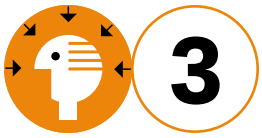

3 Better energy services, better energy sectors—and links with the poor

Catherine Waddams Price

Message from the editors

Governments around the world see energy projects and policies as key parts of their strategies for growth and development. Traditionally, governments have relied heavily on direct investment of public funds—through public providers—to expand energy capacity and access. More recently, a growing number have refocused their energy policies, opening the sector to new players and looking to the private sector to finance improvements in services. How do these interventions affect the poor? What are the links between better access to energy services—and better services—for households and communities and household welfare? What does more to improve the welfare of the poorest—growth-oriented sectoral policies or access-oriented policies? And what does the shift in focus from public investment to reform mean for the poor? Knowing the answers to these questions is critical for governments wanting to ensure that their sectoral interventions at least cause no harm to the poor and, more optimistically, can systematically improve their welfare. Current answers to these questions rest on a mix of economic reasoning and rich anecdotal evidence. But hard data to support rigorous answers remain in short supply—a major challenge for the sector.

Energy policies have a key role in the development and growth strategies of governments. Ready access to reliable, reasonably priced energy—particularly by industry, agriculture, and the commercial sector—is an important catalyst for growth. For households, better energy services can boost welfare—for example, by reducing time spent collecting biomass fuels for cooking or heating purposes or by boosting the productivity and income of household businesses. Accordingly, in many developing countries we see projects aimed at increasing the capacity of the modern energy sector to contribute to productivity, growth, and economic opportunity alongside projects that are more narrowly focused on expanding access to improved energy services for low-income or geographically dispersed communities. Traditionally, projects of both kinds relied heavily on direct investments in system expansion. More recently, governments have focused more attention on the institutional framework that supports investments and service delivery—and moved to reform this framework in the hope of enhancing operational efficiency and more efficiently mobilizing finance for system expansion and improvement.

To understand how these interventions affect the poor, we need some appreciation of the links between improved access to energy services—or better-quality services—at the household and community level and household welfare. We need some means of assessing the relative roles of growth-oriented sectoral policies and access-oriented policies in improving the welfare of the poorest. And we need some means of gauging the effect on the poor of a shift from policies centered on investment to policies centered on reform.

In general, there is broad agreement, supported by a degree of anecdotal evidence, on the direction of links between energy and poverty alleviation. But hard data on the absolute or relative magnitude of the welfare impacts of different kinds of sectoral interventions are in very short supply. Accordingly, this chapter is restricted to discussing broad directions, rather than precise measures, of impact. Similarly, while arguments about the likely effect of sectoral reform on the poor are reasonably well developed, relatively little evidence is yet available to cast light on these arguments or on the aspects of reform most likely to make a difference to the poor. Redressing this data gap is a clear

Table 1 **Potential effects of improved energy services in alleviating poverty**

Direct effects on well-being	Direct effects on health	Direct effects on education	Direct effects on economic opportunities for the poor	Trickle-down effect of increased productivity	Fiscal space (coupled with pro-poor policies)
Improved access to lighting, heat, and refrigeration Savings in time and effort (due to reduced need to gather biomass and other fuels) Improved access to information (through radio, television, and telecommunications)	Improved indoor air quality through cleaner fuel Reduced fire hazard Improved quality of health services (through better lighting, equipment, and refrigeration) Easier establishment of health centers Better education	Improved access to lighting, allowing more time to study Savings in time and effort, releasing time and energy to channel to education	Easier establishment and greater productivity of businesses that employ the poor Creation of employment in infrastructure service delivery Improved health and education and savings in time and effort, increasing individual productivity	Easier establishment and greater productivity of businesses in general (including through positive impact on the environment)	Smaller fiscal burden and higher fiscal returns from more efficient services More benefits to the poor if government spending is effectively channeled to welfare-enhancing services Higher fiscal returns associated with higher growth, coupled with pro-poor policies

priority for those in the sector concerned with improving the impact of sector policies on the poor.

Improving access and broadening choice: the direct welfare effects

An underlying objective of many energy sector projects is to give low-income households and communities in rural and periurban areas better access to modern fuels—to allow them to shift from biomass fuels to kerosene or gas for cooking, to put electric lighting in a school or power a refrigerator in a community health clinic, or to access electricity for lighting or to power equipment for household businesses. Interventions of these kinds are expected to have important and direct effects on the welfare of the poor (table 1). They may enable households to use more energy services, either because they provide them access for the first time or because they reduce prices. Greater use of energy services may deliver other benefits, particularly better health and education and, as a result, improved access to and productivity in the labor market. Better service is also likely to reduce both the monetary and the nonmonetary costs of obtaining supply.

Households consume energy because of the services of light, power, and heat that it provides. Energy sources differ in their efficiency in meeting these needs—and in their capacity to do so—and also in their positive and negative side-effects. For some uses, substitution is possible. Heat, light, and motive power can come from different sources, and the choice of source affects several aspects of household welfare. Food may be cooked over a fire of wood or dung, on an improved stove fueled by biomass, or on a stove fueled by kerosene, liquefied petroleum gas (LPG), or electricity. But both traditional (fuelwood, dung) and intermediate (kerosene) fuels impose health costs on users through the adverse effects of smoke and emissions on respiration and through fire hazard. In India recent estimates attribute about 400,000 premature deaths a year to indoor air pollution. Firewood and other biomass fuels are also time consuming to collect—accounting on average for 20 percent of rural women's work time.

Lighting may come from candles, a kerosene lamp, or an electric bulb. But the relative brightness of electric light may open a range of possibilities that are constrained where households and communities must rely on candles or kerosene—lighting a schoolroom or health clinic at night, for example. A plow may be pushed by a person or pulled by an animal—or pulled by a tractor powered by a petroleum product. A water pump may be worked by hand, or by a kerosene or diesel generator. In each case service is likely to be more effective with modern fuels such as gas, electricity, or petroleum products, in part because they are usually used with more modern and efficient equipment.

Other uses are less amenable to substitution. Refrigeration—with potential benefits ranging from

increased options for household production to the capacity for vaccine storage in health clinics—depends on some access to gas or electricity. Access to modern communications—particularly the Internet—depends on access to electricity.

Electric light opens new opportunities—lighting a school or a health clinic at night, for example.

Users generally face tradeoffs between monetary and time costs as they progress from traditional to intermediate to modern fuels. Fuelwood may be the cheapest in monetary terms, but can be very time consuming to collect; as supplies become sparse, both the time costs to the collectors and the scarcity costs to the economy increase. Intermediate fuels are generally more expensive than traditional fuels but cheaper to access than modern fuels. (Here, an important factor shaping household choice is likely to be the cost of connecting to a service. Intermediate fuels often have higher unit costs than, say, electricity or gas, but lower up-front access costs.) Moving from one type of fuel to another also often entails investment in new equipment. But the time and energy saved in collecting fuel can be converted into better health and more time for education and for other productive activity, increasing earning potential as well as providing direct benefits. The value of this time and energy depends on the opportunities available. (There is some evidence that the welfare effects of access to energy are disproportionately boosted where other infrastructure services are also present. In rural Peru, for example, recent surveys show that bundling water, sanitation, electricity, and education services has major welfare benefits—and that adding the fourth service has a development impact seven times that of adding the second. See Barnes 2000.)

Greater access to energy can be only beneficial, in the broadest sense, because it increases choice (if households do not wish to take advantage of greater choice, they are at least no worse off than before). In some circumstances, however, a new source of energy may lead to improvements for the community as a whole but result in exclusion for those who do not participate. For example, access to electricity for a small subset of households may enable these households to increase their productivity and wealth and to take advantage of improved opportunities through access to the Internet. There may therefore be an issue of "relative" as well as "absolute" access.

Hard data on the magnitude of the direct welfare impacts described here are in short supply—though anecdotal evidence is persuasive (see, for example, Albouy and Nadifi 1999). In the following chapter Vivien Foster sets out some options for remedying this data gap by clarifying indicators of poverty impact and building relevant indicators of service improvement and welfare enhancement into energy projects.

Direct impacts: the role of prices

The way in which the energy sector is regulated and prices are set has important implications for access—both direct (affecting the affordability of access) and indirect (affecting the possibility of access).

Obstacles to access may be financial rather than physical. Electricity connection fees between US$80 and US$300 are common. Once households are connected, however, electricity is usually cheaper than kerosene (Albouy and Nadifi 1999), and it also has nonfinancial benefits. Many low-income households lack access to the credit they would need to raise the connection fee, even where the financial benefits alone would warrant this investment. Worldwide, capital markets generally fail low-income groups.

Once households gain access to energy, consumption depends on affordability. The pricing of fuels is crucial in determining the amount consumed (if any) and the share of income this absorbs. Because many countries have subsidized some fuels in the past, reforms commonly include removing or restructuring these subsidies and thus affect the prices charged.

Energy consumption and income are positively related, but while energy spending rises with income, it generally does so less than proportionately—an important distinction in analyzing the link between energy services and poverty. Consumption levels off as income increases, with the poor spending 10–20 percent of their income on energy, and the rich about 2 percent (Albouy and Nadifi 1999). In some countries this larger burden for the poor is exacerbated by a higher average cost of fuel for low-income families, reflecting either fuel mix or tariff structure (table 2). The relationship between income and energy expenditure might seem to offer a route for subsidy, but in fact it contains a paradox, because the relationship is imperfect. Moreover, difficulties in access may mean that the poor receive none of the subsidy because they consume none of the product.

Energy pricing also has environmental implications—but adjusting prices to reflect environmental externalities more accurately may have adverse effects on the poor. Both fuelwood and hydrocarbon fuels are in limited supply, and

their market price may not include their scarcity value. Burning them produces emissions that affect the global climate, and this too is generally not reflected in the price. Any adjustment in prices to more accurately reflect these environmental costs will hit the poor particularly hard because fuel absorbs such a large part of their income and because they lack the funds to invest in energy-saving devices or alternative fuels or appliances. Fuel markets are interdependent in the sense that taxes or subsidies in some will have a "knock-on" effect on others. Directing environmental taxes to electricity, on the basis that it is consumed by the better-off, will raise the price of intermediate and traditional fuels too and thus also affect poorer households.

Regulatory interventions can also affect the availability of services. For example, energy pricing structures may—inadvertently—create barriers to the extension of improved service options to low-income households and communities. Regulators may face a tradeoff between short-term protection of vulnerable groups through price constraints—which will discourage entry by restricting potential profits—and the long-term benefits from competitive entry. Institutional barriers may block incentives for providing access in an appropriate form or may lead to prohibitively high prices for access. That raises questions of obligatory service and universal service obligation, discussed below.

The choice of regulatory regime also shapes incentives relating to the extent and nature of service expansion. For example, a system that rewards capital expenditure (such as any based on rate of return on assets) will push providers to supply centralized generation and transmission networks, when it might be more cost-effective to install distributed generation with much smaller local distribution systems (Jechoutek 1999).

Indirect effects of improved energy services

So far, discussion has focused on the direct effects on welfare of improving access to energy services, and barriers that may stand in the way of such improvements. Improved energy services will also generally produce improvements in the economy as a whole, with benefits for the poor both as members of society and as consumers. Such indirect benefits arise from two sources: improved efficiency of the sector and the economy, which increases total wealth, and, through cuts in subsidies, the release of more funds for other activities. (The effect of subsidy reform on the poor may be mixed if prereform subsidies were well targeted to them—but this is seldom the case in developing countries; see chapter 7.)

Table 2 **Fuel use in forty-five cities, by ease of access to electricity**

Access to electricity in city	Average monthly household income (U.S. dollars)	Average population (thousands)	Wood	Charcoal	Kerosene	LPG	Electricity
			Percentage of households using fuel[a]				
Very difficult	33	23	56.4	73.4	57.6	26.6	21.1
Difficult	67	174	72.3	33.5	65.2	21.8	42.8
Easy	62	514	24.1	62.7	50.4	21.6	47.7
Very easy	77	1,153	22.1	34.5	42.6	47.8	90.5
			Fuel use (kilograms oil equivalent per capita per month)				
Very difficult	33	23	1.31	10.09	0.35	1.49	0.24
Difficult	67	174	7.27	2.54	0.46	0.91	1.24
Easy	62	514	2.83	7.20	1.10	0.50	2.00
Very easy	77	1,153	1.71	1.75	1.75	2.00	2.79

Note: The data are from household surveys conducted in twelve developing countries in various years from 1984 to 1993.
a. Shares sum to more than 100 percent because households may use more than one fuel.
Source: Energy Sector Management Assistance Programme (ESMAP) household surveys.

The first set of benefits is likely to be more important in the longer term, especially when the dynamic effects of technological development are included.

Directing environmental taxes to electricity will raise the price of intermediate and traditional fuels too.

As noted above, better energy services may result in better provision of local facilities, such as health centers, schools, and adult education facilities. They are also likely to have a positive effect on other infrastructure, such as transport (both roads and vehicles), and on local commercial activity. Increased economic activity can also be expected at the regional and national levels. Cuts in subsidies will provide fiscal "headroom," and improved efficiency will expand the tax base and reduce demands on the budget. But how will these benefits be distributed within the community? Here again, hard data with which to answer these questions are in short supply.

Potential beneficiaries can be divided into three groups: those who benefit directly from the increased wealth, perhaps through employment; those who benefit from the use of improved facilities available to all (infrastructure, broadcasting, and education and health services, if universally provided); and those who benefit from targeted subsidies (through income effects or through better access to subsidized products and services). Distribution of the benefits generally depends both on political infrastructure and on markets.

Reforms to improve the performance of the energy sector will not necessarily benefit the poor, at least in the short run. For example, if new commercial enterprises require a particular education level, it may be the middle classes rather than the poor who can take advantage of new employment opportunities. Direct intervention in the market to introduce a "bias toward the poor" may create new distortions, sacrifice some of the efficiency benefits, and prove difficult to target.

Distributional effects of reform

Traditionally, in both developed and developing countries, the supply of energy services has been the prerogative of state-owned monopolies. Often these monopolies had specific targets for extending access to particular groups—for example, through rural electrification programs. But cost inefficiency and poor targeting have generally led to poor results—both in overall sector performance and in progress in expanding service coverage. Many energy sectors have developed inefficiently, in part because operators had few incentives to minimize costs or optimize investment—and in part because they have been distorted by past redistributional programs, targeting the poor or other groups.

Energy reforms are generally driven by a desire to improve the efficiency and reduce the cost of energy supplies. If the reforms succeed in reducing costs, a "high-level" distributional question arises: How should these benefits be shared between producers and consumers? The answer will affect the size of the total gains.

"Reform" is not a monolithic concept. Different governments have taken different approaches, both in the extent of reform and in the rules that they establish to guide service providers. In general, there is a choice between high-powered incentive schemes, usually involving private ownership (or at least the right to retain any savings) so as to maximize suppliers' incentive to reduce costs, and regulatory schemes in which cost savings are passed on to or shared with consumers, much like traditional cost-of-service regulation. While schemes that pass on savings to consumers are seen as fairer in the short term, they are often the very structures that have given rise to excessive costs in the past. Regulation can strike a compromise between incentives and fairness—for example, by imposing average price caps that are reviewed from time to time. But its effectiveness depends on the ability of the regulatory authority to monitor and enforce price limits. Regulation also needs to be politically acceptable. In the United Kingdom, which pioneered incentive regulation, the regulator's monitoring performance has been controversial. Most of the early gains from reform accrued to new owners, not consumers. As a result the Labour government is introducing reforms to improve the distribution of benefits.

The level of prices is only one aspect of the pricing problem; rebalancing prices within the overall limit is also an issue. Reforms that introduce incentives based on profit maximization by suppliers may well lead them to raise prices or withdraw from markets that they had previously served. This may be efficient, but it could also be distributionally regressive, especially if low-income consumers are less price responsive than richer consumers. Evidence on the relative price elasticity of different income groups is mixed. Barnes and others (1998) found that demand from low-income households was more price responsive than that from richer households in many developing countries, but Nesbakken (1999) found the reverse for Norway. Any regressive effect from rebalancing in order to maximize profits will be in addition to that of removing any previous subsidy.

Competition reduces the scope for cross-subsidy between consumer groups. Forcing the incumbent to keep prices below a profitable level for a particular target group of consumers will hamper its competitiveness elsewhere and probably leave it supplying mainly the protected group of consumers. That was the early experience in U.K. residential energy markets, where incumbents retain a large share of high-cost, low-income consumers. The regulator faces a difficult choice between protecting these consumer groups through controlled prices in the short term, making them unattractive to entrants, and allowing them the longer-term benefits of competition by letting prices rise. The United Kingdom has a well-developed tax and benefit system, but the government is reluctant to use it explicitly for correcting the distributional effects of market reform.

One approach to the distributional effects of different access and pricing arrangements is to impose some obligation to supply. Chisari and Estache (1999) distinguish between obligatory service, which obliges the supplier to offer the service to all consumers in a particular area or category, and universal service obligation, which additionally requires that the service be offered on terms affordable to all. The second condition is clearly much more onerous. Reviewing the effect of such a condition in the Argentine reforms, Chisari and Estache found mixed results. Some low-income households benefited, while others migrated away from areas of formal jurisdictional control to avoid the increased cost of housing and utilities.

The impact of reform on the poor: practical experience

Some general conclusions about the effects of energy reforms on the poor can be drawn from reforms already instituted. In the United Kingdom the privatization and reorganization of the gas and electricity industries reduced costs, but the savings were not extensively shared with consumers (see, for example, Newbery and Pollitt 1997). And the introduction of competition has led to price differentiation among consumers. While the reforms provided some benefit to all consumers through lower prices, the greatest benefits went to shareholders and richer consumers (Waddams Price and Hancock 1998).

Chisari, Estache, and Romero (1997) analyze the distributional effects of utility reform in Argentina using a model that takes account of both consumer and investment expenditure patterns and the effects on incomes of changes in returns to capital and labor. They distinguish effective regulation (in which gains are diffused throughout the economy) from ineffective regulation (in which gains are retained by shareholders), but do not fully incorporate the disincentive effect of sharing on the size of achievable gains. They conclude that with effective regulation the overall distributional effect is progressive, while with ineffective regulation gains are smaller but much more evenly spread. In a later report, also based on the Argentine experience, Chisari and Estache (1999) point to the need to recognize the poor's limited access to credit and to the importance of coordinating regulatory, employment, and social policy and tailoring assistance programs for low-income or high-cost groups.

Price reform in Hungary did not worsen the distribution of income, indicating that the subsidies had been poorly targeted in the first place.

Other studies have also looked at the effect of potential price changes on households. Freund and Wallich (1995) show that subsidizing energy prices in Poland helps the rich much more than the poor, and recommend introducing prices that more accurately reflect costs and providing cash relief for the poor through social assistance or, failing that, a well-targeted and limited lifeline price for low consumption levels. In República Bolivariana de Venezuela Gutierrez (1995) concludes that prereform subsidies benefit the richest half of households and makes similar recommendations for mitigating the effects of reform on the poor. This study considers energy reform in a broad context, recognizing that low-income households would face increases in food, housing, and transport costs as well as energy prices. In this case general income support—rather than targeted energy subsidies—seems particularly apt. Newbery (1995) found that price reform in Hungary did not worsen the distribution of income, indicating that prereform subsidies had been poorly targeted.

Conclusion

Governments have traditionally used the energy sector for a variety of social ends—including ostensible efforts to alleviate poverty. However, the instruments used often resulted in poor sectoral performance and a truncated capacity either to expand improved services directly to the poor or to promote productivity improvements that could translate into

better opportunities for the poor. The reforms that have been implemented in developed and developing countries are intended to remedy this poor performance. The effectiveness of their targeting mechanisms aimed at helping low-income households has varied considerably; whether the poor lose from the reform of such mechanisms depends in part on whether they benefited from them in the first place.

Most analysts agree that the best way to protect the poor is to raise their incomes—subsidizing particular goods and services introduces distortions in both consumption and investment, which is likely to harm the entire economy in the long term. But increasing incomes is itself fraught with risk, including new distortions in the labor market, a larger budgetary burden, and the failure of targeted assistance to reach those in need. In these circumstances it becomes crucial to consider "second best" policies, including the role of energy in the welfare of the poor.

Most reform programs face a tradeoff between increasing efficiency and protecting the poor. For example, proposed reforms in Russia in 1998 to fully recover the costs of providing housing and utilities would have increased the share of households spending more than 20 percent of their budgets on these items from less than an eighth to more than half (World Bank 1999). In analyzing different subsidy schemes in Central and Eastern Europe, Lovei and others (2000) show a clear choice between pricing distortion and effective coverage. The appropriate tradeoff in each country depends on the relative size of each problem and the availability of other means to alleviate the impact of reforms on the poor. Policymakers also face choices between the speed of reform and the impact on those previously receiving subsidies, with important consequences for both the social impact and the political sustainability of the reform.

Assessing the impact of energy reform on the poor and identifying ways to mitigate any possible harm requires information that remains unavailable for many countries. How are prices related to costs? Who gains from any cross-subsidies, and what efficiency losses do these cross-subsidies incur? If the potential efficiency gains justify reform, who is likely to lose as a result of physical or financial barriers to access to supplies? How will any price changes affect access and demand levels? Should the losers be protected and, if so, should the protection be transitional or permanent? What mechanism for targeting assistance is most likely to be effective in helping those who need it while distorting consumer prices and long-term investment decisions as little as possible?

In chapter 4 Vivien Foster explains a methodology for identifying both the effect of reforms on the poor and the appropriate policy responses, and details the information required. Every country undertaking reform needs information on energy costs and demand patterns to identify who is likely to be adversely affected by reforms, whether they need assistance, and what the most effective ways are to reach them without jeopardizing the potential gains of the reforms.

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References

Albouy, Yves, and Nadia Nadifi. 1999. "Impact of Power Sector Reform on the Poor: A Review of Issues and the Literature." World Bank, Energy, Mining, and Telecommunications Department, Washington, D.C.

Barnes, Douglas F. 2000. "Energy and Poverty: Strategies for Assisting the Rural and Urban Poor." Draft background paper for the World Bank energy strategy. World Bank, South Asia Region, Energy Sector Unit, Washington, D.C.

Barnes, Douglas F., Jeffrey Dowd, Liu Qian, Kerry Krutilla, and William Hyde. 1998. "The Urban Energy Transition: Energy, Poverty, and the Environment in the Developing World." World Bank, Energy, Mining, and Telecommunications Department, Washington, D.C. Draft.

Chisari, Omar, and Antonio Estache. 1999. "Universal Service Obligations in Utility Concession Contracts and the Needs of the Poor in Argentina's Privatizations." Policy Research Working Paper 2250. World Bank Institute, Washington, D.C.

Chisari, Omar, Antonio Estache, and Carlos Romero. 1997. "Winners and Losers from Utility Privatization in Argentina: Lessons from a General Equilibrium Model." Policy Research Working Paper 1824. World Bank Institute, Washington, D.C.

Freund, Caroline, and Christine Wallich. 1995. "Raising Household Energy Prices in Poland: Who Gains? Who Loses?" Policy Research Working Paper 1495. World Bank, Europe and Central Asia, Country Department 2, Washington, D.C.

Gutierrez, Luis. 1995. "Venezuela: Efficiency Repricing of Energy." Report 13581-VE. World Bank, Latin America and the Caribbean Regional Office, Washington, D.C.

Jechoutek, Karl G. 1999. "Empowering the Future: The Dawn of a Decentralized Service Industry." Paper presented to Cambridge Energy Research Associates forum on the Future of Distributed Energy, Huntington Beach, Calif., October 12–14. World Bank, Energy, Mining, and Telecommunications Department, Office of the Director, Washington, D.C.

Lovei, Laszlo, Eugene Gurenko, Michael Haney, Philip O'Keefe, and Maria Shkaratan. 2000. "Maintaining Utility Services for the Poor: Policies and Practices in Central and Eastern Europe and the Former Soviet Union." World Bank, Europe and Central Asia Regional Office, Washington, D.C. Draft.

Nesbakken, Runa. 1999. "Price Sensitivity of Residential Energy Consumption in Norway." *Energy Economics* 21: 493–515.

Newbery, David. 1995. "The Distributional Impact of Price Changes in Hungary and the United Kingdom." *Economic Journal* 105: 847–63.

Newbery, David, and Michael Pollitt. 1997. "The Restructuring and Privatisation of Britain's CEGB: Was It Worth It?" *Journal of Industrial Economics* 3: 269–304.

U.K. Department for International Development. 1999. "Energy for the Rural Poor: Guidance Note." London.

Waddams Price, Catherine, and Ruth Hancock. 1998. "Distributional Effects of Liberalising U.K. Residential Utility Markets." *Fiscal Studies* 19 (3): 295–320.

World Bank. 1999. "Russia: Affordability of Cost Recovery—Housing and Communal Services." Washington, D.C.