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DISCUSSION PAPER SERIES

IZA DP No. 13246

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ABSTRACT

Differences across Countries and Time in Household Expenditure Patterns: Implications for the Estimation of Equivalence Scales*

When comparing economic well-being using income or expenditures, an equivalence scale is often used to adjust for differences in characteristics that affect needs. For example, a family of two is assumed to need more income than a single person, but not twice as much due to the economies of scale in consumption. In this study, we ask whether it is appropriate to use a common equivalence scale when comparing economic well-being across countries and/or time if consumption expenditure patterns differ? Based on an Engel methodology, we estimate equivalence scales for a diverse set of countries (Canada, France, Israel, Poland, South Africa, Switzerland, Taiwan, United States) in different time periods (1999-2012). We find considerable differences in economies of scale across countries, as well as increases over time. Notably, we find that economies of scale are larger than those implied by the widely accepted 'square root of household size' equivalence scale. Our results indicate that using a common equivalence scale to compare economic well-being across countries and/or time is misleading. Specifically, if economies of scale are understated (as is the case when using the 'square root of household size'), the relative poverty experienced by larger versus smaller families is being overstated.

JEL Classification: I3, D1

Keywords: economic well-being, Engel, necessities, equivalence scale, economies of scale, poverty

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1. Introduction

When comparing economic well-being using income or expenditures, it is important to consider differences in characteristics that affect needs, such as household size and structure. This is commonly done using equivalence scales, which transform households to 'equivalent individuals' (Atkinson, 2019; Buhmann et al., 1988; Organisation for Economic Co-operation and Development (OECD), 2013; Ravallion, 2016; World Bank, 2018).[1] Equivalence scales may be simple adjustments based on per capita income (i.e. dividing income or expenditures by household size). However, this approach fails to account for the economies of scale in consumption (e.g. a family of two needs more income than a single person, but not twice as much), and it does not account for different needs of adults and children within the household. More rigorous, demand system approaches incorporate the characteristics of households and consumption bundles under consideration, as well as assumptions underlying the theory and estimation of equivalence scales (Banks et al., 1994; Banks et al., 1997; Blundell and Lewbel, 1991; Browning et al., 2013). Subjective and expert equivalence scales have also been used to transform households to 'equivalent individuals' (Bishop et al., 2014; Brázdilová and Musil, 2017; Citro and Michaels, 1995; De Vos and Zaidi, 1997; Garner and Short, 2003). The latter includes the widely accepted 'square root of household size' equivalence scale (Buhmann et al., 1988) and OECD-modified equivalence scale whereby each household is assigned a value in proportion to its needs: the head of the household is assigned a value of one, plus 0.5 per adult and 0.3 per child (OECD, 2013).

[1] Equivalence scales are not the only approach that can be used. Refer to Decancq et al. (2015) for a discussion of the alternatives.

Each approach has advantages and limitations, yielding different estimates of economies of scale, and thus different estimates of economic well-being. For example, Bishop et al. (2014) find larger economies of scale in subjective equivalence scales relative to those that are implicit in the expert, OECD-modified equivalence scale. Comparing income poverty using the two approaches, Bishop et al. (2014) conclude that subjective scales redistribute poverty from larger to smaller families. Moreover, Burniaux et al. (1998) find that, while the level and distribution of poverty are sensitive to the choice of equivalence scale, comparisons across countries and time are less affected.

Indeed, a common equivalence scale is often used to compare economic well-being across countries and time. However, this may not accurately reflect differences in economic well-being if there is variation in the distribution of spending on necessities by household size. For example, based on reference budgets and their role in poverty measurement, Goedemé et al. (2019, p. 14) highlight the importance of country-specific equivalence scales in cross-country comparisons when 'economies of scale vary substantially across countries or if the provision and subsidization of essential goods and services vary in important respects within or across countries.' Using a common equivalence scale to compare economic well-being is also problematic if spending on necessities by household size varies across time, or if expenditure patterns change at different rates across countries and time.

The objective of this study is to better understand the extent to which expenditure patterns vary across countries and time, to better understand whether it is appropriate to use a common equivalence scale when comparing economic well-being. We estimate equivalence scales at different points in time for a diverse set of countries, including some that have

received less attention in the literature (e.g. South Africa, Taiwan). We use the most comparable sources of data available across countries and time. Moreover, we use the same Engel methodology in all cases, noting its limitations (Deaton and Muellbauer, 1980; Ravallion, 2016; Lewbel and Pendakur, 2008; Browning et al., 2013). For example, contemporary equivalence scales are based on cost functions derived from consumer demand data. Lewbel and Pendakur (2008, p. 3) find that reconciling Engel scales with contemporary scales 'requires strong restrictions regarding the dependence of demand functions on characteristics such as age and family size, and on the links between demand functions and utility for these different household types.' Thus, we do not claim that an Engel methodology is the 'best' way to estimate equivalence scales, rather we use this simple approach to facilitate comparisons across countries and time. As precedent, this methodology is used by Statistics Canada to estimate differences in needs by household size for low income cut-offs (Statistics Canada, 2012). It has also been used in other cross-country comparisons. For example, Phipps and Garner (1994) use an Engel approach to compare equivalence scales in Canada and the United States (US). Indeed, some of the earliest equivalence scales were based on Engel's observation that poorer families spend a greater share of income on food than richer families. Further, for a given level of income, larger families spend a greater share of income on food than smaller ones (Engel, 1883; Engel, 1895). Thus, an Engel methodology can be used to estimate equivalence scales assuming the share of income spent on food is indicative of economic well-being (i.e. families that devote the same share of income to food are equally well-off). The share of income spent on food may be regarded as fixed at a point in time for a given

household size or, at the very least, less susceptible to differences in preferences and resources than total household consumption.

We extend the original Engel methodology to include the necessities of food, housing, clothing and health care, which may differ in the economies of scale they provide (e.g. housing versus clothing). Moreover, economies of scale may differ across countries and time within a particular necessity category. For example, there may be fewer economies of scale in housing if children of opposite sex are not legally allowed to share a bedroom. Likewise, there may be fewer economies of scale in food if single parents and/or dual-earner couples are prevalent; time shortages may lead to more pre-packaged, ready-made meals instead of home-cooked meals that are amenable to sharing (e.g. a turkey or large pot of soup). There may also be differences across countries and time in the nature and availability of necessities, with important implications for economies of scale. For example, high-quality clothing can be passed from one child to the next, but this may be limited by trends toward low-quality 'disposable clothing' (Tan, 2016). Moreover, some new necessities may provide economies of scale (e.g. home Internet), while others may not (e.g. cell phones). Finally, differences across countries and time in the relative prices of necessities affect how much extra income larger families require to have the same standard of living as a single person.[2] For example, if food is relatively expensive and housing is relatively cheap, then economies of scale may be smaller compared to a situation in which the opposite is true.

[2] We assume that individuals who live in the same household have the same standard of living, but we acknowledge this is not always the case (Burton et al., 2007).

In this study, we estimate equivalence scales across countries and time for three consumption bundles: (1) food; (2) food, housing and clothing; (3) food, housing, clothing and health care. Based on an Engel methodology, we examine relative income needs by looking at the shapes of the equivalence curves across household size, as well as smoothed single-parameter estimates. The latter allow us to make direct comparisons with the 'square root of household size' equivalence scale. For all consumption bundles, we find considerable differences in economies of scale across countries. We also find that economies of scale have increased over time, and our single-parameter estimates imply larger economies of scale than the widely accepted 'square root of household size' (Buhmann et al., 1988). Thus, our results indicate that using a common equivalence scale to compare economic well-being across countries and/or time is misleading. For example, if economies of scale are being understated by the 'square root of household size' equivalence scale, then the relative poverty experienced by larger versus smaller families is being overstated.

In what follows, we describe our materials and methods. We then discuss our results, which include descriptive statistics, equivalence scales by household size and single-parameter equivalence scales. In Section 4, we conclude.

2. Materials and methods

2.1 Data

In this study, we use the most comparable sources of data available for a diverse set of countries: Canada, France, Israel, Poland, South Africa, Switzerland, Taiwan and the US. Table 1 summarizes the source and availability of data by country. Data for Canada come from public-

use files of the Survey of Household Spending, which is administered by Statistics Canada. Data for the US come from the Bureau of Labor Statistics, Consumer Expenditure Survey. All other data come from the Luxembourg Income Study (LIS) Data Center (2019), which is an archive of harmonized survey data on income and wealth across countries. Expenditure data are also included, as available (refer to Sierminska and Garner (2005) for an early comparison of expenditures using LIS data). LIS data have been collected for over three decades and are available for more than 50 countries. We selected countries for which income and expenditure data are available in at least two years. Another criterion was the availability of before-tax income because we do not observe after-tax income in the US. During the study period, '[self-] reported income tax data were not accurate enough for economic analysis' (Bureau of Labor Statistics, 2015, p. 36). The Bureau of Labor Statistics began to impute federal, state and local income tax in 2013, so after-tax income is available in more recent data, but not during our study period. After-tax estimates for a subset of countries – excluding the US – are available in an earlier working paper (Daley et al., 2014). However, the current analysis is based on before-tax income to maintain consistency across countries and time.

[Table 1]

As shown in Table 1, our data range from 1999 to 2012, however this varies by country. For example, data for Poland are available in 1999, 2004, 2007 and 2010, whereas data for South Africa are available in 2008 and 2010. Likewise, data for Canada are available from 2004 to 2009, after which point the Survey of Household Spending was re-designed and not compatible. Data for the US are available from 2004 to 2012. These data start in 2004 because this is when the Bureau of Labor Statistics began to impute missing before-tax income. It accounts for

missing income using multiple imputation techniques, producing five imputations to account for variability in the process (Bureau of Labor Statistics, 2018). We use the mean of the five imputations.

Household-level data on income and expenditures were recorded via interviews, diaries and sometimes both. For example, in Canada, respondents were first interviewed, then they kept a diary of expenditures by all household members for a one- to two-week period. Income data were recovered from tax files with respondents' permission. In the US, households were interviewed quarterly over a 12-month period.[3] Our analysis is based on annual income and expenditures, so we only include households that were observed for four quarters. For example, we defined the 2004 sample to include households that were observed in quarters one to four of 2004, as well as households that were observed from quarter two of 2004 to quarter one of 2005 since most of their expenditures refer to the year 2004. Expenditures are summed over the four quarters and annual income is reported in the last interview.

2.2 Key variables

For all countries, 'income' consists of before-tax earnings, transfer payments, investment income and other sources (e.g. pensions, scholarships, child support). 'Expenditures' are outlays on goods and services for private use or gifts, including tax and transaction costs. We consider three consumption bundles: (1) food; (2) food, housing and clothing; (3) food, housing, clothing and health care. The first bundle is consistent with the original Engel methodology. The second

[3] Prior to 2015, the Bureau of Labor Statistics collected expenditure data over five consecutive quarters, with data from the first interview being used for bounding but not estimation. Beginning in 2015, only four quarters of data are collected with no bounding.

bundle is similar to the definition of necessities used by Statistics Canada in estimating low income cut-offs (Statistics Canada, 2012), as well as the US Supplemental Poverty Measure (Dalaker, 2017). The third bundle includes health care, the private cost of which differs across countries and time. This is important when considering economic well-being in countries where households spend a relatively large share of income on health care (e.g. the US).

Food, housing, clothing and health care are defined as consistently as possible across countries. Note that LIS data follow the Classification of Individual Consumption According to Purpose (United Nations, 2018), so the definitions are slightly different than those used in Canada and the US. More information is available in Appendix Table 1. In short, 'food' includes food and non-alcoholic beverages purchased from stores for consumption at home. It does not include alcohol or food from restaurants. This is consistent with low income cut-offs in Canada but different than the US Supplemental Poverty Measure, which includes 'food away from home' (Office of Management and Budget, 2010). 'Housing' includes insurance (except in LIS data) and utilities, as well as renter and owner expenses such as mortgage interest and principal payments (imputed rent in LIS data). Maintenance and repairs are also included. 'Clothing' includes accessories, outerwear and footwear, but not dry cleaning or laundry services. 'Health care' consists of direct spending on goods and services, as well as insurance premiums (except in LIS data).

The consumption bundles considered in this study limit cross-country differences in the definition of necessities. For example, snow shovels are not considered, yet they are necessary in most of Canada (they are generally not necessary in Israel, South Africa or Taiwan). However, our consumption bundles are broad enough to accommodate some cross-country differences.

For example, 'clothing' includes snow boots and parkas. Differences in relative prices are also captured to some extent, as well as important institutional factors. For example, some countries have public health care. At the same time, there may be economies of scale in private health insurance since many providers offer family plans.

2.3 Equivalence scales by household size

We estimate equivalence scales by household size following the approach used by Statistics Canada to estimate low income cut-offs (Statistics Canada, 2012). Phipps and Garner (1994) also this approach to compare equivalence scales in Canada and the US. We start by estimating Equation 1 for each country using household-level data. We do so using Ordinary Least Squares (OLS) regressions with robust standard errors and normalized sampling weights.

$$lnEXP = \beta_0 + \beta_1 lnY + \sum_{j=2}^{6} \gamma_j SIZE\, j + \boldsymbol{\alpha X} + \varepsilon \qquad [1]$$

EXP is real spending on necessities, defined by each of the three consumption bundles. Y is real before-tax household income. $SIZE$ is a set of dummy variables to indicate household size. The base is a single person. $\boldsymbol{X}$ includes rural/urban residence, region and time. β_0, β_1 and γ_j and $\boldsymbol{\alpha}$ are parameters to be estimated. ε is the error term.

Rearranging the predicted values, we find an expression for log income share devoted to necessities, as outlined in Equation 2 where $SHARE$ equals EXP divided by Y.

$$lnSHARE = \beta_0 + (\beta_1 - 1)\, ln\, Y + \sum_{j=2}^{6} \gamma_j SIZE\, j + \boldsymbol{\alpha X} \qquad [2]$$

All else constant, a household with j members and Y_j income will be equally well-off as a single person with Y_1 if Equation 3 holds.

$$\beta_0 + (\beta_1 - 1)\, ln\, Y_1 + \boldsymbol{\alpha X} = \beta_0 + (\beta_1 - 1)\, ln\, Y_j + \gamma_j + \boldsymbol{\alpha X} \quad [3]$$

Cancelling and rearranging terms, we find the equivalence scale for a household with j members. As outlined in Equation 4, it indicates the relative income needed for the household to spend the same share on necessities, and thus have the same economic well-being, as an otherwise similar single person.

$$\frac{Y_j}{Y_1} = e^{\frac{\gamma_j}{1-\beta_1}} \quad [4]$$

Using country-specific OLS estimates, we evaluate Equation 4 by household size with the respective dummy variable coefficient (γ_j) and coefficient on income (β_1). For example, suppose that $\frac{Y_2}{Y_1} = e^{\frac{\gamma_2}{1-\beta_1}}$ = 1.4. This would imply that a family of two needs 1.4 times (40 percent) more income than a single person to spend the same share on necessities, and thus have the same economic well-being.

2.4 Single-parameter equivalence scales

In addition to equivalence scales by household size, we estimate single-parameter equivalence scales that smooth across household size. This is useful for comparing levels, rather than shapes of the equivalence curves. Notably, this approach yields equivalence scales that are analogous to the widely accepted 'square root of household size' scale (Buhmann et al., 1988), which will indicate whether it is appropriate to use a common equivalence scale when comparing economic well-being across countries and time.[4]

[4] See Coulter et al. (1992), Jenkins and Cowell (1994) for a discussion of parameterized equivalence scales.

First, we estimate Equation 5 using OLS regressions with robust standard errors and normalized sampling weights. We do so for each country with a pooled sample and by year.

$$lnEXP = \beta_0 + \beta_1 lnY - \beta_2 lnSIZE + \boldsymbol{\alpha X} + \varepsilon \quad [5]$$

Here, $SIZE$ is a continuous measure of household size that is top-coded at six. Rearranging the predicted values, we find an expression for log income share devoted to necessities, as outlined in Equation 6.

$$lnSHARE = \beta_0 + (\beta_1 - 1)\, ln\, Y - \beta_2 lnSIZE + \boldsymbol{\alpha X} \quad [6]$$

A household with j members and Y_j income will be equally well-off as a single person with Y_1 if Equation 7 holds, all else constant.

$$\beta_0 + (\beta_1 - 1)\, ln\, Y_1 + \boldsymbol{\alpha X} = \beta_0 + (\beta_1 - 1)\, ln\, Y_j - \beta_2 lnj + \boldsymbol{\alpha X} \quad [7]$$

Cancelling and rearranging terms, Equation 8 is the single-parameter equivalence scale for a household with j members.

$$\frac{Y_j}{Y_1} = j^{\frac{\beta_2}{\beta_1 - 1}} \quad [8]$$

Using OLS estimates of Equation 5, we evaluate Equation 8 with the coefficients on household size and income (β_2 and β_1, respectively). We do so for each country with a pooled sample and by year. For example, suppose that $\frac{\beta_2}{\beta_1 - 1}$ = 0.6. This would imply that a family of two needs $2^{0.6}$= 1.52 times (52 percent) more income than a single person to spend the same share on necessities, and thus have the same economic well-being. A family of three would need $3^{0.6}$= 1.93 times (93 percent) more income, and so on.

3. Results

3.1 Descriptive statistics

Table 2 outlines the average share of income spent on food, housing, clothing, and health care in each country during the study period. We find that households in Poland and South Africa spend a relatively large share of income on food (25.9 and 26.7 percent, respectively), especially compared to Switzerland (8.7 percent) and the US (9.8 percent). On the other hand, households in the US spend a large proportion of income on housing and health care (25.6 and 6.1 percent, respectively), while those in South Africa spend the least on these necessities. Table 2 also indicates that households in Canada, France and Taiwan spend a large share of income on housing, clothing and health care, respectively.

[Table 2]

3.2 Equivalence scales by household size

We first compare equivalence scales for Canada and the US, followed by comparisons with LIS countries. We do this because the consumption bundles are most similar in Canada and the US, and these countries have more overlapping years of data.

3.2.1 Comparisons between Canada and the US

Figures 1 and 2 depict equivalence scales by household size for Canada and the US. Appendix Table 2 contains the OLS coefficients upon which these scales are based (i.e. country-specific coefficients on income and household size from OLS regressions of Equation 1). Scales are

reported separately for the three consumption bundles: (1) food; (2) food, housing, and clothing; (3) food, housing, clothing, and health care.

[Figures 1 to 2]

In both countries, economies of scale are smaller when the consumption bundle includes only food. Moreover, economies of scale for food are smaller in Canada. For example, a family of four spends 2.9 times as much on food as a single person, compared to 2.4 in the US. Similarly, a family of six spends 4.1 times as much on food as a single person, compared to 3.1 in the US. This is unexpected given longer hours of paid work in the US (Burton and Phipps, 2007), which may lead families to purchase more pre-packaged, ready-made meals with limited economies of scale. However, if families eat out more (instead of purchasing pre-packaged, ready-made meals), the lower estimate for the US may be explained by the exclusion of 'food away from home' in our analysis. Another explanation could be that food prices are considerably higher in Canada relative to the US (Gopinath et al., 2011). This is consistent with Table 2, which indicates that Canadian households spend a larger share of income on food.

Also shown in Figures 1 and 2, economies of scale increase when housing and clothing are added to the consumption bundle. For example, a Canadian family of six spends 2.5 times more than a single person on food, housing and clothing, compared to 4.1 on food. Likewise, in the US, a family of six spends 2.1 times more than a single person on food, housing and clothing, compared to 3.1 on food. Economies of scale remain larger in the US, which may reflect lower prices or buying in bulk. However, there are fewer differences between Canada and the US with the more extensive consumption bundles, compared to the bundle that includes only food.

These results are consistent with reference budgets for European cities; the relative cost of additional household members decreases as the share of income spent on housing increases, resulting in flatter implicit equivalence scales (Goedemé et al., 2019).

Finally, in the US, economies of scale increase when health care is added to the consumption bundle, perhaps due to family plans in private health insurance. Out-of-pocket spending on health care is much lower in Canada in the presence of public health care (Table 2). Although many Canadian households purchase extended coverage with economies of scale in family plans, the major components of out-of-pocket spending are prescription drugs and dental care (Sanmartin et al., 2014), which are per-person expenditures. Also, differences in equivalence scales that include health care may reflect the additional costs faced by people with disabilities, some of which are not covered by health insurance and thus must be paid out-of-pocket. This issue is alluded to by Atkinson (2019).

3.2.2 Comparisons between Canada, the US and LIS countries

Next, we expand our analysis beyond North America to consider France, Israel, Poland, South Africa, Switzerland and Taiwan. Figures 3 to 8 depict equivalence scales by household size for these countries, separately for the three consumption bundles. Again, Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based.

[Figures 3 to 8]

We find that economies of scale are quite different across countries. For example, based on the consumption bundle of food, housing, clothing and health care, a family of two needs between 27.9 (Canada) and 59.8 (Israel) percent more income to have the same economic well-being as

a single person. The mean is 43.1 percent. Equivalence scales also differ across countries for larger families, but the rates at which needs increase by household size are not constant. Moreover, the highs and lows occur in different countries. For example, based on the consumption bundle of food, housing, clothing and health care, the equivalence scale for a four-person household is lowest in Switzerland at 1.54 and highest in Taiwan at 2.38. The estimate for Taiwan is an outlier. The next highest equivalence scale occurs in France, where a four-person household needs 89 percent more income to have the same economic well-being as a single person. Bishop et al. (2014) note that such differences may reflect differences in the generosity of welfare states.

3.2.3 Comparisons between Canada and the US across time

In addition to comparisons across countries, it is important to consider how changes in expenditure patterns across time affect economies of scale. Thus, Figure 9 contains equivalence scales by household size for Canada and the US across time, comparing our estimates to those from 1986-1988 (Phipps and Garner, 1994). Recall that we use before-tax income (we do not observe after-tax income in the US during our study period), while Phipps and Garner (1994) use after-tax income. Moreover, household size is top-coded at six in our data, versus seven in Phipps and Garner (1994).

We find that economies of scale increased over time in both countries, and gains were generally larger in Canada. For example, a Canadian family of three spent 76 percent more than a single person on food, housing, clothing and health care in 1986. This decreased to 57 percent in 2004-2009. In the US, a family of three spent 62 percent more than a single person on food,

housing, clothing and health care in 1986-1988, compared to 52 percent in 2004-2012. Changes in economies of scale may be explained by changes in consumption spending across time, as evidenced by comparing Table 2 to Phipps and Garner (1994). Specifically, there was a reduction in spending on necessities with smaller economies of scale (i.e. food, clothing), as well as an increase in spending on necessities with larger economies of scale (i.e. housing, health care). Moreover, changes in consumption spending were generally larger in Canada.

[Figure 9]

Taken together, these findings suggest that economies of scale vary across countries and time. Thus, using a common equivalence scale to compare economic well-being may be misleading. We also find that economies of scale vary by consumption bundle and household size. Thus, using single-parameter equivalence scales (which smooth across household size) may be misleading for some purposes, such as estimating the needs associated with having an additional child. Yet, single-parameter equivalence scales are useful for comparing needs by household size in terms of levels, rather than shapes of the equivalence curves. They are also appropriate if differences in equivalence curves result from cross-country anomalies in household structure or other factors that are not directly relevant to the comparison. We now consider single-parameter equivalence scales across countries and time, with comparisons to the 'square root of household size' scale.

3.3 Single-parameter equivalence scales

Table 3 contains the coefficients on income and continuous measure of household size from OLS regressions of Equation 5, and the ensuing single-parameter equivalence scales. They are

given for each consumption bundle by country and year, in addition to a pooled sample for each country.

[Table 3]

3.3.1 Comparisons across countries

The widely accepted 'square root of household size' equivalence scale corresponds to $\frac{\beta_2}{\beta_1 - 1}$ = 0.5 in Equation 8 (Buhmann et al., 1988). This implies that a family of four needs twice as much income as a single person to have the same economic well-being ($4^{0.5}$= 2). Estimates less than 0.5 would indicate larger economies of scale. For example, based on the consumption bundle of food, housing, clothing and health care, the single-parameter equivalence scale for the US is 0.37. This implies that a family of four needs 67 percent more income than a single person ($4^{0.37}$ = 1.67). Except Taiwan, single-parameter equivalence scales are consistently less than 0.5, ranging from 0.246 in South Africa to 0.465 in Israel. These results indicate that the 'square root of household size' understates economies of scale, and thus overstates the relative poverty experienced by larger versus smaller families.

Also in Table 3, we find that the relationship of needs to household size is steeper in Canada, France, Israel and Poland. It is flatter in South Africa, Switzerland and the US. Economies of scale are especially large in South Africa. For example, based on the consumption bundle of food, housing, clothing and health care, a family of four needs 41 percent more income to have the same economic well-being as a single person ($4^{0.246}$ = 1.41). This is consistent with Figure 6, which indicates that needs actually decline with household size for larger families. It is possible

that consumption bundles contain discretionary spending among smaller South African families, and thus do not represent basic needs.

3.3.2 Comparisons across time

In addition to the pooled sample for each country, we estimate single-parameter equivalence scales by year. There are negligible changes across time for countries with many years of data (i.e. Canada, Poland, the US). Presumably, this differs from our comparison with Phipps and Garner (1994) because we do not have a long horizon over which to assess changes in single-parameter equivalence scales.

4. Discussion

The objective of this study is to examine whether it is appropriate to use a common equivalence scale when comparing economic well-being across countries and/or time. We do so using the most comparable sources of data available. Based on an Engel methodology, we consider the shapes of the equivalence curves across household size, as well as smoothed single-parameter estimates for three consumption bundles: (1) food; (2) food, housing and clothing; (3) food, housing, clothing and health care.

We find that equivalence scales differ across consumption bundles, such that economies of scale are larger when considering necessities other than food. This occurs in every country except South Africa, where the consumption bundles likely include discretionary spending among smaller families, and thus do not represent basic needs. It is also interesting to note that, in the US, economies of scale increase when health care is added to the consumption bundle. Future work should emphasize groups for whom health care may have a greater

impact, such as the elderly and disabled (Morciano et al., 2015). It is also important to consider the effect of health care policy on economic well-being, such as the Patient Protection and Affordable Care Act, implemented in the US after our study period.

For all consumption bundles, we find considerable differences in economies of scale across countries. This is important when deciding whether to use a common equivalence scale in cross-country comparisons of economic well-being. For example, based on the consumption bundle of food, housing, clothing and health care, a family of two needs between 27.9 percent (Canada) and 59.8 percent (Israel) more income to have the same economic well-being as a single person. Similarly, for a family of four, additional needs range from 54.3 percent in Switzerland to more than double in Taiwan. Along with differences across countries for a given household size, additional needs vary across household size for a given country. For example, the relationship of needs to household size is steeper in Canada, France, Israel and Poland. It is flatter in South Africa, Switzerland and the US.

Despite these differences, there are some similarities in the distribution of needs by household size across countries. For example, except the consumption bundle that includes only food, most single-parameter estimates are less than 0.5. This implies larger economies of scale than the widely accepted 'square root of household size'. Thus, contemporary comparisons might be more accurate if a lower parameter is used. This coincides with our finding that economies of scale have increased over time, as suggested by the comparison with Phipps and Garner (1994), despite being roughly constant in the short run.

To facilitate comparisons with the 'square root of household size' equivalence scale, our estimates reflect economies of scale in consumption, but we do not consider other characteristics that affect needs. On the other hand, the equivalence scales recommended for poverty measurement in the US account for both economies of scale in consumption and the different needs of adults and children in the household (Citro and Michaels, 1995; Office of Management and Budget, 2010). Future comparisons of equivalence scales across countries and time should consider household structure (e.g. the number of adults and children) and other characteristics that affect needs such as age, gender and health status. For example, children of different ages have different needs (Blundell and Lewbel, 1991), as do men and women (Haddad and Kanbur, 1990; Ravallion, 2016; World Bank, 2018). These differences could be related to developmental consumption needs or bargaining power within the household (Browning et al., 2013). Also in future work, purchasing power parity could be used to account for cross-country differences in prices.

Of course, comparisons of economic well-being are imperfect because we cannot account for the myriad of ways in which countries differ, including institutional differences and measurement issues across surveys. We also recognize that necessities differ across countries and time, with important implications for economies of scale (e.g. home Internet, cell phones, food from restaurants). Moreover, our equivalence scales do not provide information about the welfare derived from spending on necessities or how families view their needs.

We do not claim that an Engel approach is the 'best' way to estimate equivalence scales, however our study shows that comparisons of economic well-being across countries and/or time should be done with care. Using a common equivalence scale (such as the 'square root of

household size') may simplify the analysis, but it may be misleading. For example, if economies of scale are being understated, then the relative poverty experienced by larger versus smaller families is being overstated.

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Appendix Table 1. Definitions of food, housing, clothing and health care by country

Necessity	Canada	France, Israel, Poland, South Africa, Switzerland, Taiwan (LIS countries)	US
Food	Food and non-alcoholic beverages from stores, purchases for parties, weddings, etc., purchases from stores on trips	Food and non-alcoholic beverages for consumption at home based on the Classification of Individual Consumption According to Purpose code 01	Food and non-alcoholic beverages from stores, purchases for parties, weddings, etc., purchases from stores on trips, meals as pay, board (including at school), school lunches
Housing	Insurance and utilities (e.g. water, sewage, garbage collection, electricity, natural gas, other fuel, telecommunications), renter expenses including rent and maintenance/ repairs not reimbursed by landlords, owner expenses including mortgage interest, principal payments maintenance/repairs, property taxes and other spending (e.g. ground rent, management)	Utilities, renter and owner expenses with imputed rent, excluding insurance based on the Classification of Individual Consumption According to Purpose code 04	Insurance and utilities (e.g. water, sewage, garbage collection, electricity, natural gas, other fuel, telecommunications), renter expenses including rent and maintenance/ repairs not reimbursed by landlords, owner expenses including mortgage interest, principal payments maintenance/repairs, property taxes and other spending (e.g. ground rent, management)
Clothing	Clothing including uniforms, sportswear, sleepwear, hosiery, underwear, accessories, watches/jewelry, cloth diapers, material for making clothes, sewing patterns and notions, services excluding dry cleaning and laundry (e.g. storage, rentals, repairs, alterations), outerwear including furs, footwear	Clothing and footwear based on the Classification of Individual Consumption According to Purpose code 03	Clothing including uniforms, sportswear, sleepwear, hosiery, underwear, accessories, watches/jewelry, cloth diapers, material for making clothes, sewing patterns and notions, services excluding dry cleaning and laundry (e.g. storage, rentals, repairs, alterations), outerwear including furs, footwear
Health care	Hospital care, physician care, other health practitioners including eye and dental care, nursing homes and residential care facilities, other services (e.g. ambulances, laboratory services), prescription and non-prescription drugs, medical supplies (e.g. eyewear, hearing aids, canes, wheelchairs), insurance premiums including private health plans, dental plans, accident and disability insurance	Health care goods and services excluding insurance premiums based on the Classification of Individual Consumption According to Purpose code 06	Hospital care, physician care, other health practitioners including eye and dental care, nursing homes and residential care facilities, other services (e.g. ambulances, laboratory services), prescription and non-prescription drugs, medical supplies (e.g. eyewear, hearing aids, canes, wheelchairs), insurance premiums including fee-for-service health plans, preferred-provider plans, health maintenance organizations and Medicare supplements

Appendix Table 2. OLS coefficients and equivalence scales by household size for three consumption bundles

Country	Variable	Food		Food, housing and clothing		Food, housing, clothing and health care	
		OLS coefficient	Equivalence scale	OLS coefficient	Equivalence scale	OLS coefficient	Equivalence scale
Canada n=64,733	Income	0.283 (0.006)	–	0.460 (0.004)	–	0.466 (0.003)	–
	Size = 2	0.425 (0.010)	1.810 (0.023)	0.110 (0.005)	1.225 (0.011)	0.131 (0.005)	1.279 (0.011)
	Size = 3	0.603 (0.011)	2.317 (0.033)	0.247 (0.007)	1.581 (0.018)	0.242 (0.006)	1.573 (0.017)
	Size = 4	0.756 (0.012)	2.870 (0.041)	0.339 (0.007)	1.872 (0.021)	0.326 (0.007)	1.841 (0.020)
	Size = 5	0.855 (0.021)	3.296 (0.083)	0.411 (0.009)	2.139 (0.033)	0.394 (0.009)	2.093 (0.032)
	Size = 6	1.007 (0.022)	4.071 (0.116)	0.501 (0.012)	2.528 (0.057)	0.489 (0.012)	2.501 (0.055)
France n=18,228	Income	0.456 (0.011)	–	0.365 (0.014)	–	0.411 (0.013)	–
	Size = 2	0.476 (0.016)	2.401 (0.068)	0.171 (0.020)	1.309 (0.039)	0.1 89(0.019)	1.347 (0.040)
	Size = 3	0.557 (0.019)	2.784 (0.087)	0.377 (0.023)	1.810 (0.058)	0.374 (0.023)	1.803 (0.061)
	Size = 4	0.666 (0.019)	3.406 (0.107)	0.393 (0.024)	1.857 (0.061)	0.404 (0.023)	1.887 (0.063)
	Size = 5	0.771 (0.022)	4.132 (0.163)	0.449 (0.029)	2.027 (0.086)	0.456 (0.028)	2.048 (0.089)
	Size = 6	0.784 (0.035)	4.228 (0.267)	0.504 (0.040)	2.211 (0.133)	0.490 (0.037)	2.161 (0.128)
Israel n=16,991	Income	0.277 (0.009)	–	0.344 (0.007)	–	0.372 (0.007)	–
	Size = 2	0.525 (0.023)	2.065 (0.064)	0.314 (0.016)	1.615 (0.039)	0.308 (0.016)	1.598 (0.040)
	Size = 3	0.664 (0.025)	2.504 (0.080)	0.402 (0.018)	1.846 (0.047)	0.364 (0.017)	1.741 (0.046)
	Size = 4	0.824 (0.025)	3.122 (0.095)	0.476 (0.018)	2.062 (0.051)	0.408 (0.017)	1.862 (0.048)
	Size = 5	0.966 (0.026)	3.799 (0.122)	0.557 (0.018)	2.302 (0.059)	0.474 (0.018)	2.058 (0.055)
	Size = 6	1.152 (0.025)	4.917 (0.161)	0.705 (0.018)	2.928 (0.077)	0.628 (0.018)	2.603 (0.071)
Poland n=128,957	Income	0.348 (0.002)	–	0.511 (0.002)	–	0.530 (0.002)	–
	Size = 2	0.388 (0.004)	1.814 (0.010)	0.202 (0.004)	1.510 (0.010)	0.179 (0.003)	1.442 (0.010)
	Size = 3	0.506 (0.004)	2.173 (0.012)	0.286 (0.004)	1.794 (0.012)	0.224 (0.004)	1.579 (0.011)
	Size = 4	0.603 (0.004)	2.519 (0.014)	0.346 (0.004)	2.027 (0.014)	0.269 (0.004)	1.732 (0.012)
	Size = 5	0.687 (0.005)	2.866 (0.019)	0.390 (0.005)	2.219 (0.019)	0.308 (0.005)	1.876 (0.016)
	Size = 6	0.783 (0.006)	3.323 (0.025)	0.453 (0.005)	2.524 (0.025)	0.365 (0.006)	2.108 (0.021)

Appendix Table 2 (continued). OLS coefficients and equivalence scales by household size for three consumption bundles

Country	Variable	Food		Food, housing and clothing		Food, housing, clothing and health care	
		OLS coefficient	Equivalence scale	OLS coefficient	Equivalence scale	OLS coefficient	Equivalence scale
South Africa n=9,749	Income	0.456 (0.010)	–	0.593 (0.010)	–	0.655 (0.010)	–
	Size = 2	0.193 (0.034)	1.425 (0.090)	0.176 (0.039)	1.539 (0.149)	0.184 (0.040)	1.571 (0.183)
	Size = 3	0.319 (0.034)	1.798 (0.122)	0.259 (0.037)	1.887 (0.169)	0.253 (0.038)	1.859 (0.201)
	Size = 4	0.355 (0.035)	1.921 (0.124)	0.259 (0.039)	1.887 (0.179)	0.233 (0.040)	1.771 (0.204)
	Size = 5	0.358 (0.039)	1.930 (0.140)	0.232 (0.042)	1.766 (0.182)	0.192 (0.043)	1.601 (0.196)
	Size = 6	0.376 (0.033)	1.996 (0.121)	0.212 (0.036)	1.683 (0.148)	0.167 (0.037)	1.508 (0.159)
Switzerland n=10,433	Income	0.138 (0.014)	–	0.276 (0.012)	–	0.282 (0.012)	–
	Size = 2	0.617 (0.017)	2.047 (0.034)	0.136 (0.015)	1.207 (0.023)	0.181 (0.015)	1.284 (0.025)
	Size = 3	0.837 (0.021)	2.641 (0.053)	0.257 (0.018)	1.426 (0.033)	0.264 (0.019)	1.441 (0.035)
	Size = 4	1.011 (0.020)	3.233 (0.062)	0.317 (0.017)	1.549 (0.032)	0.314 (0.017)	1.543 (0.033)
	Size = 5	1.158 (0.024)	3.832 (0.095)	0.341 (0.022)	1.601 (0.046)	0.336 (0.023)	1.591 (0.047)
	Size = 6	1.184 (0.042)	3.950 (0.185)	0.350 (0.034)	1.621 (0.075)	0.349 (0.036)	1.620 (0.080)
Taiwan n=25,115	Income	0.288 (0.004)	–	0.404 (0.004)	–	0.360 (0.004)	–
	Size = 2	0.422 (0.009)	1.808 (0.022)	0.207 (0.008)	1.416 (0.019)	0.278 (0.008)	1.594 (0.019)
	Size = 3	0.713 (0.009)	2.725 (0.032)	0.355 (0.009)	1.815 (0.025)	0.415 (0.008)	2.007 (0.024)
	Size = 4	0.903 (0.009)	3.556 (0.040)	0.457 (0.009)	2.155 (0.028)	0.516 (0.008)	2.378 (0.027)
	Size = 5	1.045 (0.009)	4.345 (0.051)	0.535 (0.009)	2.453 (0.033)	0.610 (0.009)	2.785 (0.033)
	Size = 6	1.206 (0.010)	5.443 (0.070)	0.622 (0.010)	2.840 (0.040)	0.747 (0.009)	3.506 (0.044)
US n=34,836	Income	0.228 (0.004)	–	0.484 (0.003)	–	0.475 (0.003)	–
	Size = 2	0.396 (0.007)	1.671 (0.014)	0.100 (0.006)	1.214 (0.014)	0.148 (0.006)	1.333 (0.014)
	Size = 3	0.557 (0.008)	2.058 (0.020)	0.228 (0.008)	1.557 (0.021)	0.216 (0.007)	1.519 (0.019)
	Size = 4	0.689 (0.008)	2.443 (0.024)	0.326 (0.008)	1.883 (0.025)	0.290 (0.007)	1.753 (0.022)
	Size = 5	0.762 (0.010)	2.685 (0.034)	0.357 (0.009)	1.997 (0.034)	0.313 (0.009)	1.835 (0.029)
	Size = 6	0.869 (0.012)	3.086 (0.047)	0.391 (0.011)	2.134 (0.042)	0.336 (0.010)	1.917 (0.036)

Notes: Data come from the Survey of Household Spending, LIS Data Center and Consumer Expenditure Survey. Standard errors are reported in parentheses. Standard errors of equivalence scales are calculated using the methodology outlined by Phipps and Garner (1994). The equivalence scales are summarized by country in Figures 1 to 8.

Table 1. Source and availability of data by country and year

Country	Source	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Canada	Survey of Household Spending						X	X	X	X	X	X			
France	Family Budget Survey via LIS Data Center		X					X							
Israel	Household Expenditure Survey via LIS Data Center			X						X			X		
Poland	Household Budget Survey via LIS Data Center	X					X			X			X		
South Africa	National Income Dynamics Study via LIS Data Center										X		X		
Switzerland	Income and Consumption Survey via LIS Data Center		X		X		X								
Taiwan	Survey of Family Income and Expenditure via LIS Data Center		X					X							
US	Consumer Expenditure Survey						X	X	X	X	X	X	X	X	X

Table 2. Share of income spent on necessities by country

Country	Food	Housing	Clothing	Health care
Canada	10.308	23.194	3.750	3.274
n=64,733	(0.039)	(0.077)	(0.018)	(0.021)
France	15.964	11.324	5.698	3.487
n=18,228	(0.078)	(0.153)	(0.056)	(0.055)
Israel	16.693	10.903	3.231	3.647
n=16,991	(0.116)	(0.105)	(0.045)	(0.054)
Poland	25.877	16.637	3.984	4.385
n=128,957	(0.037)	(0.035)	(0.017)	(0.018)
South Africa	26.669	8.232	2.029	1.705
n=9,749	(0.326)	(0.200)	(0.110)	(0.094)
Switzerland	8.741	15.045	2.871	3.717
n=10,433	(0.060)	(0.139)	(0.043)	(0.088)
Taiwan	18.968	20.029	2.738	8.451
n=25,115	(0.052)	(0.067)	(0.011)	(0.052)
US	9.811	25.585	1.913	6.128
n=34,836	(0.037)	(0.077)	(0.011)	(0.039)

Notes: Data come from the Survey of Household Spending, LIS Data Center and Consumer Expenditure Survey. Shares are reported in percentage terms. Standard errors are reported in parentheses.

Table 3. OLS coefficients and single-parameter equivalence scales for three consumption bundles

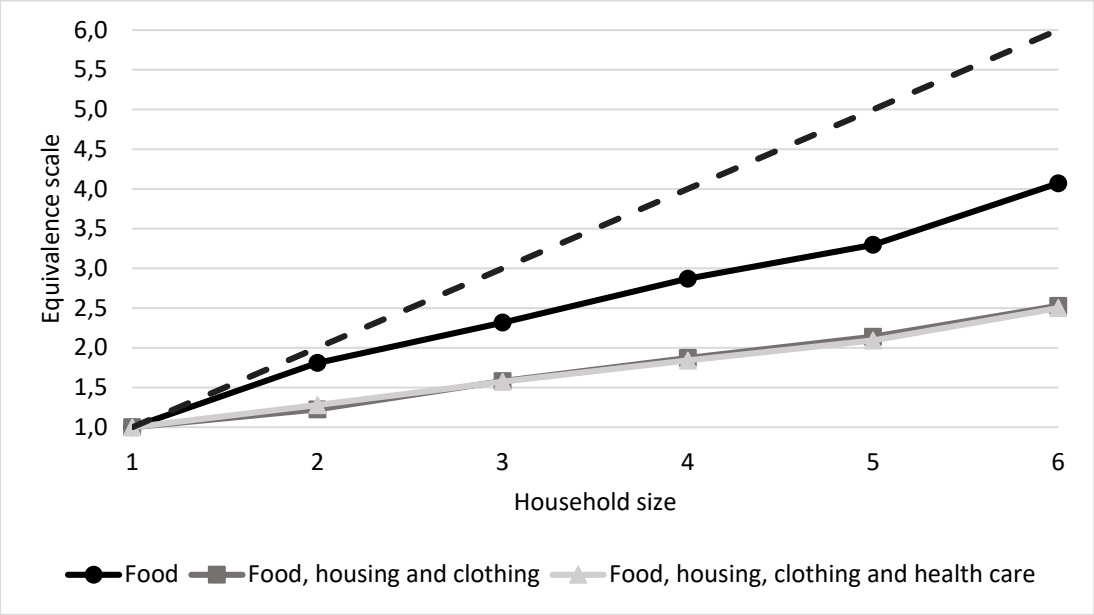
Country	Year	Food			Food, housing and clothing			Food, housing, clothing and health care		
		OLS coeff. on income	OLS coeff. on size	Equivalence scale	OLS coeff. on income	OLS coeff. on size	Equivalence scale	OLS coeff. on income	OLS coeff. on size	Equivalence scale
Canada n=64,733	Pooled	0.287 (0.006)	0.539 (0.008)	0.755 (0.009)	0.453 (0.004)	0.260 (0.004)	0.475 (0.006)	0.462 (0.003)	0.248 (0.004)	0.460 (0.006)
	2004	0.257 (0.011)	0.566 (0.015)	0.763 (0.015)	0.444 (0.008)	0.266 (0.010)	0.479 (0.015)	0.451 (0.008)	0.455 (0.010)	0.465 (0.014)
	2005	0.265 (0.010)	0.545 (0.014)	0.741 (0.016)	0.426 (0.007)	0.265 (0.009)	0.461 (0.013)	0.438 (0.007)	0.252 (0.009)	0.449 (0.013)
	2006	0.265 (0.012)	0.595 (0.015)	0.809 (0.019)	0.447 (0.007)	0.277 (0.009)	0.502 (0.014)	0.438 (0.007)	0.264 (0.008)	0.488 (0.013)
	2007	0.285 (0.012)	0.529 (0.015)	0.739 (0.018)	0.470 (0.008)	0.251 (0.010)	0.473 (0.016)	0.479 (0.008)	0.237 (0.009)	0.456 (0.015)
	2008	0.322 (0.016)	0.515 (0.021)	0.760 (0.025)	0.469 (0.010)	0.248 (0.011)	0.467 (0.018)	0.475 (0.009)	0.235 (0.011)	0.448 (0.018)
	2009	0.322 (0.024)	0.487 (0.034)	0.718 (0.035)	0.455 (0.010)	0.256 (0.012)	0.470 (0.018)	0.463 (0.010)	0.246 (0.011)	0.459 (0.017)
France n=18,228	Pooled	0.471 (0.011)	0.461 (0.012)	0.871 (0.020)	0.433 (0.015)	0.227 (0.015)	0.399 (0.023)	0.475 (0.014)	0.237 (0.015)	0.451 (0.023)
	2000	0.451 (0.016)	0.498 (0.017)	0.908 (0.030)	0.331 (0.026)	0.268 (0.028)	0.401 (0.036)	0.397 (0.025)	0.288 (0.027)	0.479 (0.038)
	2005	0.503 (0.016)	0.418 (0.016)	0.842 (0.029)	0.392 (0.010)	0.315 (0.011)	0.518 (0.015)	0.425 (0.010)	0.300 (0.010)	0.522 (0.016)
Israel n=16,991	Pooled	0.281 (0.009)	0.572 (0.012)	0.796 (0.015)	0.346 (0.007)	0.338 (0.008)	0.517 (0.012)	0.374 (0.007)	0.291 (0.008)	0.465 (0.012)
	2001	0.219 (0.015)	0.614 (0.020)	0.786 (0.024)	0.297 (0.013)	0.398 (0.015)	0.566 (0.019)	0.333 (0.013)	0.346 (0.015)	0.519 (0.020)
	2007	0.302 (0.015)	0.558 (0.023)	0.799 (0.029)	0.348 (0.011)	0.316 (0.014)	0.484 (0.019)	0.376 (0.011)	0.264 (0.014)	0.424 (0.020)
	2010	0.323 (0.014)	0.547 (0.019)	0.809 (0.028)	0.382 (0.013)	0.312 (0.015)	0.504 (0.023)	0.403 (0.013)	0.272 (0.014)	0.455 (0.023)
Poland n=128,957	Pooled	0.335 (0.002)	0.435 (0.002)	0.654 (0.003)	0.502 (0.002)	0.252 (0.002)	0.506 (0.004)	0.523 (0.002)	0.196 (0.002)	0.411 (0.004)
	1999	0.364 (0.004)	0.403 (0.005)	0.633 (0.006)	0.521 (0.005)	0.230 (0.005)	0.480 (0.008)	0.535 (0.005)	0.183 (0.005)	0.393 (0.008)
	2004	0.381 (0.004)	0.429 (0.005)	0.693 (0.007)	0.530 (0.004)	0.240 (0.004)	0.512 (0.008)	0.559 (0.005)	0.177 (0.004)	0.402 (0.009)
	2007	0.362 (0.005)	0.404 (0.005)	0.633 (0.007)	0.511 (0.005)	0.248 (0.005)	0.507 (0.008)	0.531 (0.005)	0.190 (0.005)	0.405 (0.008)
	2010	0.335 (0.005)	0.404 (0.005)	0.608 (0.006)	0.500 (0.005)	0.238 (0.005)	0.476 (0.008)	0.517 (0.005)	0.189 (0.005)	0.392 (0.008)

Table 3 (continued). OLS coefficients and single-parameter equivalence scales for three consumption bundles

Country	Year	Food			Food, housing and clothing			Food, housing, clothing and health care		
		OLS coeff. on income	OLS coeff. on size	Equivalence scale	OLS coeff. on income	OLS coeff. on size	Equivalence scale	OLS coeff. on income	OLS coeff. on size	Equivalence scale
South Africa n=9,749	Pooled	0.458 (0.010)	0.193 (0.016)	0.355 (0.028)	0.595 (0.010)	0.109 (0.017)	0.270 (0.041)	0.657 (0.010)	0.084 (0.017)	0.246 (0.050)
	2008	0.447 (0.013)	0.210 (0.019)	0.380 (0.032)	0.593 (0.014)	0.133 (0.021)	0.326 (0.050)	0.669 (0.014)	0.106 (0.021)	0.319 (0.061)
	2010	0.472 (0.015)	0.182 (0.024)	0.345 (0.046)	0.599 (0.015)	0.094 (0.026)	0.235 (0.065)	0.648 (0.016)	0.073 (0.027)	0.208 (0.076)
Switzerland n=10,433	Pooled	0.159 (0.014)	0.717 (0.013)	0.852 (0.013)	0.274 (0.012)	0.223 (0.011)	0.308 (0.013)	0.288 (0.012)	0.219 (0.011)	0.308 (0.013)
	2000	0.164 (0.021)	0.708 (0.020)	0.847 (0.022)	0.269 (0.020)	0.223 (0.017)	0.305 (0.021)	0.285 (0.020)	0.226 (0.018)	0.316 (0.021)
	2002	0.147 (0.019)	0.723 (0.022)	0.848 (0.022)	0.282 (0.019)	0.220 (0.018)	0.307 (0.022)	0.303 (0.019)	0.214 (0.018)	0.307 (0.023)
	2004	0.166 (0.030)	0.719 (0.026)	0.862 (0.022)	0.274 (0.022)	0.225 (0.020)	0.310 (0.024)	0.277 (0.022)	0.216 (0.020)	0.299 (0.024)
Taiwan n=25,115	Pooled	0.284 (0.004)	0.656 (0.005)	0.916 (0.005)	0.403 (0.004)	0.340 (0.004)	0.570 (0.006)	0.354 (0.004)	0.386 (0.004)	0.598 (0.005)
	2000	0.282 (0.006)	0.652 (0.006)	0.909 (0.008)	0.401 (0.005)	0.340 (0.006)	0.568 (0.008)	0.347 (0.005)	0.383 (0.006)	0.586 (0.007)
	2005	0.289 (0.006)	0.658 (0.007)	0.925 (0.008)	0.402 (0.005)	0.340 (0.006)	0.569 (0.009)	0.362 (0.005)	0.390 (0.006)	0.611 (0.008)
US n=34,836	Pooled	0.236 (0.004)	0.476 (0.005)	0.623 (0.006)	0.480 (0.003)	0.226 (0.004)	0.434 (0.007)	0.478 (0.003)	0.193 (0.004)	0.370 (0.007)
	2005	0.223 (0.013)	0.515 (0.017)	0.663 (0.018)	0.502 (0.010)	0.220 (0.013)	0.442 (0.022)	0.491 (0.009)	0.187 (0.011)	0.368 (0.020)
	2006	0.242 (0.009)	0.476 (0.013)	0.628 (0.016)	0.496 (0.009)	0.213 (0.011)	0.423 (0.019)	0.490 (0.009)	0.180 (0.011)	0.353 (0.019)
	2007	0.244 (0.009)	0.485 (0.013)	0.642 (0.016)	0.496 (0.010)	0.217 (0.013)	0.433 (0.022)	0.487 (0.009)	0.188 (0.012)	0.365 (0.021)
	2008	0.233 (0.009)	0.483 (0.013)	0.631 (0.016)	0.485 (0.010)	0.230 (0.012)	0.447 (0.021)	0.476 (0.009)	0.207 (0.012)	0.396 (0.020)
	2009	0.227 (0.010)	0.480 (0.013)	0.621 (0.015)	0.455 (0.009)	0.237 (0.013)	0.435 (0.020)	0.457 (0.009)	0.206 (0.012)	0.379 (0.020)
	2010	0.249 (0.009)	0.447 (0.013)	0.595 (0.016)	0.480 (0.009)	0.209 (0.012)	0.403 (0.021)	0.481 (0.008)	0.173 (0.011)	0.334 (0.020)
	2011	0.246 (0.009)	0.442 (0.013)	0.587 (0.015)	0.468 (0.009)	0.237 (0.011)	0.447 (0.019)	0.474 (0.008)	0.202 (0.011)	0.384 (0.018)
	2012	0.226 (0.010)	0.480 (0.012)	0.621 (0.015)	0.451 (0.010)	0.244 (0.012)	0.445 (0.019)	0.464 (0.009)	0.204 (0.011)	0.380 (0.019)

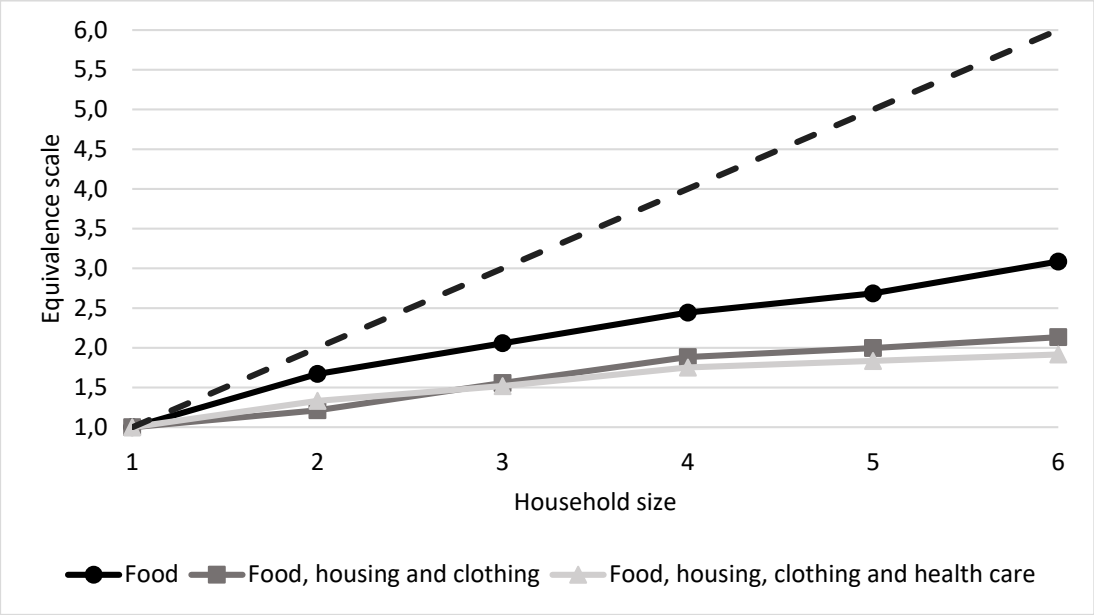
Notes: Data come from the Survey of Household Spending, LIS Data Center and Consumer Expenditure Survey. Standard errors are reported in parentheses. Standard errors of equivalence scales are calculated using the methodology outlined by Phipps and Garner (1994).

Figure 1. Equivalence scales by household size for three consumption bundles – Canada



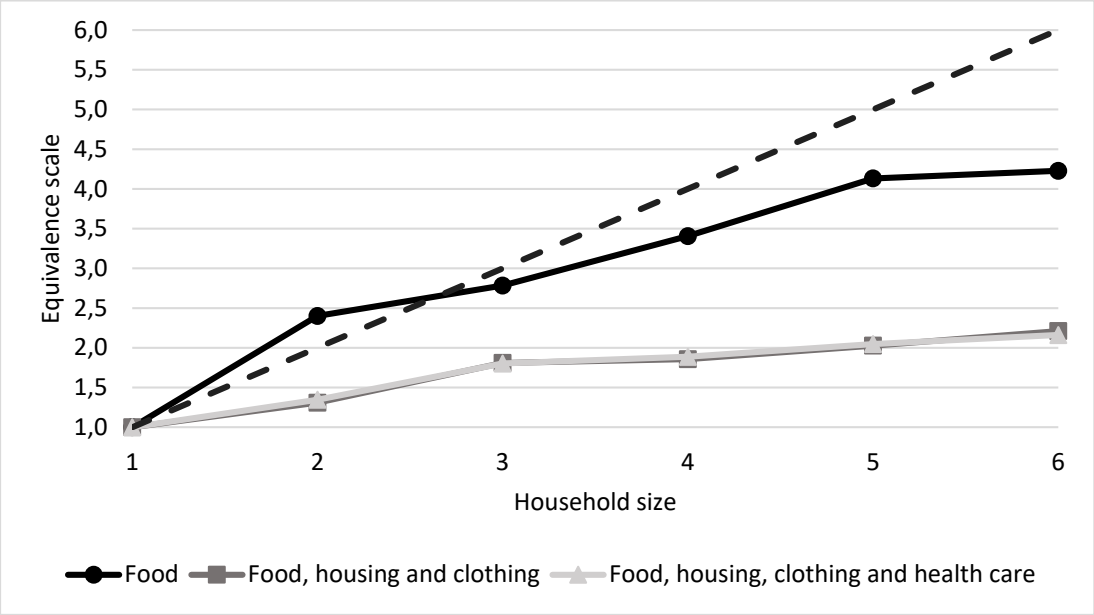
Notes: Data come from the Survey of Household Spending. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 2. Equivalence scales by household size for three consumption bundles – US



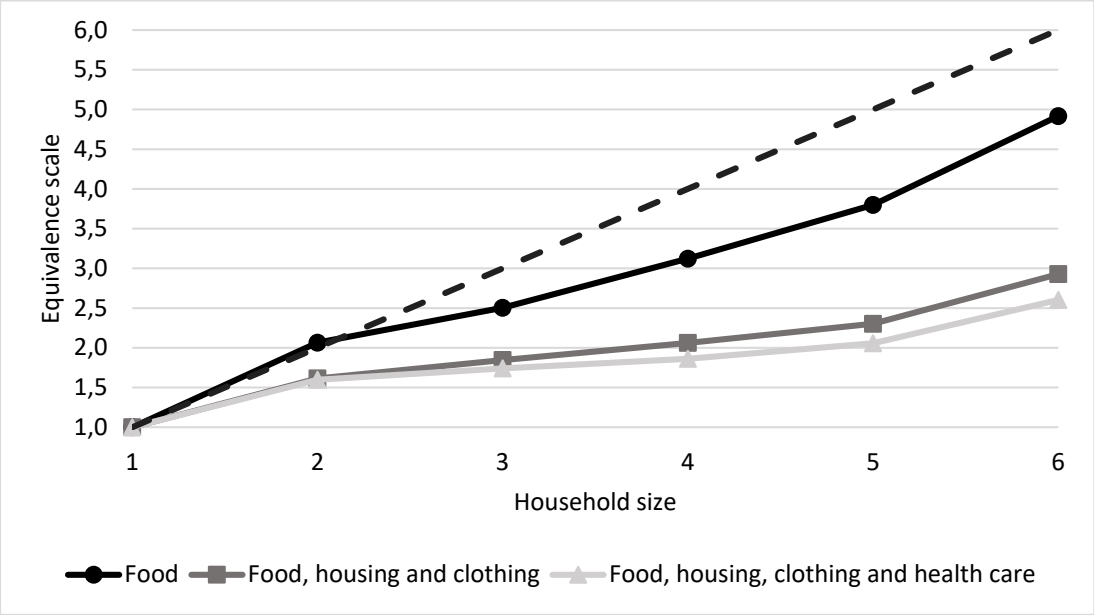
Notes: Data come from the Consumer Expenditure Survey. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 3. Equivalence scales by household size for three consumption bundles – France



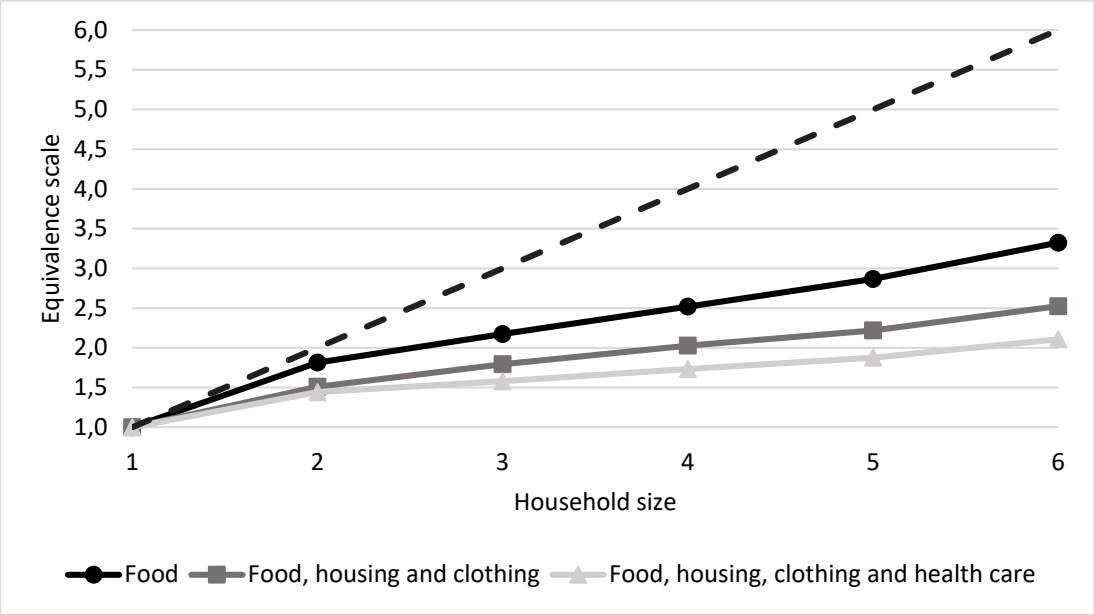
Notes: Data come from the LIS Data Center. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 4. Equivalence scales by household size for three consumption bundles – Israel



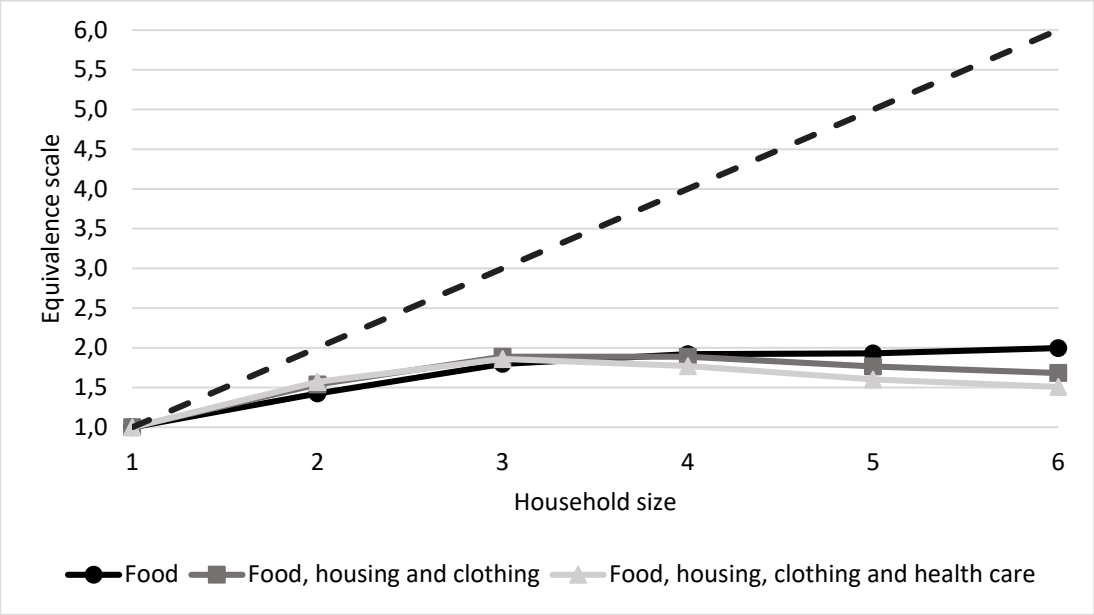
Notes: Data come from the LIS Data Center. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 5. Equivalence scales by household size for three consumption bundles – Poland



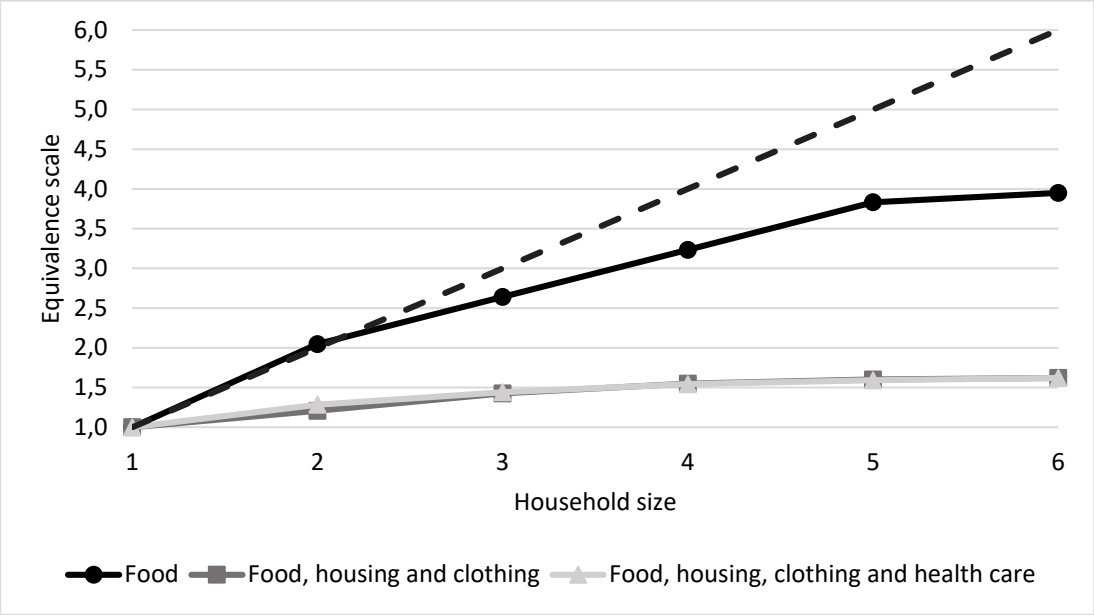
Notes: Data come from the LIS Data Center. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 6. Equivalence scales by household size for three consumption bundles – South Africa



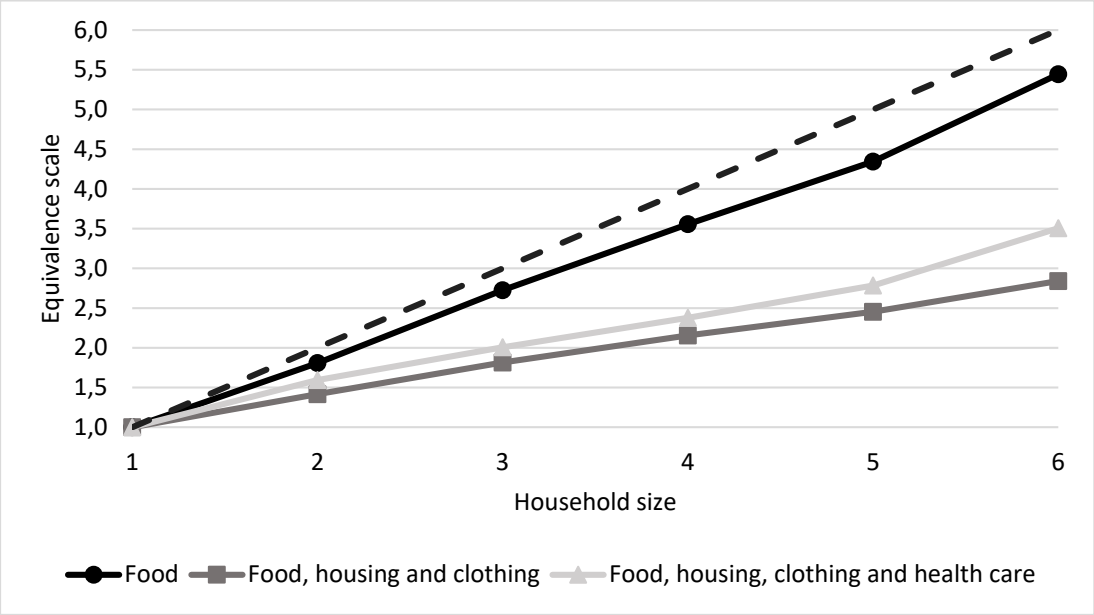
Notes: Data come from the LIS Data Center. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 7. Equivalence scales by household size for three consumption bundles – Switzerland



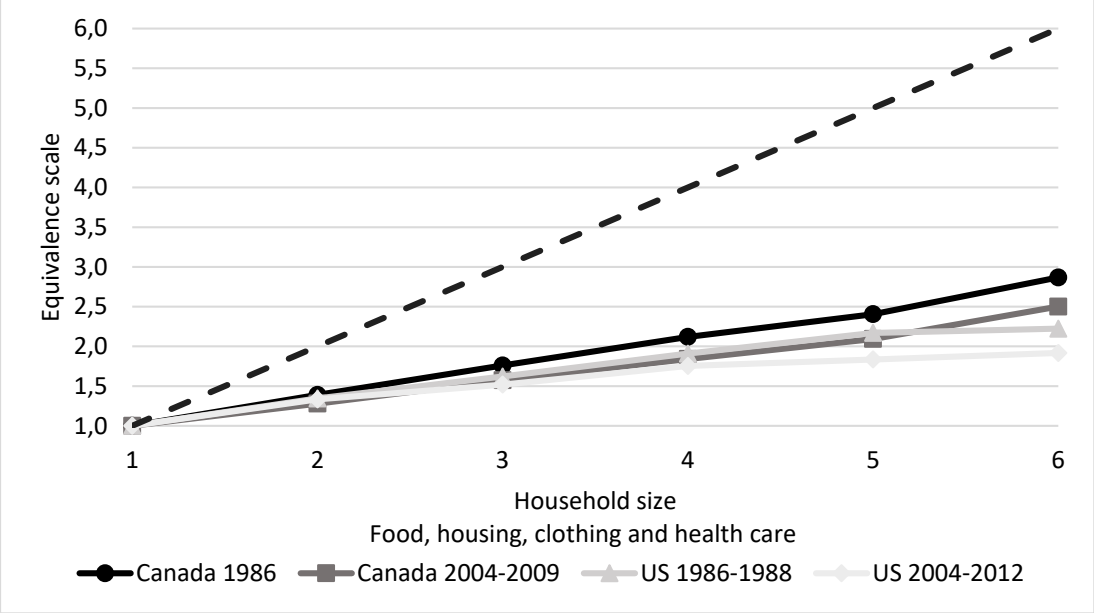
Notes: Data come from the LIS Data Center. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 8. Equivalence scales by household size for three consumption bundles – Taiwan



Notes: Data come from the LIS Data Center. Appendix Table 2 contains the OLS coefficients upon which these equivalence scales are based. The 45-degree dotted line indicates no economies of scale.

Figure 9. Equivalence scales by household size for food, housing, clothing and health care – Canada and the US across time



Notes: Data come from Phipps and Garner (1994), the Survey of Household Spending and Consumer Expenditure Survey. Appendix Table 2 contains the OLS coefficients upon which the more recent equivalence scales are based. The 45-degree dotted line indicates no economies of scale.