electricity virtually. There is no geographical limitation as members do not share electricity physically, but rather financially.

The deployment of decentralized energy resources leads to two main challenges for the main grid: (i) the power generation from RES is inherently fluctuating due to its weather and (ii) decentralized RES power generation yields a reverse flow of electricity to the grid from local generation (Muhr, 2019). In addition to sharing electricity, virtual energy communities can provide additional services to the grid that were not possible before. Enabled by block chain, such communities can provide flexibility services to the grid by offering storage capacities of its numerous geographically distributed members (Muhr, 2019). One of biggest and earliest virtual energy communities focusing on connecting individual storage capacities and offering services to the grid is the sonnenCommunity.

BATTERY STORAGE COMMUNITIES AND BLOCKCHAIN: THE SONNENCOMMUNITY

The sonnen GmbH was founded in 2010 and has its headquarters in Bavaria, Germany. The company started as manufacturer of batteries and the first sonnenBatterie came onto the market in 2011 and was also the first complete lithium-ion system to be delivered. The main motivation for the founders was to increase the consumption of self-generated solar power instead of feeding it into the grid. One reason might have been falling feed-in tariffs have declined, which lead to self-consumption becoming more attractive than selling into the grid.

In addition to being a manufacturer of battery storage systems, the company also became an energy provider in 2015. Sonnen extended its business model by founding the sonnenCommunity, which is based on a virtual aggregation of prosumers. All its members are equipped with a PV system and a battery. It was the first decentralized energy community in which people can generate their own electricity, store and share it with other members. This type of sharing is a type of peer to peer (P2P) electricity trading, which means that prosumers exchange remaining electricity with other consumers (Park and Yong, 2017). In contrast to many other communities, this trading happens automatically in the sonnenCommunity (Muhr, 2019). Furthermore, it has increasingly focused on the aspect of storage.

PROVIDING STORAGE AND FLEXIBILITY SERVICES USING BLOCKCHAIN TECHNOLOGY

Redispatch measures are necessary interventions in electricity production. Redispatch means that the grid operator requests to adjust the active power feed-in from power plants to avoid or resolve occurring congestion. This issue increases with more RES electricity in the system. Reasons for this include the weather repentance of RES. To a certain extent, the network operators can prepare their plans based on forecasts. Furthermore, RES electricity production and electricity demand are often regionally separated. In Germany, e.g., wind power is largely produced in the north, while the industrial centers with high electricity requirements are located in the south. If existing transmission grids can no longer transport it to the south, redispatch measures must be taken to intervene in power production. This could mean that RES production is limited or even switched off so that the power grid does not collapse.

An alternative possibility that ensures that the electricity from RES is preserved is storage. Such a services provided by the sonnen. The company's focus on storage lead to the introduction of a specialized tariff in September 2016: the sonnenFlat. The participating citizens own a PV system and a sonnenBatterie and make a small part of their storage available for the power grid when they do not need it. All these small storage devices are networked a thousand times over, such that many small memories create one large memory. With this large (virtual) storage capacity, sonnen can offer services to grid providers such as relieving the network at certain times and compensating for fluctuations. In return for providing parts of their battery storage, members of the sonnenCommunity receive free electricity from the grid whenever they need it. In cooperation with Germany's largest transmission network operator TenneT, decentralized

batteries are used for the first time for redispatch measures in the German grid. The decentralized battery storage systems are networked with blockchain technology. The resulting the battery pool can be used for redispatch measures help to stabilize the power grid.

SUCCESS FACTORS, LIMITATIONS, AND REPLICATION POTENTIAL

The pooling of batteries of individual home systems has advantages for both the service provider and the household. The former can, in addition to selling batteries and other equipment, additionally offer redispatch services to the grid operator. Households benefit as they have additional earnings from their battery storage that they cannot use otherwise, in case of sonnen these come in the form of free electricity. As long as these redispatch services do put too much of a burden on the battery, this seems like an interesting new source of revenues for owners or RES home systems with batteries. In the case of sonnen, grid operators claim a participating battery's storage capacity only a few minutes a day (Muhr, 2019). Overall, this approach has a large replication potential as it does not rely and specific national policies or market characteristics. In fact, sonnen has already expanded into numerous markets, such as the USA and Australia. The model of sonnenCommunity, hover, shares a disadvantage of typical prosumership models: it requires purchasing equipment, i.e. a solar home system and a sonnenBatterie (Szichta and Tietze, 2020). Hence, it might not be suitable for low income households or households living in a rented flat.

The provision of storage services also has positive impacts on the energy transition as a whole by lowering the social costs of integrating renewable energies into the electricity mix. Hence, less conventional power plant capacity is required which results in lower CO_2 emissions and the need for further network expansion declines. ◻

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CONSUMER STOCK OWNERSHIP PLANS FOR RES INVESTMENTS

The transition of the energy system towards renewable energy sources (RES) requires substantial investments. One major challenge is the acceptance of the large-scale deployment of renewables in the population. This social acceptance depends on various factors, such as characteristics of projects, the perception of the distribution of costs and benefits, and the degree of public participation (Ellis and Ferraro, 2016). Community co-ownership of renewable energy projects can increase the level of acceptance of local RES projects compared to local commercial projects and can lead to a more positive perception of RES in general (Musall and Kuik, 2011). Consumers becoming owners of RES are referred to as prosumers. Due to the importance of the involvement of consumers as prosumers or co-investors in RES, the European Union has included this topic in the recast of the Renewable Energy Directive (RED II) that entered into force in December 2018. According to the RED II, prosumers have the right to generate renewable energy on their premises, including for their own consumption, and store or sell their excess production of renewable electricity. This is applicable to individuals, i.e. private households or non-energy small and medium enterprises (SMEs) (Art. 21 RED II) and to collectives such as tenant electricity projects or through membership in Renewable Energy Communities (RECs) that are organised as independent legal entities (Art. 22 RED II) (Lowitzsch, 2019c).

In general, there are different approaches of consumer involvement in RES production. The introduction of feed-in tariffs across Member States made it attractive for individual households to become prosumers. The possibility to sell excess RES electricity from, e.g., solar home systems into the grid for a guaranteed tariff facilitated the repayment of loans for the RE installation. However, the continuing replacement of feed-in tariffs by auction systems, which typically favour large scale RES projects, lowered the incentives for this type of investment by citizens. Furthermore, becoming an individual prosumer is mainly an option for households above a certain income level. An alternative option for cooperative citizen involvement is an energy cooperative, which is an association of natural or legal persons. Energy cooperatives often typically establish and operate renewable energy production facilities or participate in such systems and its members can receive dividend payments[1] In such cooperatives, each member typically has one vote. This might render it difficult to include other non-household partners, such as commercial investors, SMEs. Hence, there seems to be a need for a model that is capable to combine heterogenous co-investors in RECs.

FINANCING RES THROUGH CONSUMER STOCK OWNERSHIP PLANS

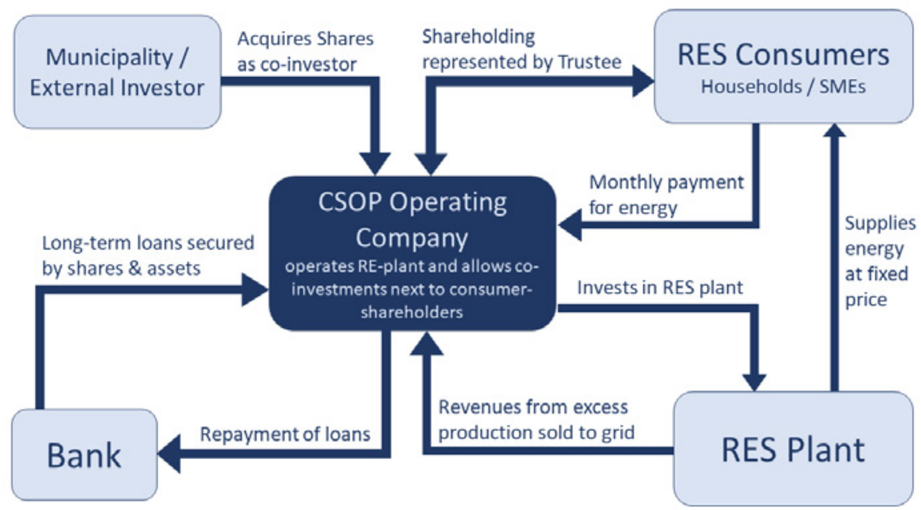
According to Article 2 of the RED II, a REC's shareholders or members are "natural persons, SMEs or local authorities, including municipalities". Hence, compared to energy cooperatives whose members are typically (local) households, these energy communities are supposed to also include commercial co-investors and local authorities. Such a combination of heterogenous co-investors requires a new organisation models that allow to pool RE investments by individuals and open them up to municipal or SME investments. An innovative financing mechanism to for exactly this purpose is the so-called Consumer Stock Ownership Plan (CSOP) (Lowitzsch, 2019a). An overview of the financial structure of a CSOP is depicted in **Figure 1**.

A CSOP enables consumers, even those that do not have savings or access to credit, to become

1. More information can be found in the EurObserv'ER Case Study on energy cooperatives (see sources).

Fig. 1

Overview of the Financing Structure of a Consumer Stock Ownership Plan.



Source: own illustration based on Lowitzsch et al. (2019)

prosumers to acquire an ownership stake in a local RES supplying them. It allows participation in both financially and in decision-making and allows co-investments of municipalities and local commercial partners. At its core is an intermediate entity, the CSOP Operating Company, which is a corporation with limited liability that, on behalf of its co-owners, invests in a RE plant and operates it. The typical phases to set up such a structure to finance the renewable energy investment are summarized in **Table 1**.

EFFECTS OF THE CSOP ON ITS STAKEHOLDERS

Overall, the CSOP model involves various local stakeholders in RES projects [2]. This local and participatory approach has the potential to increase acceptance of RES deployment and local individuals benefit from local RES generation. This is a main difference to more profit-oriented and non-local approaches such as YieldCos. In that case, different types of investors can also buy shares and benefit from the profits generated through RES plants. However, in contrast to CSOPs, these plants are typically not local and there is the involvement in decision making is lower. Furthermore, the local approach enables the participation of municipalities interested in advancing the energy transition. One advantage for participating consumers is the possibility to earn dividends from this investment due to (future) sales of energy produced by the RES plant. Furthermore, an individual does neither require past savings nor a personal credit to participate in the CSOP, as it is already possible with a rather small initial share capital. Hence, this structure has the possibility for low-income households, who might be otherwise not be able to finance a RES installation individually, to become prosumers. In the CSOP structure, the loan is repaid from future profits generated by the plant and secured by a fixed asset, i.e. the RES plant. Hence, the personal liability of an individual household is limited to the value of its shares; there is no additional personal liability. Finally, the entry and exit costs are rather low. Consumers can sell their shares to other households, e.g. to the new resident in case of moving away.

In contrast to RES investments of individual consumers or purely private co-ownership structures, CSOPs provide opportunities for local authority participation. With this model, local authorities have the possibility to actively promote RES investments. Municipalities can bring together their local stakeholders and help to align their interests and help to initiate a CSOP. If a CSOP is implemented, the municipality can flexibly choose its financial contribution and, in contrast to cooperatives, is also represented in the management and supervisory bodies. For SMEs and other potential commercial co-investors, a main advantage of the CSOP model is that voting rights are proportional to their shares. This is not the case in most other citizen energy models, where typically each member has one vote independent of shareholding. Furthermore, the shareholding citizens are represented by the trustee, which makes the voting behaviour more predictable and simplifies communication and management. Finally, this model reduces the transaction costs for commercial banks. Instead of issuing micro loans to numerous consumers investing in RES, the bank provides one bank loan to a pooled investment of all participating consumers.

CSOPS IN THE EU: THE SUPPORTING CONSUMER CO-OWNERSHIP IN RENEWABLE ENERGIES (SCORE) PROJECT

The SCORE project, which is funded by the EU under the HORIZON2020 programme, supports the introduction CSOPs in the EU's energy sector as a business model for RECs introduced by RED II. Initially, the CSOP model is tested initially in two pilot regions: the Susa Valley (Italy) and the city of Litomerice (Czech Republic)[3]. The Susa Valley covers 14 municipalities with 90,000 inhabitants in northern Italy. In this pilot region, the project was launched in June 2018 and aims at the replacement of non-RES by RES facilities: fossil fuel powered block heating facilities are to be replaced by biomass powered ones, based on locally produced wood chips. Biomass capacity is expected to increase by 1.3 MWh per year and to ultimately benefit 2,200 households. The municipality of Litomerice has 25,000 inhabitants and is located northwest of Prague. The pilot project was launched in June 2018 and aims at expending the existing solar PV capacity by 1.5 MWp. 250 households will be co-owners of the new PV facilities that, in addition to serving those households, will supply excess energy to public and administrative buildings. Subsequently, additional municipalities can participate in the SCORE project as "Follower Cities". The first is the City of Essen (Germany), which became a pilot location in early 2020. During the project lifetime, 650 kWp of PV capacity is planned to be installed and co-owned by 200 households. Municipalities can contact the SCORE team if they are interested to become a Follower City.

2. *For a more detailed discussion see Lowitzsch (2019) and Lowitzsch et al. (2019).*

3. *More information on all pilots can be found on https://www.score-h2020.eu/pilots-follower-cities/*

Tabl. 1

Typical steps of CSOP-Financing of a RES Plant

Step	Description
1	A fiduciary vehicle is set up (usually a private corporation with limited liability or a natural person in the case of very small), which administers the consumer accounts.
2	Fiduciary agreements are completed (trustee – consumers) that define the number of shares in the CSOP. The share of a household in the CSOP typically is proportional to its energy consumption (other principles are possible).
3	Participating RES consumers (households) contribute initial share capital by the participating households as their investment (typically around 100 – 250€ each).
4	The CSOP Operating Company – the intermediary entity – is set up and invests into a new or an existing RES plant.
5	Municipality and/or commercial co-investors, such as local SMEs, can buy shares in the CSOP Operating Company
6	Standard energy supply agreements between RES consumers and the CSOP Operating Company are completed.
7	On behalf of the shareholders, the CSOP Operating Company takes a bank loan. The RES plant and/or shares as collateral such that households are shielded from personal liability.
8	Repayment of loan (principal and interest) are paid from revenues generated through (i) the monthly payments of households for energy and (ii) selling surplus energy production of the RES plant to the grid.
9	After the loan to finance the RES plant is served, all profits are paid as dividends to the consumer shareholders based on the number of shares.

Source: Lowitzsch et al. (2019) and Lowtitzsch, (2019b).

CHALLENGES, SUCCESS FACTORS, AND POTENTIAL FOR REPLICABILITY

CSOPs are an interesting addition to existing prosumer models. Main advantages of this model are the inclusion of local authorities and SMEs, which can be challenging with other business models. In addition to furthering the energy transition, the

CSOP model has the potential to include households that have not be able to become in prosumers before. Due to the rather low barriers with respect to financial resources and RES expertise, also low-income households should be able to participate in and benefit from local RES investments. To which extend this actually happens will have to be evaluated after several CSOPs will have been implemented and operating in the EU. A key success factor of CSOPs is an active involvement of all stakeholders (Lowitzsch, 2019b). Particularly the involvement of local authorities seems beneficial to align the RES investment with local policies and serve as an intermediary between participation consumers, local SMEs. If available, the CSOP investment would benefit from a public support programme that might lead to lower loan rates for the RES investment. There are, however, also potential challenges for implementing CSOPs. These include, e.g., energy utilities that might try to oppose such business models as they might endanger their monopolistic position. Furthermore, citizens might have reservations due to the – at least on first sight – rather complicated structure of a CSOP. Hence, information events and campaigns might be a suitable and important tool to reach as many of the typically very heterogenous households in a municipality.

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