Impact of Counter-Urbanization on Size, Population Mix, and Welfare of an Agricultural Region

Eli Feinerman, Israel Finkelshtain, Anat Tchetchik, and Mordehai Delgo

The article explains the phenomenon of counter-urbanization, which has become prominent in most developed countries. We develop a model that provides an economic rationalization for the observed willingness of incumbent farmers of a rural region to absorb nonfarmer urban migrants. The analytical findings show that counter-urbanization increases the region's welfare-maximizing population, decreases the optimal number of incumbent farmers, and increases the per capita welfare. The empirical results, which are based on data from rural Israel, demonstrate that while the optimal population of farmers decreases slightly, the total optimal population of the region more than triples and farmers' per capita welfare almost doubles.

Key words: counter-urbanization, local public good, farmer welfare, mixed populations.

JEL codes: H44, O18, P26, R13.

Urban-to-rural migration has become a prominent phenomenon in most developed countries. This change in demographics, which is apparent in both the United States (e.g., USDA 1996, 2009) and the European Community (e.g., Champion 2006; Delgo 2006; Panebianco and Kiehl 2003), is commonly referred to in the literature as counter-urbanization. Most studies on counter-urbanization have focused on the socioeconomic factors affecting urban inhabitants' demand to reside in rural areas (e.g., Bierens and Kontuly 2008; Crump 2003; Halfacree 1994; McCarthy 2008). Irwin et al. (2010) provide a comprehensive review of the related agricultural economic literature and suggest that natural resource amenities play a key role in attracting migrants to rural areas in the United States.

The economic explanation for the acceptance of counter-urbanization by the incumbent population is limited and has received the attention of mainly rural sociologists and geographers. Increased income levels, job opportunities in rural regions, and provision of important local public services (Bosworth 2009; Moseley and Owen 2008; Stockdale, Findlay, and Short 2000) are some of the more prominent explanations. The current article elaborates upon this last point—the provision of local public goods (LPGs)—by means of a theoretical model and an accompanying empirical analysis.

The theoretical basis for this article is rooted in a long tradition dealing with the efficient supply of LPGs (e.g., Berglas 1976; Feinerman and Kislev 1991; Hochman, Pines, and Thisse 1995; Tiebout 1956) and relies to a great extent on Club Theory (Buchanan 1965). As do Feinerman and Kislev (1991), we consider the provision of LPGs to a rural agricultural community and emphasize the land requirement for the agricultural production process. However, unlike them, we account for the possibility of migration of nonfarmers to rural areas, and thereby consider the impact of counter-urbanization on the provision of LPGs and the population mix and size of rural areas, as well as on the welfare of the incumbent farmer-residents.

Provision of public services in rural areas has been the subject of a series of studies. Jones and

Eli Feinerman and Israel Finkelshtain are, respectively, professor and associate professor at the Department of Agricultural Economics and the Center of Agricultural Economic Research, Hebrew University of Jerusalem. Anat Tchetchik is a lecturer at the Department of Hotel and Tourism Management, Ben-Gurion University of the Negev. While working on the paper, Mordehai Delgo was a PhD candidate at the Department of Agricultural Economics, Hebrew University of Jerusalem.

Financial support from the Agricultural Chief-Scientist Fund, the Sapir Fund, and the Deutsche Forschungsgemainschaft is gratefully acknowledged.

Amer. J. Agr. Econ. 93(4): 1032–1047; doi: 10.1093/ajae/aar027
Received September 2010; accepted March 2011; published online July 13, 2011

Gessaman (1974) discussed the special characteristics of LPGs in rural areas. They surveyed previous studies that had estimated the cost function associated with the provision of LPGs and asserted that further research should be aimed at assessing the benefits from consolidation of functions and/or service delivery units. One of our main objectives here is to establish a simulation framework for this precise issue and apply it in the context of the Israeli situation.

Kraybill and Weber (1995) presented the institutional changes required for elevation of LPG provision and residents' welfare in rural areas. Huang, Orazem, and Wohlgemuth (2002) examined the impact of local government services on rural population growth and found it to be neutral, or even negative. Their explanation was that counties that provide better or higher quality LPGs levy higher taxes to finance those services and hence do not attract more immigrants. Kilkenny (2010) suggests that the small and sparse population of rural regions is a major cause for their inability to self-finance provision of LPGs. As a result, central governments often support the provision of LPGs in rural areas. For example, the USDA invests $14 billion annually on nonfarm programs, mostly on public goods such as transport, waste disposal, and rural water infrastructure.

The main contribution of the current article is to show that by absorbing nonfarmer settlers, it is possible to significantly reduce the cost of provision of LPGs and the need for federal assistance.

As to the regulatory environment, rural policy changes have been taking place since the 1990s, when most developed countries transformed their focus from support of agriculture to support of rural development. In the European Union (EU), agricultural activity covers 50.5% of the total territory and rural areas are being confronted with various changes that affect economic activity, the landscape, and the environment. In recent years, agro-environmental policy in Europe has been placed at the forefront of a wider debate concerning the future of rural areas, not just agricultural ones (Feinerman and Komen 2003). The new Rural Development Regulation of the EU reflects the shift in attention within rural areas from agricultural production to rural development, and embraces both farmers and nonfarm residents. The regional governmental structure in western countries has also undergone far-reaching changes, consisting mainly of strengthening of the local governments, accompanied by the central government's withdrawal from its hold on social affairs policy, a decrease of its share in financing LPGs, and a decentralization of authority and responsibility (Tacoli 1998). To exploit scale economies, public services are often supplied by the local governments, but these economies may become exhausted as the average cost curves of supplying these services are generally U-shaped. This is the rationale for the existence of separate regional or local governments.

In the current article, we study the situation in rural areas of Israel, which cover almost 90% of the country's total land area. The regional councils (RCs) are the municipal authorities in rural areas, comprising almost all of the rural communities in the country. There are more than fifty RCs in Israel, and each of them governs a number of settlements spread across a relatively large rural area. The council's basic goal is to provide its residents with a welfare-maximizing complex of municipal public goods and services, subject to land and financial constraints. Like many other rural areas in western countries, the rural municipal system in Israel has undergone far-reaching changes over the last couple of decades, the most notable of which include: (*a*) establishment of new non-agricultural communities that have been incorporated into existing clusters of villages; (*b*) a significant expansion of existing villages, which consisted of farmers owning agricultural assets, as new dwellers with no agricultural interests join them; (*c*) a shift in the "center of gravity" from local communities to RCs, as the latter have gained power in the provision of municipal public goods and services, and (*d*) a decrease in the number of farmers in each agricultural community coupled with a transition toward bigger land units of agricultural production. The above changes have been magnified by the waves of urban-to-rural migration (counter-urbanization).

In this article we focus on the economic aspects of the supply-side analysis of counter-urbanization and attempt to fill the gap in the literature. We develop a simple theoretical model that provides an economic justification for the willingness of incumbent farmer-residents of a rural region to absorb nonfarm residents (urban-to-rural migrants) and apply it to an average/typical RC in Israel. Our contribution to the literature is twofold. From a positive perspective, we provide an explanation for the willingness of incumbent farmers of rural regions to absorb nonfarmer urban-to-rural migrants: the incumbent farmers benefit from both sharing (with the new immigrants) the cost of provision of LPGs and enhancing their levels. From a normative point of view, the analysis offers theoretical and empirical frameworks to assess the optimal population level and mix (in terms of farmers and nonfarmer migrants) in rural regions. The analysis can assist policymakers and regional planners in establishing optimal levels of publicly provided goods and services, as well as optimal population size and mix and optimal zoning of an efficient RC.

The remainder of this article is organized as follows. First, we introduce the conceptual and theoretical frameworks and compare the case in which the RC is composed of farmers only to the case of a mixed population of farmers and nonfarmer residents. Then, we present the data and specify and estimate relevant functional forms required for application of the analysis. Next, we utilize the econometric analysis of the previous section to test and quantify the analytical findings of the theoretical analysis. Finally, in the last section, we summarize the results and draw conclusions.

The Model

In this section we present the theoretical model and derive the optimal levels of population and publicly provided public goods under two scenarios: one in which the RC consists of farmers only, and the other in which a mixed population is enabled. We then compare the solutions of these scenarios and derive a proposition.

The Setup

Consider a spatial rural RC with a fixed land area of $\bar{L}$ hectares (ha), cultivated by (identical) N^a family farms, each endowed with an endogenously determined land area of $l = \bar{L}/N^a$ ha and composed of m family members. Each farm derives income of $W(l)$ dollars from agricultural production, where W is strictly concave and twice differentiable. The farm size that maximizes profits is denoted by l^*.[1] The associated number of farm operators and members of their families is referred to as N^f $(=mN^a)$ and is defined through the equality: $l^* = m\bar{L}/N^f$ (see figure 1).

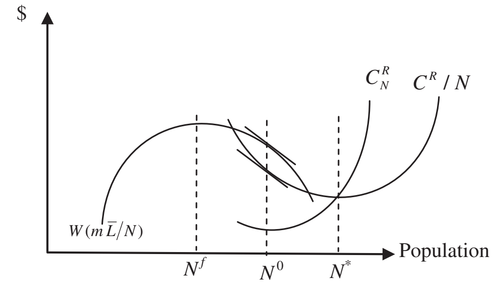

Figure 1. The regional optimal population

The RC is an economic entity providing its residents with G units of a regional-level public good (RPG). The RPG is assumed to serve the entire population of the council. Below we distinguish between an RC composed of farmers only and an RC with a mixed population of farmers and nonfarm residents. The number of nonfarm residents (if any) in the RC is denoted by N^U. The costs of supplying the RPGs are shared equally among all residents, farmers and nonfarmers alike.

The cost of providing G units of an RPG is dependent not only on N $(=mN^a + N^U)$, the number of residents within the jurisdiction of the RC, but also on the total size or area of the region, $\bar{L}$. The latter raises the cost due to longer service lines and increased transportation cost. Thus, the regional-level cost function—$C^R(G, N, \bar{L})$—is increasing in all of its arguments and, for a given G and $\bar{L}$, the average cost function $C^R(G, N, \bar{L})/N$ is assumed to be a U-shaped function of N *with a minimum at* N^* (figure 1). Hereafter, we assume that $N^* > N^f$.[2]

[1] The assumption that $W(l)$ has a maximum is consistent with the literature on farm size (e.g., Eastwood, Lipton, and Newell 2010; Kislev and Peterson 1996). Those authors assert that scale economies may exist in small farms but tend to be eliminated in larger family farms. The assumption is confirmed by our empirical findings below.

[2] This assumption implies that the optimal population density that minimizes the per capita cost of LPG supply is larger than the optimal density from a farming perspective. The former was estimated in a study of 55% of U.S. counties (e.g., Conklin 2004; Ladd 1992) to be just below a person per hectare. Interestingly, our empirical study below yields almost the same number: 0.9 persons per hectare. Assuming for the moment that the above two densities are identical (i.e., $N^* = N^f$) and that each farm family is composed of $m = 4$ members implies an average farm size of less than 4 ha. However, the average farm size in most developed countries is much larger: over 190 ha in the United States and about 40 ha in the EU (Eastwood et al. 2010). The optimal farm size estimated in our empirical analysis below is approximately 17 ha. It is therefore safe to assume that $l^*(= 4\bar{L}/N^f)$ is much larger than 4 ha, implying that N^f is smaller than N^*. In other words, it is safe to assume that in all Israeli RCs (as well as in rural areas in most developed countries), the farmers' population (including all family members) that exploits economies of scale in agricultural production is significantly smaller than the optimal number of residents of a region that minimizes the cost per capita of LPG supply.

Efficient Equilibrium

First, the optimal regional level population size and the optimal level of the publicly provided public good are analyzed separately for each of the two aforementioned cases. Then, the differences are analyzed and discussed.

Case 1: Farmers only. Here we assume that all N residents of the RC are farmers only (*i.e.*, $N^u = 0, N^a = N/m \rightarrow l = \bar{L}/N^a = m\bar{L}/N$), which by and large reflects the situation prevailing in Israel until the mid-1990s. Each individual farmer derives utility from the consumption of a composite good, $\left[\frac{1}{m}W(m\bar{L}/N) - C^R(G,N,\bar{L})/N\right]$ dollars, and from consuming G units of an RPG (jointly with all other region members), $U(G)$, which is continuously increasing, twice differentiable and concave. Thus, the (money metric) utility function of a representative farmer is given by $\frac{1}{m}W(m\bar{L}/N) - C^R(G,N,\bar{L})/N + U(G)$. The regional-level optimization problem of a benevolent central planner can be formulated as follows:

$$(1) \qquad \underbrace{Max}_{N,G}\left\{\frac{1}{m}W(m\bar{L}/N) - C^R(G,N,\bar{L})/N + U(G)\right\}.$$

Assuming an internal solution, the first-order necessary conditions are:

$$(2) \qquad N:\ C^R(\cdot)/N - C^R_N(\cdot) = \frac{1}{m}W'(\cdot)[m\bar{L}/N]$$

$$(3) \qquad G:\ C^R_G(\cdot) = NU_G.$$

As can be seen from figure 1, the assumption that $N^* > \mathrm{N}^f$ implies that condition (2) holds only when $\partial W/\partial N < 0 \Leftrightarrow W' \equiv \partial W/\partial l > 0$. Namely, condition (2) implies that in order to exploit economies of scale in farming, the optimal size of the regional population (denoted by N^0 $(= mN^a)$) falls short of the one that minimizes the average cost $(C^R(\cdot)/N)$. Condition (3) is the usual Samuelson rule for providing a collectively consumed public good at an optimal level of G^0.

It is worth noting that the above analysis implicitly assumes that the total land area available for agricultural production is independent of land use for residential areas. This assumption is justifiable on both empirical and theoretical grounds. Typically, the residential areas occupy only a negligible fraction (less than 1%) of total land area of a rural RC and hence the quantitative effect of the above assumption is expected to be insignificant. Relaxing this assumption does not affect the theoretical findings. Specifically, excluding land use for residential needs, total land available for agricultural production is reduced from $\bar{L}$ to $\hat{L} = \bar{L} - h \cdot N^a$ (where $\bar{L} >> h \cdot N^a$) where h (in hectares) is the residential area of each of the N^a family farms. Replacing $W(m\bar{L}/N)$ in optimization problem (1) by $W(m\bar{L}/N - h)$ will not change the first-order conditions (2) and (3) (and its impact on the optimal values of N and G is expected to be negligible).

Case 2: Mixed population composed of farmers and nonfarmer residents. We now assume that the region can be populated by both farmers and nonfarmers. We assume that all individuals, farmers and nonfarmers alike, share equally in the costs of providing the RPG, G, and obtain the same utility from its utilization. Under this assumption, the optimization problem of a regional planner is to choose the level of $G$and the level of population of farmers and nonfarmer residents that maximize the utility of a representative farmer, while guaranteeing reservation utility level, $\bar{U}^e$, to a typical nonfarmer resident. Formally,

$$(4) \qquad \underbrace{Max}_{N,N^a,G}\left\{\left[U(G) + \frac{1}{m}W(\bar{L}/N^a) - C^R(G,N,\bar{L})/N\right] + \lambda\left[U(G) + I^0 - C^R(G,N,\bar{L})/N - \bar{U}^e\right]\right\},$$

where λ is a Lagrange multiplier, I^0 is the (exogenous) urban income of a nonfarmer resident, and mN^a $(\leq N)$ is the number of farmers in the municipality.

Assuming an internal solution, the first-order necessary conditions are:

$$(5) \qquad N:\ [C^R(\cdot)/N - C^R_N(\cdot)](1+\lambda) = 0;$$

$$(6) \qquad N^a:\ W'(\cdot) = 0;$$

$$(7) \qquad G:\ [NU_G(\cdot) - C^R_G(\cdot)](1+\lambda) = 0.$$

Condition (5) implies that the optimal population size of the RC (denoted N^*) is attained when average and marginal costs per member are matched (i.e., when the RC operates at minimum average cost), as depicted in figure 1. Condition (7) is identical to condition (3), and determines the optimal regional level (G^*) provision of the public good. Condition (6) implies that the optimal number of farms in the region, N^{a^*}, is attained when the value of marginal product per farmland vanishes (i.e., when revenues per farm are maximized).

As in Case 1, we implicitly assume here that residential areas of farmers (h ha per family) and of nonfarmers (say, $\tilde{h}(< h)$ ha per family) do not result in farmland loss. Relaxing this assumption will result in reducing agricultural land from $\bar{L}$ to $\tilde{L} = \bar{L} - h \cdot N^a - \tilde{h}N^u = \bar{L} - h \cdot N^a - \tilde{h}[N - N^a]$ (where $\bar{L} >> h \cdot N^a + \tilde{h}N^u$). Replacing $W(\bar{L}/N^a)$ in optimization problem (4) by $W(\bar{L}/N^a - \tilde{h}(N/N^a) - (h - \tilde{h}))$ will not change first-order conditions (5)–(7), and as already noted, its quantitative impact on the optimal values of N, N^a, and G is expected to be negligible. Thus, as in Case 1, the assumption that the amount of farmland is independent of farmers' residential area does not affect the analytical findings and is expected to have a negligible impact on the empirical results. Since it simplifies the analysis, we maintain this assumption for the rest of the analysis.

Comparison of the Optimal Values

To compare the results associated with the above two cases, note from the first-order conditions of optimization problems (1) and (4) that N^0 and G^0 are determined by conditions (2) and (3), while N^* and G^* are determined by conditions (5) and (7). To compare N^* and N^0, let us first rewrite the first-order conditions (5) and (7) as follows:

$$(5') \quad Q \equiv C^R(\cdot)/N - C^R_N(\cdot) = 0,$$

$$(7') \quad H \equiv NU_G(\cdot) - C^R_G(\cdot) = 0.$$

The second-order conditions for optimum require that

$$Q_N = -C^R_{NN} < 0,$$
$$H_G = NU_{GG} - C^R_{GG} < 0 \text{ and}$$
$$[(-C^R_{NN}) \cdot (NU_{GG} - C^R_{GG}) - (U_G - C^R_{NG})^2] > 0.$$

Differentiating (5') and (7') totally with respect to G and N yields:

$$\left.\frac{dG}{dN}\right|_{Q=0} = \frac{C^R_{NN}}{U_G - C^R_{NG}}; \text{ and}$$
$$\left.\frac{dG}{dN}\right|_{H=0} = -\frac{U_G - C^R_{NG}}{NU_{GG} - C^R_{GG}}.$$

The sign of $U_G - C^R_{NG}$ is ambiguous *a priori* and we distinguish between the following two alternatives:

Alternative I. If $U_G - C^R_{NG} > 0$, then $\left.\frac{dG}{dN}\right|_{Q=0}$ and $\left.\frac{dG}{dN}\right|_{H=0}$ are both positive, and it can be easily verified that the sign of the difference $\left\{ \left.\frac{dG}{dN}\right|_{Q=0} - \left.\frac{dG}{dN}\right|_{H=0} \right\}$ is equal to the sign of $\{(-C^R_{NN}) \cdot (NU_{GG} - C^R_{GG}) - (U_G - C^R_{NG})^2\}$, which is positive by the second-order conditions. The (N, G) combinations that satisfy the equations $Q = 0$ and $H = 0$ and the optimal solution (N^*, G^*) are depicted in figure 2a.

Now, note from first-order condition (2) that under Case 1, $C^R(\cdot)/N - C^R_N(\cdot) > 0$, while under Case 2 it is equal to 0 (see condition (5)). This, coupled with the fact that $\frac{\partial Q}{\partial N} = -C^R_{NN} < 0$, implies that for any given level G, the optimal level of N in Case 1 is smaller than that obtained in Case 2. The (N, G) combinations that satisfy condition (2) with $Q > 0$ in Case 1 are located above the curve denoted by $Q = 0$ in Case 2 (see figure 2a). Inspection of the figure clearly shows that $N^* > N^0$ and $G^* > G^0$.

Alternative II. If $U_G - C^R_{NG} < 0$, then both derivatives, $\left.\frac{dG}{dN}\right|_{Q=0}$ and $\left.\frac{dG}{dN}\right|_{H=0}$, are also negative, and it can be easily shown (via utilization of the second-order conditions) that curve $Q = 0$ is steeper than curve $H = 0$ in the (N, G) axes (see figure 2b). It can also be shown that the (N, G) combinations that satisfy condition (2) with $Q > 0$ in Case 1 are located below the curve denoted by $Q = 0$ in Case 2. Inspection of the figure clearly shows that $N^* > N^0$ and $G^* < G^0$.

To compare the total number of farms in the region in Cases 1 and 2, (N^0/m) and N^{a*}, respectively, note that $W'(\cdot)$ is positive in Case 1 and equal to zero in Case 2. This implies that $\bar{L}/(N^O/m) < \bar{L}/N^{a^*} \Rightarrow (N^O/m) > N^{a^*}$.

Finally, our analysis implies that the utility of a representative farmer, $\left[U(G) + \frac{1}{m}W(\bar{L}/N^a) - C^R(G, N, \bar{L})/N\right]$, in Case 2 is higher than in Case 1. This explains why incumbent farmers of RCs in Israel enthusiastically

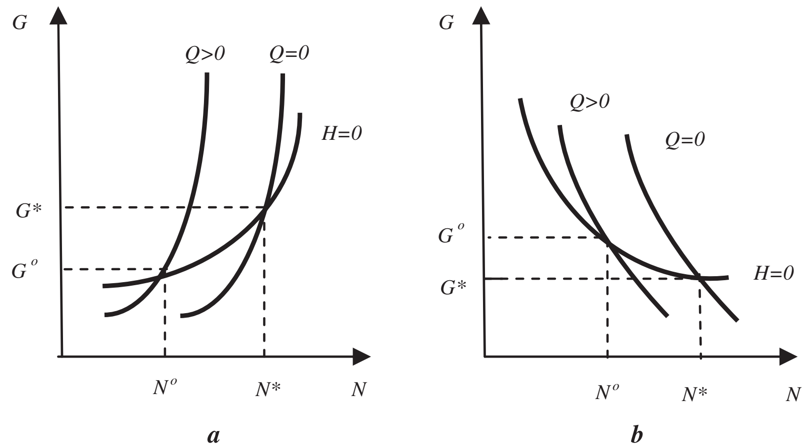

Figure 2. Optimal (*N, G*) combinations in Cases 1 and 2, when: (2*a*) $U_G - C_{NG}^R > 0$ and (2*b*) $U_G - C_{NG}^R < 0$

welcome the new urban immigrants. It is convenient to explain this finding by dividing the shift from Case 1 to Case 2 into two stages. In stage 1, the level of the RPG is fixed at G^0 (Case 1) and the population level increases from N^0 to N^* (including mN^{a*} farmers). As a result, the revenue per farm from agricultural cultivation (which is maximized under Case 2) increases from $\frac{1}{m}W(\bar{L}/N^O)$ to $\frac{1}{m}W(\bar{L}/N^{a*})$ and the average cost decreases from $C^R(G^O, N^O, \bar{L})/N^O$ to $C^R(G^O, N^*, \bar{L})/N^*$ (see figure 1). Obviously, at this stage the welfare of a representative farmer increases. In stage 2, we hold the population size and the number of farmers fixed at levels N^* and N^{a*}, respectively. The central planner will choose to change the level of the RPG (from G^0 to G^*) only if it further increases the welfare of the representative farmer, i.e., the planner will increase G if $\partial[U(G) - C^R(G, N^*, \bar{L})/N^*]/\partial G$ is positive and will decrease it if the derivative is negative. Noting from condition (5) that at the optimal solution, the direction of the welfare-improving change in G can be summarized as follows: if $U_G - C_{NG}^R > 0$, then $G^* > G^0$; and if $U_G - C_{NG}^R < 0$, then $G^* < G^O$. Obviously, these results match the ones presented in figure 2a and 2b.

The above analysis is summarized in the following proposition.

Proposition. *Assume a fixed land area $\bar{L}$ and U−shaped average cost function $C^R(G, N, \bar{L})/N$of an RC that is planning to maximize the utility of a representative farmer while guaranteeing reservation utility level to a typical nonfarmer resident. Then:*

- *(i) the optimal population level in Case 2 (mixed population) is larger than that in Case 1 (farmers only), i.e., $N^* > N^0$*
- *(ii) the optimal number of farmers in Case 2 is lower than that in Case 1, i.e., $N^{a^*} > (N^0/m)$*
- *(iii) the optimal level of the RPG in Case 2, (G^*), is smaller (larger) than that in Case 1, (G^0), if $U_G - C_{NG}^R < 0$ ($U_G - C_{NG}^R > 0$), and*
- *(iv) the welfare of a representative farmer in Case 2 is higher than his/her welfare in Case 1.*

The proposition suggests both positive and normative implications. From a positive perspective, it provides an explanation for the willingness of the incumbent population of rural regions to absorb nonfarmer immigrants. The contribution of such immigrants is twofold. Their presence allows exploiting economies of scale in two seemingly unrelated production processes. The first is the production of LPGs and the second is farming. The result is an increase in the welfare of the incumbent population. From a normative perspective, the proposition indicates at least two directions for welfare-enhancing rural policies. The first is the encouragement of nonfarmers' migration to rural areas. The second is consolidation of municipal units, both within the rural sector and between rural regions and adjacent urban communities. However, consolidation of LPG providers will usually result in increased transportation costs due to the larger area of the jurisdiction. Thus, such mergers create a trade-off between scale economies and increased transportation cost, whose optimum is characterized in the empirical section below[3].

Data and Empirical Analysis

Application of the conceptual analysis requires the specification of a few functional forms and the estimation of various parameters. In this section, we present the data and specify and estimate the functions $C^R(G, N, \bar{L})$ and $W(\bar{L}/N)$.

The presentation of the optimal solutions under Cases 1 and 2 and of the results of a few simulations is postponed until the next section. Due to lack of data, it is impossible to estimate the utility function $U(G)$.

Data

The empirical analysis is based on data from three major sources:

(i) *Municipal censuses* in the rural areas for 1998 and 1999 (Delgo 2006), which were performed as a cooperative project between the Hebrew University and the Ministry of Agriculture's Planning Authority. The municipal censuses focus on the physical quantities of products and services provided by the local governments (RCs) in the rural area, their costs, their finance, and the mechanism used to allocate them. More specifically, the censuses collected data on the following items: public buildings, central sewage system, roads and pavements, sanitation, street sweeping, street lighting, gardening, drinking water, security, swimming pools, municipal workers, total residents, and the municipal budget. The census population included all settlements under the jurisdiction of fifty-one (out of fifty-four) Israeli RCs. These include cooperatives (*kibbutzim* in Hebrew), semi-cooperatives (*moshavim* in Hebrew), and other rural villages. Municipal data on 700 settlements (70% of the population) were collected in the census.[4]

(ii) *The RCs' financial reports for 1995–1999* obtained from the financial departments of the RCs and the Ministry of Internal Affairs. Specifically, this data source is composed of the balance sheets and annual budgets for fifty-one RCs in Israel for the years 1995–1999. The specific data used for the current analysis include: (*a*) expenditure per resident in the council and (*b*) an index of financial stability, FS, which evaluates the council's ability to maintain its liabilities and to function without the need for external help from the central government (Delgo 2006).

(iii) *The data set of Fleischer, Lichtman, and Mendelsohn (2008)*. This data set is based on a national representative survey of 383 Israeli farms for the year 2003, of which 230 grow crops. The data used in the current analysis for the estimation of $W(l)$ were based on 164 observations of crop growers who reside in moshavim. The relevant data set contains information about: size of cultivated area, size of irrigated area, education and age of the farm owner, type of farm (flowers, field crops, etc.), soil and climate characteristics, and more.

Estimation

As mentioned, the above data sets were used for the estimation of the functions $C^R(G, N, \bar{L})$ and $W(l)$.

The regional-level cost function $C^R(G, N, \bar{L})$. The data utilized for the estimation of the regional level cost function are summarized in table 1. The per capita or average regional level cost function C^R/N was estimated via the generalized least squares (GLS) regression model with random effects using panel data. The data consisted of observations of fifty-one councils in five consecutive years (1995–1999). The random effects refer to the council's efficiency level and components of LPG which are unobservable (these differences between councils could be captured by fixed effects; however, in accounting for the large number of cross sections, fifty-one councils, the dramatic decrease

[3] Steiner and Kaiser (2010), for example, discuss the profitability of a merger of Swiss municipalities and found that since 2006, municipal mergers have been implemented in eleven different cantons, primarily in agrarian and agrarian-mixed municipalities.

[4] Data collection in the kibbutzim sector needed to distinguish between the municipal and productive systems which are integrated together in this sector.

Table 1. Descriptive Statistics of the Variables Employed in the Estimation of the Regional Cost Function

Variable	Description	Mean	Standard Deviation
Expenditure(2)	Five years average expenditure per capita for 1995–1999 (in 2004 USD)	1863	904
Residents[a]	Number of residents in the council	9645	6601
Residents sq.	Number of residents squared	136, 407, 421	181, 413, 576
Distance[a,c]	Average distance between the villages and the council's center (in km)	15.1	7.2
Educbuild(1)	Educational building index	0.72	0.19
Primary(1)	Average number of students in primary school classes	24.9	3.9
Branches(1)	Household garbage and trimmed branch evacuation index (based on monthly frequency)	85.8	66.1
Kibbutzim[a]	Percentage of kibbutzim in the council	27.5	26.9
FS(3)	The council's financial stability index	−6.1	11.9
Owncollec(2)	Ratio of self-collected municipal taxes to total income in regular budget	45.1	16.6
Elections[b]	=1 if this was a year prior to elections	0.2	
Socioecon[d]	Socioeconomic index	3.3	0.9
Age65pl[a]	Percent residents older than 65	6.9	3.4
Age017[a]	Percent residents younger than 17	37.7	6.7

Sources: (1), (2), (3) The three data sources described in the text, respectively.
Note: Numbers in parentheses indicate the source data in accordance with the categories in the text, and asterisks refer to additional sources.
[a]"Local Authorities in Israel" 1998 and 1999, Israeli Central Bureau of Statistics
[b]Israel Ministry of Internal Affairs
[c]Calculated by summing the distances between each village and the council center and dividing this by the number of villages
[d]The socioeconomic index is a measure built by the Israeli Central Bureau of Statistics (similar to indices constructed by the Office of National Statistics of Great Britain and the Australian Bureau of Statistics, among others) and reflects a combination of basic characteristics of a specific geographical unit.[5]

in degrees of freedom led us to choose the random effects estimation).

The estimation of the random effect model was conducted by NLOGIT software (version 3). The results, as well as the calculated elasticities, are presented in table 2. These results confirm our assumption that $C^R(G, N, \bar{L})$ is increasing in all of its arguments and that, for a given G and $\bar{L}$, a U-shaped average cost function for N prevails. Specifically, note from the table that the coefficient of the variable *Distance* (a proxy for $\bar{L}$) is positive and statistically significant, consistent with club theory, which predicts that the cost of provision of public goods increases with the distance of its provision (e.g., Fujita 1989): a 10% increase in the distance raises the per capita cost by 4.1%.

Three variables, *Educbuild*, *Branches,* and *Primary*, are our proxies for the level of the LPG. The variable *Educbuild* is an index of investment in education facilities, perhaps the most important public good provided by the RC. As expected, its effect on the cost is positive and statistically significant and implies high elasticity: increasing the inventory of education buildings by 10% will increase the average expenditure by 4.9%. An additional variable that indicates the level of public education is *Primary*, which measures the RC average classroom density: the more crowded the classes (i.e., the higher the value of *Primary*), the lower the quality of the public education. Indeed, as expected, its regression coefficient is negative. Finally, as the level of the household garbage and trimmed branch collection services provided by the RC (as measured by *Branches*) increases, so does the cost, C.

Additional variables that affect the cost function are the socioeconomic index and the characteristics of the tax-collection system. Similarly, the effect of the socioeconomic index is negative and statistically significant, implying

[5] In the case of the RCs, the characteristics of the socioeconomic index include: financial resources of the residents (e.g., average income per capita, percent of earners above twice the average wage, percent of sub–minimum wage earners), motorization level (e.g., percent of new motor vehicles), schooling and education (percent of students entitled to a matriculation certificate—aged 17–18, percent of students aged 20 29), employment and unemployment profile and demographic characteristics (percent of families with four or more children, median age). The index is created using the factor analysis method, a reliable and accepted statistical technique for combining the values of a number of variables into one quantitative index (source: CBS, Characterization and Classification of Local Authorities by the Socio-Economic Level of the Population 2001).

Table 2. The Regional Cost Function: A GLS Random Effects Model

Variable	Coefficient	Standard Error	Elasticity
Constant	3802.3*	1224.8	
Residents	−0.201*	0.038	−1.06
Residents sq.	4.97E–06*	1.25E–06	0.37
Distance	51.0*	16.3	0.41
Socioecon	−231.8*	120.7	−0.40
Branches	2.0	1.4	0.09
Owncollec	19.1*	6.2	0.46
FS	−4.7	3.3	0.02
Age65pl	−28.5	39.4	−0.10
Age017	−44.6*	17.6	−0.90
Educbuild	1282.4*	429.2	0.49
Kibbutzim	−1.5	3.7	−0.02
Elections	7.0	32.3	7.5E–04
Primary	−30.7	25.0	−0.41
Yearvar	14.9	14.6	0.03

Note: Dependent variable: expenditure per capita; $R^2 = 0.67$; Random effects model: v(i,t) = e(i,t) + u(i); Lagrange multiplier test vs. model (3) = 172.6.
*Significant at 5%.

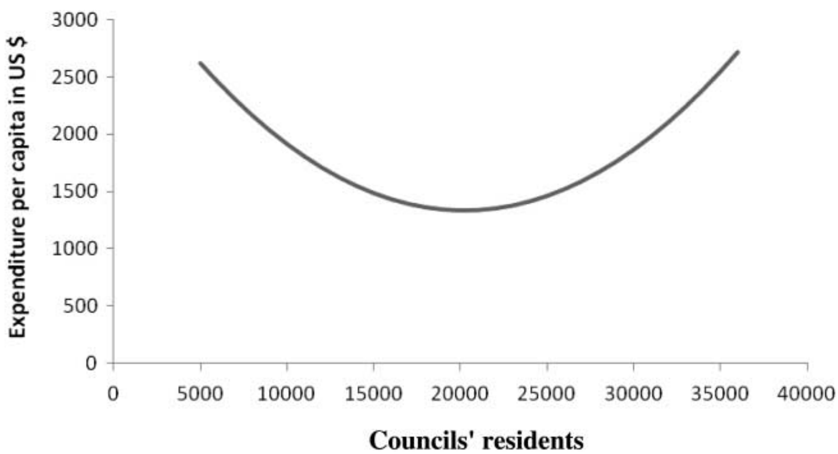

Figure 3. Expenditure per capita as a function of RC population calculated at sample means

that an RC with a population having higher socioeconomic status will enjoy lower cost in the provision of public goods. The importance of this effect is illustrated by the relatively high elasticity, implying that a 10% increase of the council's residents will reduce average per capita expenditures by 4%. Finally, the higher the ratio of self-collected municipal taxes to total income (the coefficient of *Owncollec*), the smaller the expenditure per resident becomes; e.g., a 10% increase in this ratio decreases average expenditure by 4.6%.

Furthermore, the regression results suggest that Israel's organization of RCs deviates from the optimum with respect to population size. According to the regression results, the optimal population level for minimization of average costs is approximately 20,000, while actually, the average RC consists of "only" 9,645 residents. Figure 3 demonstrates the average expenditure per council resident as a function of the number of residents in the councils according to the regression results (table 2), calculated at the sample means.

Similarly, equation (8) below utilizes the results of the regression to show the regional-level average cost function. For illustration and simulation purposes, we present the regional costs as a function of the number of residents, N, where all other variables are held fixed at

Table 3. Descriptive Statistics of the Variables Employed in the Estimation of the Farm Profit Function

Variable	Description	Mean	Standard Deviation
Profit	Profit per farm after capital costs, depreciation and tax (in 2004 USD)	1,849	33,839
ln(rad)[c]	log of average annual radiation for the years 1961-1990 (in W/m^2)	8.61	0.02
ln(temp)[a]	log of average annual temperature for the years 1965-1979 (in ^{O}C)	2.96	0.03
Wind[c]	Average annual wind speed for the years 1961-1990 (in m/s)	3.09	0.49
ln(precip)[a]	log of average annual precipitation for the years 1965-1979 (in mm^3)	6.23	0.27
Experience(3)	Farmer's years of experience running the farm	32	13.5
Sand[b]	Thin sand on the ground (%)	4.07	2.45
Salinity[b]	=1 if the soil is saline	0.22	
Flowers(3)	=1 if flowers are being grown on the farm	0.24	
Vegetables(3)	=1 if vegetables are being grown on the farm	0.30	
Fieldcrops(3)	=1 if field crops are being grown on the farm	0.014	
Hectare(3)	Size of cultivated land (ha)	3.67	7.45

Note: Numbers in parentheses indicate the source data in accordance with the categories delineated in the text; asterisks refer to additional sources.
Sources: [a]Interpolated application of Israeli Meteorological Station data for the years 1965–1979 and 1961–1990, Bitan and Rubin (2000). [b]Rabikovich (1981).
[c]These data were obtained by downscaling the data of the Global Climate Model ECHAM4 for the years 1961–1990 (Andreas Heckl, the Institute for Meteorology and Climate Research Atmospheric Environmental Area, Forschungszentrum Karlsruhe, Germany, 2006).

their sample means:

$$(8)\quad C^R(N)/N = 3214.1 - 0.201 \cdot N + 0.00000497007 \cdot N^2 \Rightarrow$$
$$C^R(N) = 3214.1N - 0.201 \cdot N^2 + 0.00000497007 \cdot N^3$$

Profit per farm, W(l). The data used for the econometric estimation of this function are taken from Fleischer et al. (2008). The results of the regression analysis (with the White heteroscedasticity robust covariance matrix) are presented in table 4. Table 3 provides the descriptive statistics of the variables employed in the regression.[6] Accordingly, the profit as a function of farm area in hectares, $l(=\bar{L}/N^a)$, calculated at the sample means is:

$$(9)\quad W(l) = -1288 + 2212 \cdot l - 60.4 \cdot l^2$$
$$(10)\quad W'(l) = 2212 - 120.8 \cdot l$$

[6] It is useful to note that in the Israeli moshavim sector, the size of the farm, *l*, is exogenous, predetermined by historical and institutional arrangements.

Table 4. The Farm Profit Function: A Regression Analysis

Variable	Coefficient	Standard Error
Constant	791,988*	340,814.4
Experience	522.7*	202.9
ln(temp)	–14,958.1	11,917.7
ln(rad)	–100,177.0*	39,990.9
Wind	–3,779.15	5,263.0
Flowers	24,357.8*	6,493.3
Vegetable	–8,598.6	6,024.2
Fieldcrops	74,513.5**	39,505.0
Salinity	9,544.5	8,708.2
ln(precip)	14,369.8	11,913.2
Sand	2,846.2*	1,199.8
Hectare	2,212*	1,047.0
Sq. Hectare	–60.4*	22.1

Note: With White heteroscedasticity robust covariance matrix. Dependent Variable: Profit per farm in 2004 (USD). $R^2 = 0.26$.
*indicates significance at 5% level.
**indicates significance at 10% level.

Results

Based on the data and econometric analysis of the previous section, we are now in a position to quantify and test our analytical findings from the Model section. The council's area, $\bar{L}$, is set to the sample average, 24,400 ha, and we assume that each farm is cultivated by an average household with $m = 4$ members.

Case 1: Farmers Only

Recall that N^0 is the optimal number of residents in the RC and that $N^0/4$ is the associated optimal number of farms (= households). The first-order condition (2), which can be written as $W'(\frac{4\bar{L}}{N^0}) \cdot \left[\frac{4\bar{L}}{N^0}\right] = \left(\frac{C^R(\cdot)}{N^0} - C_N^R(\cdot)\right)$, coupled with the estimated functions in equations (8) and (10), yields $N^a = 1,360$ farms, implying $N^0 = 5,440$ residents in the RC. Each farm cultivates $24,400/1,360 = 17.9$ ha and earns \$18,954 annually. The average cost per resident of supplying the RPG is \$2,267.5, i.e., \$9,070 per farm household. As a result, the net annual monetary surplus per farm household, $[W(\cdot) - 4C^R(\cdot)/N]$, is \$9,884.

Case 2: Mixed Population

In this case, the optimal number of farms in the council, N^{a^*}, is set to a level that maximizes annual revenue per farm (condition (6)), and is equal to 1,332. As predicted by the analysis in the Model section, this number is lower than that of farmers in Case 1, but the difference is quite small. However, the total number of residents in the RC in this Case, N^*, is equal to 20,000, which is 3.67 times larger than the population in Case 1. This dramatic increase is attributed to $N^{u^*} = 14,672$ nonfarming residents immigrating from the urban sector to the RC, when a mixed population is allowed (Case 2).

The impact of the newcomers—the nonfarm residents—on the number of farms in the region (decreased by 2.06% relative to Case 1), the area cultivated by each farm (increased by 2.23%), and the farm-level revenue (increased by 0.05%) is marginal. However, the newcomers share the costs of supplying the RPG with the farmers, and their number is determined such that the RC operates at minimum average cost, \$1,182 per resident. Indeed, each farm's share in the cost of the RPG in Case 2 (\$4,728) is lower by 47.9% than its share in Case 1 (\$9,070). As a result, the annual net monetary surplus per farm increases by 44%, from \$9,884 in Case 1 to \$14,237 in Case 2.

The significant increase in net surplus is not the only gain accrued by the incumbent farmers as a result of the massive number of nonfarmer residents immigrating to the region. They will also enjoy a higher level of regional public good, relative to Case 1, i.e., $G^* > G^0$. The counter-urbanization process in Israel in the last two decades has been accompanied by a significant increase in the level of RPGs (new schools, new shopping and cultural centers, new roads, etc.) in the vast majority of the RCs in Israel. However, we cannot estimate the contribution of the increased level of RPGs due to a lack of data on their monetary level, coupled with the fact that the utility function $U(G)$ is not known. Therefore, the 44% increase in net annual monetary surplus per farm underestimates the advantage of counter-urbanization for the incumbent farmers in Israel and should be viewed as a minimum bound.

Simulations: Merger of Adjacent Councils

Although in the 1980s, three RCs in Israel merged with a couple of smaller RCs in their vicinity to exploit economies of scale, the current composition of RCs is far from optimal in terms of population size. Indeed, the results of the previous section show that the optimal population size of an average RC, which minimizes average costs (approximately 20,000 residents), is much larger than the actual size (the average RC consists of 9,645 residents). The population levels of the RCs in Israel vary significantly, from a minimum of less than 1,000 to a maximum of 43,000. The population of only ten RCs (out of fifty-four) exceeds 20,000, and the population of thirty RCs is lower than 10,000.

Accordingly, in 2003 the Israeli government issued a consolidation program for thirteen RCs. To evaluate the profitability of merging neighboring RCs, we use the estimated coefficients of the GLS random effects regression model in table 2 and data from actual councils (rather than an average/typical council, as in Cases 1 and 2). The results for all thirteen potential consolidations are reported in table 5. The table presents the ex ante and ex post merger population levels and per capita expenditures. Our calculations suggest that in nine of the thirteen cases, the merger results in a Pareto improvement that reduces all (two or three) councils' per capita expenditures. Merger-associated benefits (or losses) vary widely among RCs, mostly because of the variability in their current population relative to the optimal one.

The required analyses are illustrated by elaborating on the merging of two pairs of adjacent RCs: (a) Drom Ha'sharon, in the southern Sharon region, and its neighbor to the west Hof Ha'sharon, and (b) Menashe, east of the city of Hadera, and its small neighbor to the north Alona.

Table 5. Results Summary of Merging 12 Adjacent RCs based on 5-Year Averages 1995–2000

Mergers	Population	Average expenditure–actual	Unified council
1. a. Drom Ha'Sharon**	a. 19,280	a. 1,086.6	1338.7
b. Hof Ha'Sharon*	b. 7,120	b. 2,185.4	
		Avg. **1,370**	
2. a. Menashe*	a. 11,420	a. 1,441.8	1265
b. Alona*	b. 1,000	b. 1,708.8	
		Avg. **1,463**	
3. a. Nahal-Sorek*	a. 2,300	a. 1,665.2	1343.8
b. Hevel-Yavne*	b. 3,760	b. 1,862.6	
		Avg. **1,788**	
4. a. Gderot*	a. 3,340	a. 1,347.5	1050.7
b. Brener*	b. 4,320	b. 2,297.3	
c. Gan-Rave*	c. 4,050	c. 1,548.7	
		Avg. **1757**	
5. a. Yoav*	a. 4,240	a. 2,529.2	1562.9
b. Lahish*	b. 5,460	b. 1,900	
		Avg. **2,175**	
6. a. Yoav*	a. 4,240	a. 2,529.2	1337.3
b. Shafir*	b. 7,440	b. 1,793.9	
		Avg. **1,950**	
7. a. Galil-Elion*	a. 12,580	a. 2,151.5	1613.4
b. Mevo'ot-Hermon*	b. 4,780	b. 1,978.4	
		Avg. **2,104**	
8. a. Megido**	a. 8,040	a. 1,533.3	1704.6
b. Emek-Izre'el**	b. 23,880	b. 1,168.2	
		Avg. **1,260**	
9. a. Emek-Izre'el**	a. 23,880	a. 1,168.2	1974.8
b. Zvulun*	b. 8,260	b. 2,393.2	
		Avg. **1,483**	
10. a. Hof Ha'sharon*	a. 7,120	a. 2,185.4	1205.5
b. Lev-Ha'sharon*	b. 12,440	b. 1,412.9	
		Avg. **1,697**	
11. a. Tamar*	a. 2,300	a. 5,323.7	3663.1
b. Arava-Tihona**	b. 2,060	b. 2,583.1	
		Avg. **4,029**	
12. a. Eylot*	a. 2,520	a. 3,257.4	2453
b. Arava-Tihona*	b. 2,060	b. 2,583.1	
		Avg. **2,921**	
13. a. Hevel-Yavne*	a. 3,760	a. 1,862.6	1200.8
b. Gderot*	b. 3,340	b. 1,347.5	
c. Brener*	c. 4,320	c. 2,297.3	
		Avg. **1,876**	

Note: Prices in 2004 USD. * = the merger is profitable to that council. ** = the merger is not profitable to that council

The results of the mergers are presented in tables 6 and 7. It should be noted that in addition to the number of residents, the average expenditure per resident in the unified councils is also dependent on the distance between the villages and the council's center, as well as on the other variables in the regression (e.g., sociodemographic characteristics, level of LPGs and financial stability). The values for these variables were calculated as weighted

Table 6. Merging of Drom Ha'Sharon and Hof Ha'Sharon RCs Based on 5-Year Averages 1995-2000

	Drom Ha'Sharon	Hof Ha'Sharon	Unified council
Population (2004)	19,280	7,120	26,400
Land area (ha), $\bar{L}$	9,500	5,000	14,500
Average expenditure per capita, $C^R(N)/N$	1,068.6[a]	2185.4[b]	1338.7[c]
Planned number of standard farm households[d]	2,714	1,428	4,142
Income per farm, $W(l) = 3.5$, under planned scenario	5,714	5,714	5,714
Net profits per farm under planned scenario[e]	1,440	−3,028	359
Optimal land per farm (ha) ($W'(l) = 0$, see equation10)	18.3	18.3	18.3
Income per farm under optimal land allocation	18,964	18,964	18,964
Optimal number of farm households	520	273	793
Optimal net income per farm	14,690	10,222	13,609

Note: Prices in 2004 USD.
[a]calculation: $3{,}085 - 0.201 \cdot 19{,}280 + 0.000005 \cdot (19{,}280)^2$
[b]calculation: $3{,}363 - 0.201 \cdot 7{,}120 + 0.000005 \cdot (7{,}120)^2$
[c]calculation: $3{,}160 - 0.201 \cdot 26{,}400 + 0.000005 \cdot (26{,}400)^2$
[d]Number of "standard farms" approved for the RC by the Ministry of Agriculture before it was established (resulting in 3.5 ha per "planned farm").
[e] $W(l = 3.5) - 4 \cdot [\frac{C^R(N)}{N}]$

Table 7. Merging of Menashe and Alona RCs Based on 5-Year Averages 1995-1999

	Menashe	Alona	Unified council
Population (2004)	11,420	1,000	12,420
Land area (ha), $\bar{L}$	16,000	2,700	18,700
Average expenditure per capita, $C^R(N)/N$	1,441.8[a]	1,708.8[b]	1,265[c]
Planned number of standard farm households[d]	4,571	771	5,342
Income per farm, $W(l) = 3.5$, under planned scenario	5,714	5,714	5,714
Net profits per farm under planned scenario[e]	−53.2	−1,121.3	654
Optimal land per farm (ha) ($W'(l) = 0$, see equation 10)	18.3	18.3	18.3
Income per farm under optimal land allocation	18,964	18,964	18,964
Optimal number of farm households	874	147	1,021
Optimal net income per farm	13,197	12,129	13,904

Note: Prices are in 2004 USD.
[a]$3{,}085 - 0.201 * 11{,}420 + 0.000005 * (11{,}420)^2$
[b]$1{,}905 - 0.201 * 1000 + 0.000005 * (1{,}000)^2$
[c]$2{,}990 - 0.201 * 12{,}420 + 0.000005 * (12{,}420)^2$
[d]Number of "standard farms" approved for the RC by the Ministry of Agriculture before it was established (resulting in 3.5 ha per "planned farm").
[e] $W(l = 3.5) - 4 \cdot [\frac{C^R(N)}{N}]$

(by the councils' population and jurisdiction areas) averages or sums of the values of each council in the unified council.

According to table 6, merging the two councils is not profitable for the nonfarmer or farmer residents of Drom Ha'sharon, and they are likely to oppose it: the average expenditure per capita will increase by 23.2% and the net income per farm will decrease by 7.4%. In contrast, the residents of Hof Ha'sharon are likely to support the merger: the expenditure per capita will decrease by 38.7% and the net income per farm will increase by 33.3%. Since the population of the former council is 2.7 times larger than that of the latter, the political feasibility of the merger is slim.

On the other hand, the merger is profitable from an aggregate point of view: the aggregate benefits for the residents of Hof Ha'sharon ($8,868,031)[7] exceed the total losses accrued by the residents of Drom Ha'sharon ($6,890,760).[8] Presumably, the latter council's objections to merging can be mitigated via

[7] Aggregate benefits from merging for Hof Ha'sharon: Farmers: (13,609 – 10,222) · 273 · 4 = 3,764,124; Nonfarmers: (2185.4 – 1338.7) · 6,028 = 5,103,907. Total = 8,868,031.

[8] Aggregate losses from merging for Drom Ha'sharon: Farmers: (14,690 – 13,609) · 520 · 4 = 2,248,480; Nonfarmers: (1338.7 – 1068.6) · 17,200 = 4,642,280. Total = 6,890,760.

monetary transfers (of at least $6,890,760) from the residents of Hof Ha'sharon, but this would be very hard to implement.

The results for the RCs Menashe and Alona are summarized in table 7. They clearly indicate that merging the two councils is highly profitable for the residents of both: under unification, the average expenditure per capita decreases and the net income per farm increases relative to the current situation of separate operations. It is therefore safe to assume that residents of both RCs, farmers as well as nonfarmers, will support a merger initiative. Similar analyses were conducted for each of the thirteen possible mergers, providing the basis for the results in table 5.

The results of the simulations should be considered with caution. Our assumption that merging decisions will be based solely on the associated profitability for the residents of the unified councils is an oversimplification of reality. Merging of RCs involves a few difficult questions which are not accounted for in our analysis. For example: who will be the head of the unified RC and which heads will give up their positions? Which public workers will be fired and who is responsible for their compensation? Who will bear the costs of canceling contracts signed by one or more of the separate RCs with private or public companies? Where the unified RC is composed of two RCs, one in good financial condition and the other on the brink of bankruptcy, will the residents of the former agree to cover the debts of the latter? However, we believe that the "profitability test" is crucial: if a potential unification passes this test, the separate RCs will be motivated to consider the abovementioned difficulties more seriously.

Summary and Conclusions

The driving forces for the prominent process of urban-to-rural migration (or counter-urbanization) in developed countries can be roughly divided into "demand side" and "supply side" motivations. Most of the literature has focused on the demand side, investigating the socio-economic factors affecting the willingness of urban dwellers to migrate to rural areas. The supply-side analysis focuses on the willingness of rural communities to absorb newcomers. Economic analysis of the supply side is still limited and the existing literature comes mainly from rural sociologists and geographers. The current article attempts to fill this gap. We developed a simple theoretical model that provides an economic justification for the observed willingness of incumbent farmers of a rural region to absorb nonfarmer urban-to-rural migrants and applied it to an average/typical RC in Israel.

The analytical findings suggest that due to economies of scale, the optimal population level of an RC with a mixed population of farmers and nonfarmer residents (Case 2) is larger than that obtained under the scenario of an RC composed only of farmers (Case 1). Indeed, in the empirical analysis applied to an average/typical RC in Israel, we found that the optimal number of residents in Case 2 is 3.67 times larger than that in Case 1. The analytical analysis also suggests that the optimal number of farmers in Case 2 is lower than that in Case 1 and that the welfare of each farmer in Case 2 is larger than in Case 1. We found that the annual net monetary surplus per farm under Case 2 ($14,237) is 44% higher than that under Case 1 ($9,884). This result may explain why most farmers in rural areas of Israel have enthusiastically welcomed urban-to-rural migrants in the last two decades. Utilizing the estimated coefficients of the GLS random effects regression model and data of actual councils, we found that in many cases, merging neighboring RCs might be profitable.

The historical structure of the Israeli rural communities was unique. Most of the farmers were organized in village-level cooperatives, known as *moshavim* and *kibbutzim*, with dual functionality in the areas of both agriculture and provision of LPGs. However, during the changes in the last two decades the two functions were separated, and currently the sole responsibility for providing RPGs is on the RC; the villages themselves have only minor residual responsibilities. Therefore, today, many characteristics of the Israeli rural municipal system are common in other developed countries as well. These include: urban-to-rural migration, small population and inability to exploit economies of scale, incentives to merge adjacent rural municipalities, and a shift in the "center of gravity" of the supply of LPGs from local communities to regional-level authorities.

Moreover, the prevalence of the principles of club theory in the supply of LPGs implies the relevance of specific-country research to communities in other countries. Our analysis may assist policymakers worldwide in (*a*) determining rural community size and population mix, (*b*) determining the desired level of local public services, and (*c*) evaluating the profitability of expanding rural jurisdiction areas via merger of neighboring regional municipalities.

The present analysis can be extended in various directions. First, it can account for the local communities (mostly villages) which make up the RC, defining "village" as a subregion in which *g* units of an essential village-level LPG (VPG) are provided, assuming that the VPG serves the entire population of the village. Obviously, it is expected that the economies of scale in the regional population will be higher than those associated with the village-level population. This extension would enable determining the optimal number of villages in the RC and optimal population sizes per village, as well as the relationships between the VPGs and RPGs. Second, in addition to sharing the costs of the LPGs, the mutual benefits for farmer and nonfarmer residents can be extended to include environmental and recreational values. While agricultural production practices have to be in accordance with environmental standards, rural areas also have to satisfy the growing demand of nonfarm residents, at both the national and regional levels, for outdoor recreation and tourism, nature and wildlife conservation, and landscaping. One could investigate the welfare impacts of governmental-level or regional-level policies aimed at encouraging farmers to adopt environmentally beneficial practices with spillover effects on the welfare of the nonfarmers. Third, rather than dealing with identical farmer and nonfarmer residents and a single RPG, the analysis can be extended to heterogeneous farmers supplying different agricultural products (e.g., milk producers versus orchard growers with different land requirements), heterogeneous nonfarmers differing in their attitudes (utilities) toward rural life and in their income, and a variety of regional LPGs (such as a regional school that serves farmers and nonfarmers alike, and a service center or garage for agricultural machinery that serves only farmers). Another extension would be to allow negative spillovers from nonfarmer residents to farmers. This could be done by introducing land rent in the equation for farm profits. As nonfarmer residents increase in number, farmland rent would rise, reducing the profitability of farming.

Our hope is that the current article will serve as a building block for these (and other) extended analyses.

References

Berglas, E. 1976. On the Theory of Clubs. *American Economic Review* 66: 116–121.

Bierens, H. J., and T. Kontuly. 2008. Testing the Regional Restructuring Hypothesis in Western Germany. *Environment and Planning* 40: 1713–1727.

Bitan, A., and S. Rubin. 2000. *Climatic Atlas for the Physical and Regional Planning in Israel,* 3rd ed. Tel-Aviv: Ramot Publishing CO.

Bosworth, G. 2009. Commercial Counterurbanization and the Rural Economy. Paper presented at the European Regional Studies Association Conference, Leuven, Belgium, April 2009.

Buchanan, J. M. 1965. An Economic Theory of Clubs. *Economica* 32: 1–14.

Champion, A. G. 2006. *State of the English Cities. The Changing Urban Scene: Demographics and the Big Picture.* Newcastle UK: Centre for Urban and Regional Development Studies, Newcastle University.

Conklin, G. H. 2004. Population Growth, Density and the Costs of Providing Public Services: A Review Article. *Sociation Today* 2(1):

Crump, J. R. 2003. Finding a Place in the Country: Exurban and Suburban Development in Sonoma County, California. *Environment and Behavior* 35: 187–202.

Delgo, M. 2006. The Economics of Rural Municipalities in Israel. PhD dissertation, Hebrew University of Jerusalem.

Eastwood, R., M. Lipton. and A. Newell. 2010. Farm Size *Handbook of Agricultural Economics*, Ch. 65, 4: 3323–3397.

Feinerman E., and Y. Kislev. 1991. Agricultural Settlement with Joint Production Services. *Agricultural Economics* 6: 1–13.

Feinerman, E., and M. H. C. Komen. 2003. Agri-Environmental Instruments for an Integrated Rural Policy: An Economic Analysis. *Journal of Agricultural Economics* 54: 1–20.

Fleischer, A., I. Lichtman, and R. Mendelsohn. 2008. Climate Change, Irrigation, and Israeli Agriculture: Will Warming Be Harmful? *Ecological Economics* 65: 508–515.

Fujita, M. 1989. *Urban Economic Theory*. Cambridge, UK: University Press.

Halfacree, K. H. 1994. The Importance of 'the Rural' in the Constitution of

Counterurbanization: Evidence from England in the 1980s. *Sociologia Ruralis* 34: 164–189.

Hochman, O., D. Pines, and J. F. Thisse. 1995. On the Optimal Structure of Local Governments. *American Economic Review* 85: 1224–1240.

Huang, T.-Z., P. F. Orazem, and D. Wohlgemuth. 2002. Rural Population Growth, 1950–1990: Roles of Human Capital, Industry Structure, and Government Policy. *American Journal of Agricultural Economics* 84: 615–627.

Irwin, E. D., A. M. Isserman, M. Kilkenny, and M. D. Partridge. 2010. A Century of Research on Rural Development and Regional Issues. *American Journal of Agricultural Economics* 92: 522–553.

Jones, L. J., and P. H. Gessaman. 1974. Public Service Delivery in Rural Areas: Problems and Decisions. *American Journal of Agricultural Economics* 56: 936–945.

Kilkenny, M. 2010. Urban/Regional Economics and Rural development. *Journal of Regional Sciences* 50: 449–470.

Kislev, Y., and W. Peterson. 1996. Economies of Scale in Agriculture: A Reexamination of the Evidence. In *the Economics of Agriculture, Paper in Honors of D. Gale Johnson,* edited by Antle J. and D. Sumner, the University of Chicago Press, Chicago 1996.

Kraybill, D. S., and A. Weber. 1995. Institutional Change and Economic Development in Rural America. *American Journal of Agricultural Economics* 77: 1265–1270.

Ladd, H. F. 1992. Population Growth, Density and the Costs of Providing Public Services. *Urban Studies* 29: 273–295.

McCarthy, J. 2008. Rural Geography: Globalizing the Countryside. *Progress in Human Geography* 32: 129–137.

Moseley, M., and S. Owen. 2008. The Future of Services in Rural England: The Drivers of Change and a Scenario for 2015. *Progress in Planning* 69: 93–130.

Panebianco, S., and M. Kiehl. 2003. Suburbanisation, Counterurbanisation, Reurbanisation? An Empirical Analysis of Recent Employment and Population Trends in Western Europe. Paper presented at the European Regional Sciences Association 2003 conference, Jyväskylä, Finland, September 2003.

Rabikovich, S. 1981. *Soils in Israel—Their Forming, Nature and Characteristics*. Tel-Aviv: Ha-Kibbuz Ha-Me'uchad.

Steiner, R., and C. Keiser. 2010. Spread, Causes, and Effects of Municipal Amalgamations in Switzerland. Paper presented at the 14th International research Society for Public Management Conference, University of Bern, Switzerland, April.

Stockdale, A., A. Findlay, and D. Short. 2000. The Repopulation of Rural Scotland: Opportunity and Threat. *Journal of Rural Studies* 16: 243–257.

Tacoli, C. 1998. Rural-Urban Interactions: A Guide to the Literature. *Environment and Urbanization* 10: 147–166.

Tiebout, C. M. 1956. A Pure Theory of Local Public Goods. *Journal of Political Economy* 64 : 416–24.

USDA. 1996. *Rural Conditions and Trends*, 7(3): 8–17.

USDA. 2009. *Rural America at a Glance*. Economic Research Service.