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Per Capita Income Versus Household-Need Adjusted Income: A Cross-Country Comparison

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Per capita income versus household-need adjusted income: a cross-country comparison

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Abstract. We use data from the Luxembourg Income Study in order to quantify the economy-wide monetary gains achieved by household-size economies due to within-household sharing of goods by individuals living in multimember households. In most countries out of the twenty countries we examine, we observe a decline in monetary gains achieved by household-size economies over time. This decline is the result of a demographic trend towards smaller-sized household units, rather than a change in the shares of aggregate disposable income earned by household types of different size.

Key words: equivalence scale, welfare, demographic change, Luxembourg Income Study, household size economies, income distribution, family economics
JEL Codes: D1, D13, D31, I31, J11

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[♠] Corresponding Author. Address of Correspondence: Department of Economics, University of Kiel, Wilhelm-Selig-Platz 1, 24118 Kiel, Germany. Email: carsten.schroeder@economics.uni-kiel.de. *Acknowledgments*. We thank participants in the Kiel conference "Income Distribution and the Family" for their comments and suggestions, and seminar participants in Munich, Exeter, Nottingham, Frankfurt, Verona, Reading, York, and the European Central Bank, for useful remarks and discussions. We are indebted to the Nottingham School of Economics for financial support and to the Center for Financial Studies (CFS) for their hospitality and financial support.

1 Introduction

To assess a country's economy performance and the material living standard of its citizens, several monetary measures have been suggested. Perhaps the most frequently used is gross domestic product (GDP) per capita. GDP is the market value of all final goods and services produced within a nation's borders during a year, and can be taken directly from national accounts, without a closer look at micro-level data.[1] GDP, however, measures what a nation produces, rather than the living standard and consumption possibilities of individuals. Net or disposable income per capita is an income measure based on national accounts which is closer to the possibility of individuals to consume.[2] Boarini et al. (2006) show that estimates derived from these different income concepts can vary widely.

Still, estimates of per-capita disposable income based on national accounts alone cannot capture household-size economies achieved in multi-member households due to the fact that housing and other categories of within-household public goods can be shared among household members. In general, household-size economies may arise from intra-household public goods, a reduction of excess capacity concerning indivisible goods, increasing returns of household-production activities, or quantity discounts (see Nelson, 1988). With household-level data on income and other socio-economic characteristics available, it is feasible to consider household-size economies in the analysis through the use of equivalence scales. Equivalence scales can be seen as a type of deflators through which incomes of different household types can be converted to a needs-adjusted basis which is comparable across individuals who live in different household types. Usually, a single adult who lives alone (one-member household) serves as the reference, and her equivalence scale is set to one. Then an equivalence scale of 1.5 for a couple indicates that the couple needs 1.5 times the income of a one-member household to reach the same living standard. Dividing the couple's household income by its equivalence scale gives the couple's welfare equivalent income in terms of income of a one-member household: if each individual from this two-adult household is taken apart in order to form a one-member household, this welfare equivalent

[1] For cross-country comparisons, GDP estimates are purchasing power parity (PPP) adjusted. Country rankings based on PPP adjusted per capita GDP are provided, for example, by the International Monetary Fund, the World Bank, and also by the Central Intelligence Agency. For more information see the "World Economic Outlook Database" of the International Monetary Fund, the "World Development Indicators" database of the World Bank, and the "World Factbook" of the Central Intelligence Agency for such country rankings.

[2] For an in-depth discussion of the suitability of the GDP per capita concept and alternative measures, see the recent instructive overviews provided in Afsa et al. (2008), Boarini et al. (2006), and references cited therein.

income reveals the income that must be given to each of the two newly formed households in order that the two individuals have the same living standard as before they were separated.

The central goal of this article is to use such micro-level data and equivalence scale measures in order to assess the importance of family-size economies for measuring average living standards at the country level. Using household-level data provided by the Luxembourg Income Study, we estimate two central statistics for a selected set of 20 OECD countries: mean equivalent disposable income versus mean per capita disposable income. Dividing the former by the latter tells us about the importance of family-size economies at the country level.

We demonstrate that demographic trends do affect the prospects of material comfort. In particular, our study shows that, over time, the fraction of large-sized families has dropped with the share of one-member households increasing, while shares of total disposable income of differently-sized household types relative to population shares has remained rather constant. These household-size dynamics have led to a drop in the economy-wide benefits from within-household sharing. Aggregate income statistics derived from national accounts neglect such changes.

To our knowledge, the possible loss in economy-wide household-size economies implied by the demographic trend towards smaller-sized household units does not appear to have been discussed in the literature, although its implication is obvious. If economy-wide household-size economies drop over time, some positive rise in aggregate disposable income is required to compensate for the loss.

In Section 2 we introduce the database and methodological concepts underlying our empirical examination. In Section 3 we present our empirical results, while in Section 4 we make concluding remarks.

2 Database and statistical measures

Our empirical examination is based on data from the Luxembourg Income Study (LIS). For numerous countries and several years, the LIS provides representative micro-level data on households' incomes and demographic characteristics (i.e., number, age and gender of each family member), with the first data wave ("Wave I") being compiled around year 1980. For a selected set of countries, data from earlier years are also provided ('historical data'). While we use data from all available data waves, in order to keep our empirical analysis tractable,

we restrict our attention to the data sets from 20 countries. Further details on our database (countries and years) are provided in Table 1.

Table 1. List of LIS data sets used in this study

Country	Code	Historical	Wave I	Wave II	Wave III	Wave IV	Wave V	Wave VI
Australia	AU	---	1981	1985	1989	1995	2001	2003
Austria	AT	---	---	1987	---	1994/95/97	2000	---
Belgium	BE	---	---	1985	1988/92	1995/97	2000	---
Canada	CA	1971/75	1981	1987	1991	1994/97	1998/2000	2004
Denmark	DK	---	---	1987	1992	1995	2000	2004
Finland	FI	---	---	1987	1991	1995	2000	2004
France	FR	---	1979	1984B	1989	1994	2000	---
Germany	DE	1973/78	1981	1983/84	1989	1994	2000	---
Ireland	IE	---	---	1987	---	1994/95/96	2000	---
Israel	IL	---	1979	1986	1992	1997	2001	2005
Italy	IT	---	---	1986/87	1989/91	1993/95	1998/2000	---
Luxembourg	LU	---	---	1985	1991	1994/97	2000	2004
Mexico	MX	---	---	1984	1989/92	1994/96	1998/2000/02	---
Norway	NO	---	1979	1986	1991	1995	2000	2004
Poland	PL	---	---	1986	1992	1995	1999	2004
Spain	ES	---	1980	---	1990	1995	2000	---
Sweden	SE	1967/75	1981	1987	1992	1995	2000	2005
Taiwan	TW	---	1981	1986	1991	1995/97	2000	2005
United Kingdom	UK	1969/74	1979	1986	1991	1994/95	1999	2004
United States	US	1974	1979	1986	1991	1994/97	2000	2004

Note. All databases have been accessed June 17, 2009.

The two key LIS variables underlying our empirical examination are the number of household members ("d4"), and disposable household income "dpi." Only households with positive incomes are considered, and we use person weights – the number of household members times the LIS frequency weight ("hweight") - when generating population-wide indicators. To make disposable household income comparable across household types, all incomes are adjusted by means of an equivalence scale. We apply a parametric equivalence scale (ES) suggested in Buhmann et al. (1988), $ES(n_h, \theta) = (n_h)^{\theta}$, where n_h denotes the number of persons living in household h, and θ gives the level of household-size economies of scale, with $0 \leq \theta \leq 1$.

In the empirical part of our paper, we distinguish two different levels of parameter θ. In the first scenario we employ the square-root equivalence scale, which is employed in numerous empirical studies and recommended by the OECD, i.e. $\theta = 0.5$. This implies that, for instance, a four member household requires twice as much income as a one-member

household to attain the same living standard. In the second scenario we assume that $\theta = 1.0$. Hence, we compute disposable household incomes per capita, assuming that no household-size economies can be achieved.

For every country and each year examined we use this household level-data to compute two welfare indicators, total population-wide equivalent income,

$$(1a) \qquad Y(\theta = 0.5) = \sum_{h=1}^{H} \left(y_h / (n_h)^{0.5} \right) \cdot n_h \cdot w_h \,,$$

and total population-wide per capita income,

$$(1b) \qquad Y(\theta = 1.0) = \sum_{h=1}^{H} \left(y_h / n_h \right) \cdot n_h \cdot w_h$$

where y_h is the disposable household income of household h, w_h denotes h's LIS household weight, and H denotes the total number of LIS household units.[3] The ratio

$$(2) \qquad \frac{Y(\theta = 0.5)}{Y(\theta = 1.0)} = \frac{\sum_{h=1}^{H} y_h \cdot (n_h)^{1-\theta} \cdot w_h}{\sum_{h=1}^{H} y_h \cdot w_h},$$

reveals the extent to which population-wide equivalent income, $Y(\theta = 0.5)$, differs from population-wide per capita income, $Y(\theta = 1.0)$. Hence, equation (2) is a relative measure capturing the economy-wide gain by household-size economies achieved relative to a case where each and every person is living in a one member household and having an income equal to $1/n_h$ -th of the disposable household income, y_h. Throughout, we refer to equation (2) as the *HSE Index*, the indicator of household size economies (HSE). Ceteris paribus, the *HSE Index* increases according to the extent to which a population benefits from household-size economies. Household-size economies are higher the larger the fraction of people living in multi-member households and also the larger multi-member households are. The *HSE Index* also increases, ceteris paribus, if the income share owned by multi-member households increases.

In sum, inter-temporal changes in the *HSE Index* can result from two interacting forces: changes in household demographics and changes in the income shares owned by different household types. To portrait demographic change in a country, we calculate, by country and year, the number of persons living a specific household type relative to the whole

population. Household types are classified according to the number of family members, m. Altogether, five household types are distinguished: one, two, three, and four member households as well as households with five and more members. So, the fraction of people living in m-member households is,

$$(3) \qquad f^m = \frac{\sum_i n_{m,i} \cdot w_{m,i}}{\sum_i \sum_m n_{m,i} \cdot w_{m,i}},$$

with $m \in \{1,2,3,4,5\}$ where $m = 5$ identifies household types with five or more members. Again, $w_{m,i}$ is the LIS weight for a household with m members which belongs to the i-th income category in the LIS database (see footnote 3 above). The income share owned by a household type, m, is given by:

$$(4) \qquad s^m = \frac{\sum_i y_{m,i} \cdot w_{m,i}}{\sum_i \sum_m y_{m,i} \cdot w_{m,i}}.$$

3 Empirical results

3.1 Economy-wide household-size economies over time and across countries

Figure 1 summarizes our estimates of the *HSE Index*. For each of our 20 countries estimates are summarized in a small panel, where year-specific point estimates are connected by a line. For example, consider the value 1.927 in year 1969 in the United Kingdom and contrast it with the value 1.594 in year 2004. This comparison indicates that aggregate weighted equivalent income exceeds aggregate weighted income per capita by 92.7 percent in year 1969 versus 59.4 percent in year 2004.

Two interesting insights are corroborated through the graphs in Figure 1. First, *HSE Indices* differ substantially across countries, ranging between 1.445 for Sweden in 1995 and a 2.273 for Mexico in 1984. Apparently, the *HSE Index* is negatively related to a country's material prosperity (we can rely upon PPP-adjusted per-capita GDP for a first proxy of comparing material prosperity across countries). In rich societies such as the Scandinavian, the central European countries, the UK and the US, *HSE Indices* are distinctly smaller

[3] LIS household weights correct for sample bias, and non-sampling errors, and are provided so as to inflate the result to reflect the total population. See the information provided at http://www.lisproject.org/techdoc.htm for details.

compared to countries with lower material prosperity (Mexico, Poland, or Taiwan). At the same time, socio-cultural differences which again affect household formation may contribute to the differences. For example, the *HSE Index* for Israel is remarkably high given the country's material prosperity. Second, for the predominant number of countries *HSE Indices* are decreasing over time. Comparing a country's *HSE Indices* in the first and the last observation period, most prominent are the downward-sloping trends over time for the following countries: Belgium (1.754 vs. 1.605), Germany (1.689 vs. 1.519), Mexico (2.273 vs. 2.031), Spain (1.979 vs. 1.780), Taiwan (2.218 vs. 1.926) and the United Kingdom (1.927 vs. 1.594). In the following section we further scrutinize the trend's driving sources.

Figure 1 about here

3.2 The drop in average household size over time

Figure 2 summarizes population shares, f^m, by household types defined above. Again there is one panel per country. Within each graph, a line connects point estimates of population shares living in a specific household type. For example, consider the case of Germany (Spain). The fraction of population living in households with five or more members declines from 9.944 percent in 1973 to 4.261 percent in 2000 (29.090 percent in 1980 to 12.430 percent in 2000 in Spain). Congruent with our previous findings, we find that the share of the population living in small household units is negatively related with a country's economic prosperity. Indeed, there is a clear tendency that the fraction of the population living in one or two member household types is increasing over time at the expense of the population share of larger household types.

Figure 2 about here

The decrease in average household size with economic prosperity may hint peoples' preferences to live in smaller household units, compared to earlier periods. In many countries it is only until recently that people can afford living in small household units and can forgo benefits from household-size economies. Indeed, the dominant hypothesis in the literature explains the decline in average household size to the improvement of peoples' economic

situations (see Michael et al. (1980), Hughes and Gove (1981), and related literature since then).

The long-term fall in household size in the developed world is well documented. For example, in the U.S. average household size has declined from 5.8 persons per household in year 1790 to 2.62 in 2000 (see US Census Bureau (2005)).[4] Whether the slowdown in recent years reflects convergence towards a new equilibrium, is still open to debate (see Bianchi and Casper (2000)). Household size reductions have been documented in many societies including the European countries (see Kuijsten (1995), for an overview). Explanations for this trend comprise changes in (a) the demographic variables fertility and adoption, nuptiality and divorce, mortality and childbearing age (Burch (1970), and Bongaarts (1983)); economic variables like income and housing prices (Börsch-Supan (1986), Di Salvo and Ermisch (1997), Haurin et al. (1993)) and macro-economic conditions (Becker et al. (2005a, 2005b), Card and Lemieux (1997)), and (c) in social norms, preferences and attitudes (Fernández et al. (2006), Guiliano, (2007)).

3.3 The change of income shares owned by household types over time

The trend towards smaller household units goes hand in hand with the changing of income shares, s^m, owned by the different household types. Estimates of s^m are provided in Figure 3.

Figure 3 about here

The structure of Figure 3 is equivalent to Figure 2. Relative to the population shares, f^m, it turns out that the income share tends to be particularly low for the one-member household type. This finding holds for all countries and years considered. On the other hand, income shares, s^m, relative to population shares, f^m, tend to rise with m. This can best be seen in Figure 4 which provides the ratios of s^m and f^m.

Figure 4 about here

[4] For further details, see also Jiang and O'Neill (2007), Ermisch and Overton (1985), or Kobrin (1976). Extensive statistics for the developing world are provided in Bongaarts (2001), and Diallo and Wodon (2007).

If $s^m / f^m > 1$ ($s^m / f^m < 1$), the share of total disposable income assembled in the hands of households of type m exceeds (falls below) the same households' population share. For almost all countries and periods it is the case that the s^m / f^m-ratio is the higher the higher is m. Moreover, ratios change only little over time. Hence, it is the demographic change towards smaller family units over time (the changes in the population shares, f^m) rather than changes in the income endowments of family types, captured by s^m / f^m-ratio, driving the inter-temporal decline of the *HSE Index*.

Both our findings, the positive relationship between household size and average position in the equivalent disposable income distribution as well as the stability of the household rankings, is supported by a recent work published by the OECD (2008).

4 Concluding remarks

The descriptive statistics provided in this article, in particular the drop in average household size over time and also the constancy of household-type specific income shares relative to population shares over time, are underlying the inter-temporal decline in monetary gains countries achieve by household-size economies. The micro-level phenomenon that economically better-off people are willing/can cope better with a loss of household-size economies, and tend to live in smaller household units compared to previous decades, carries over to the macro level. As a reduction in average household size increases the material needs of the average citizen, a substantial part of the per capita income growth over the decades is required to offset the reduction in economy-wide household-size economies.

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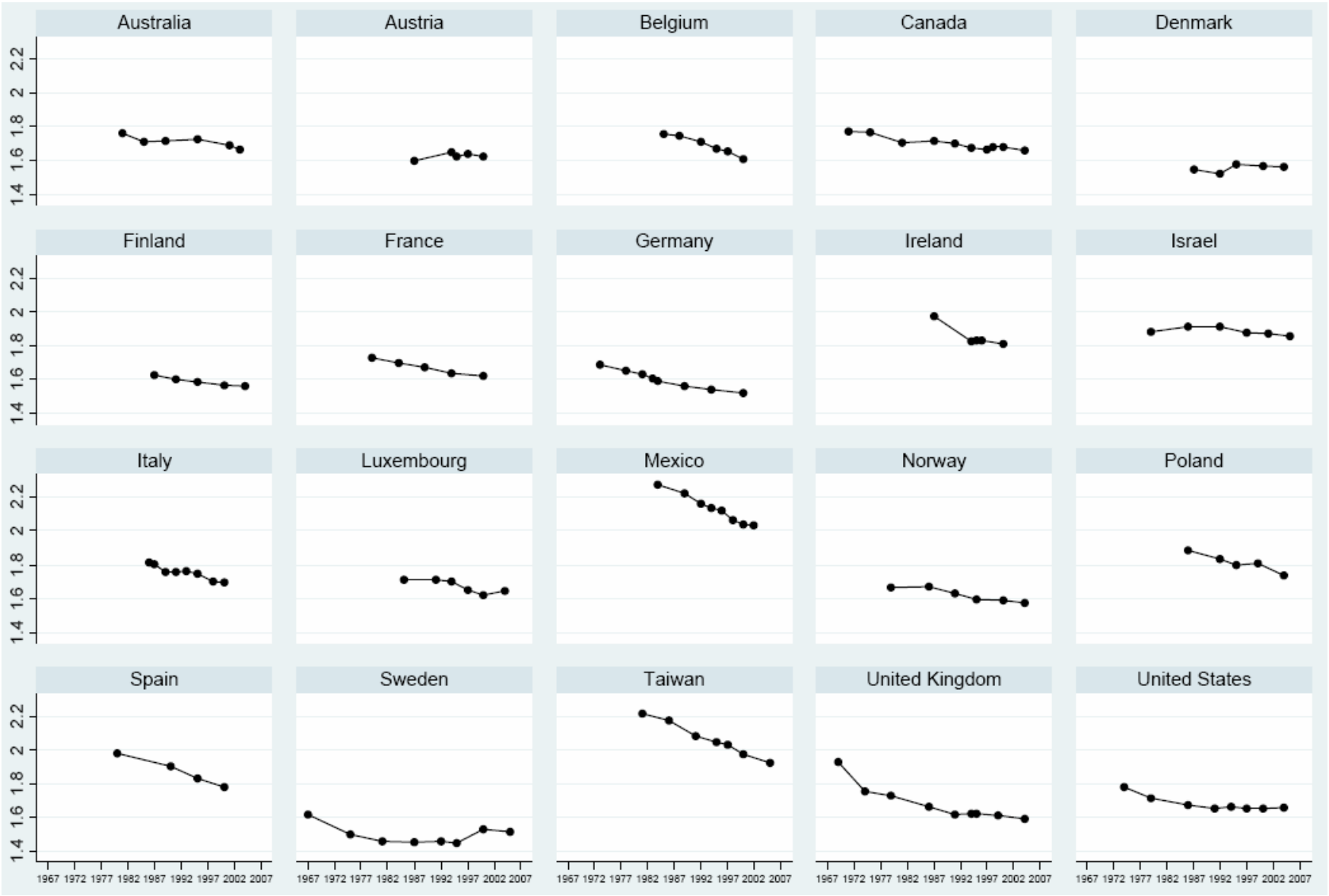
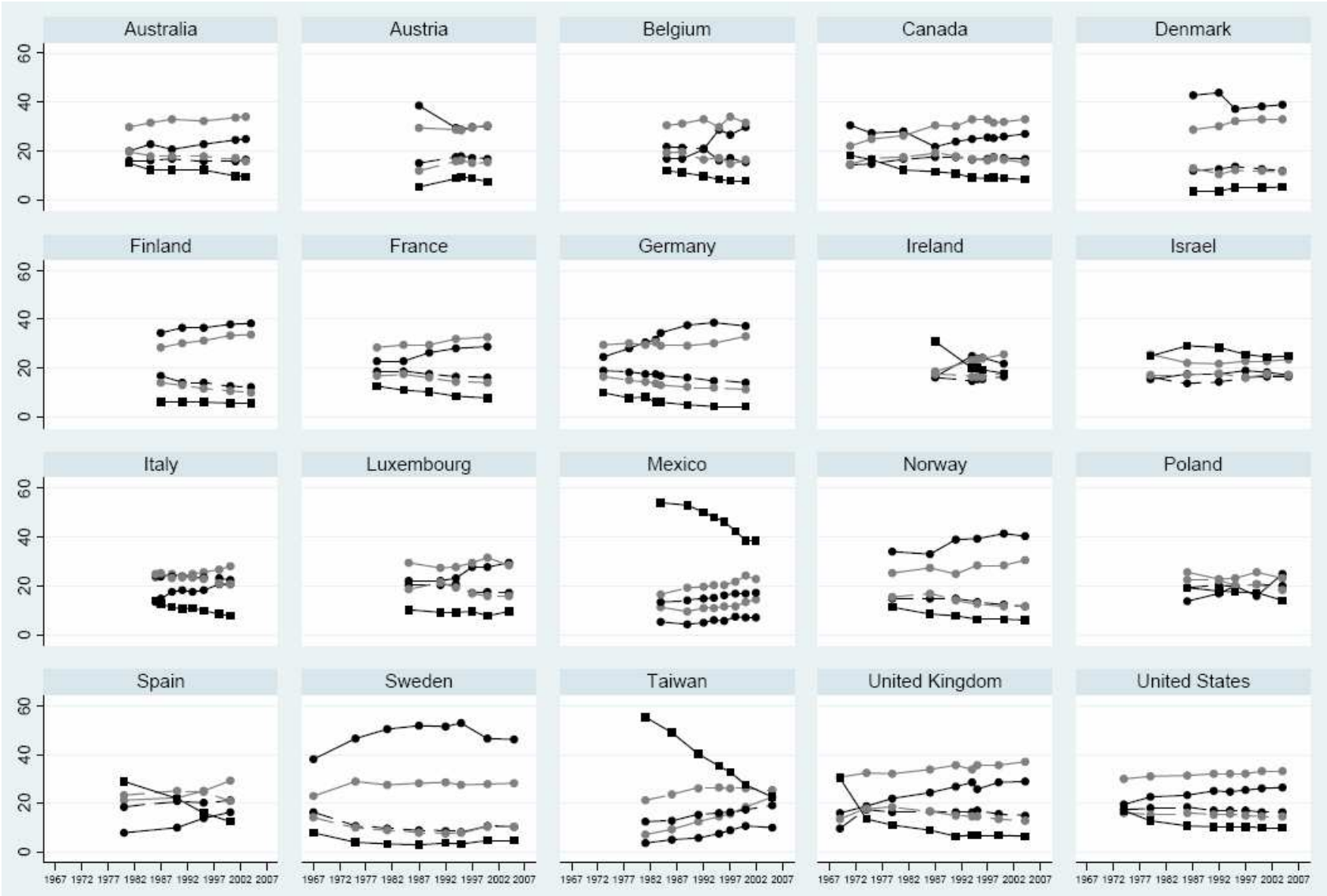
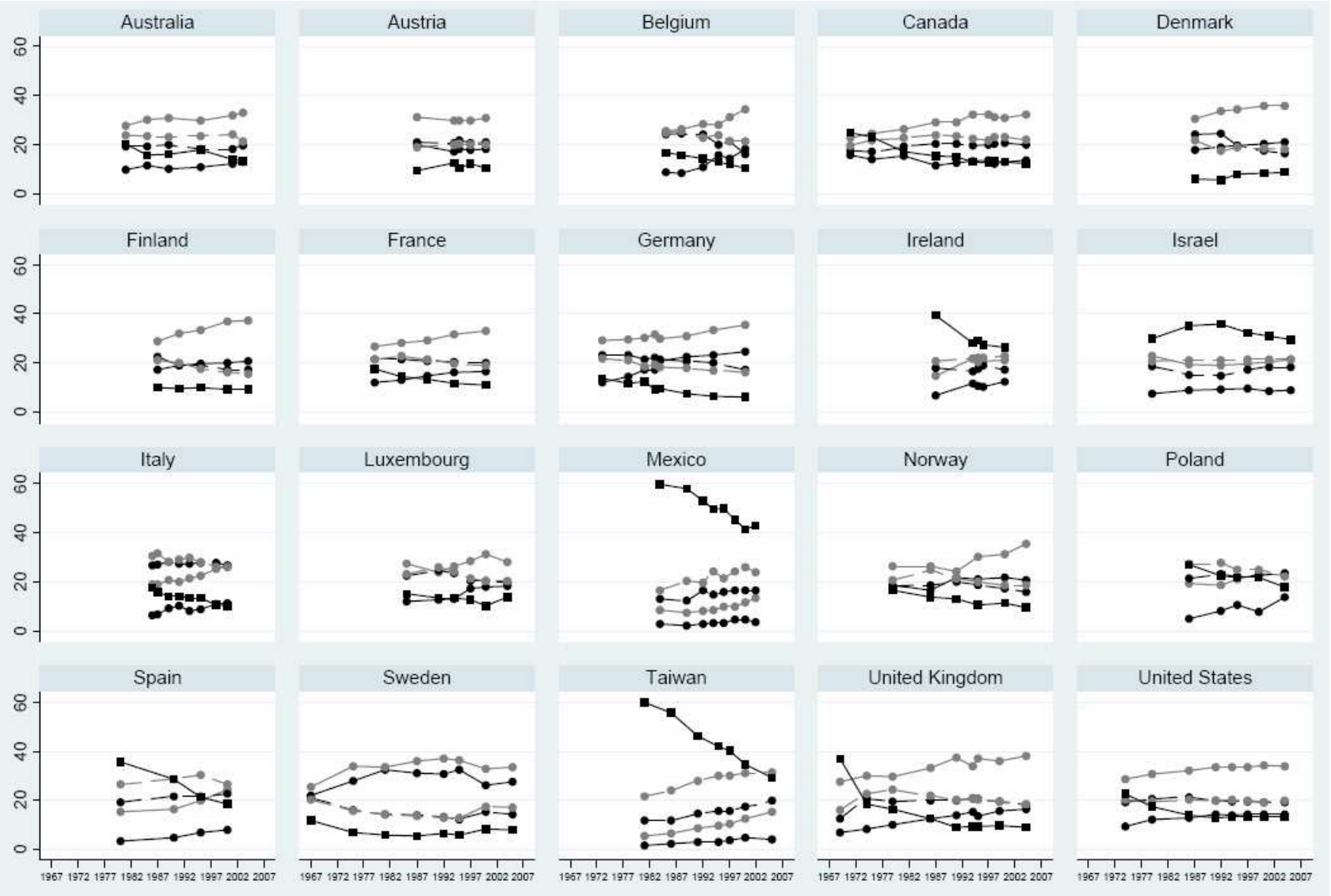


Figure 1. One-member-household equivalent average income divided by per-capita income.



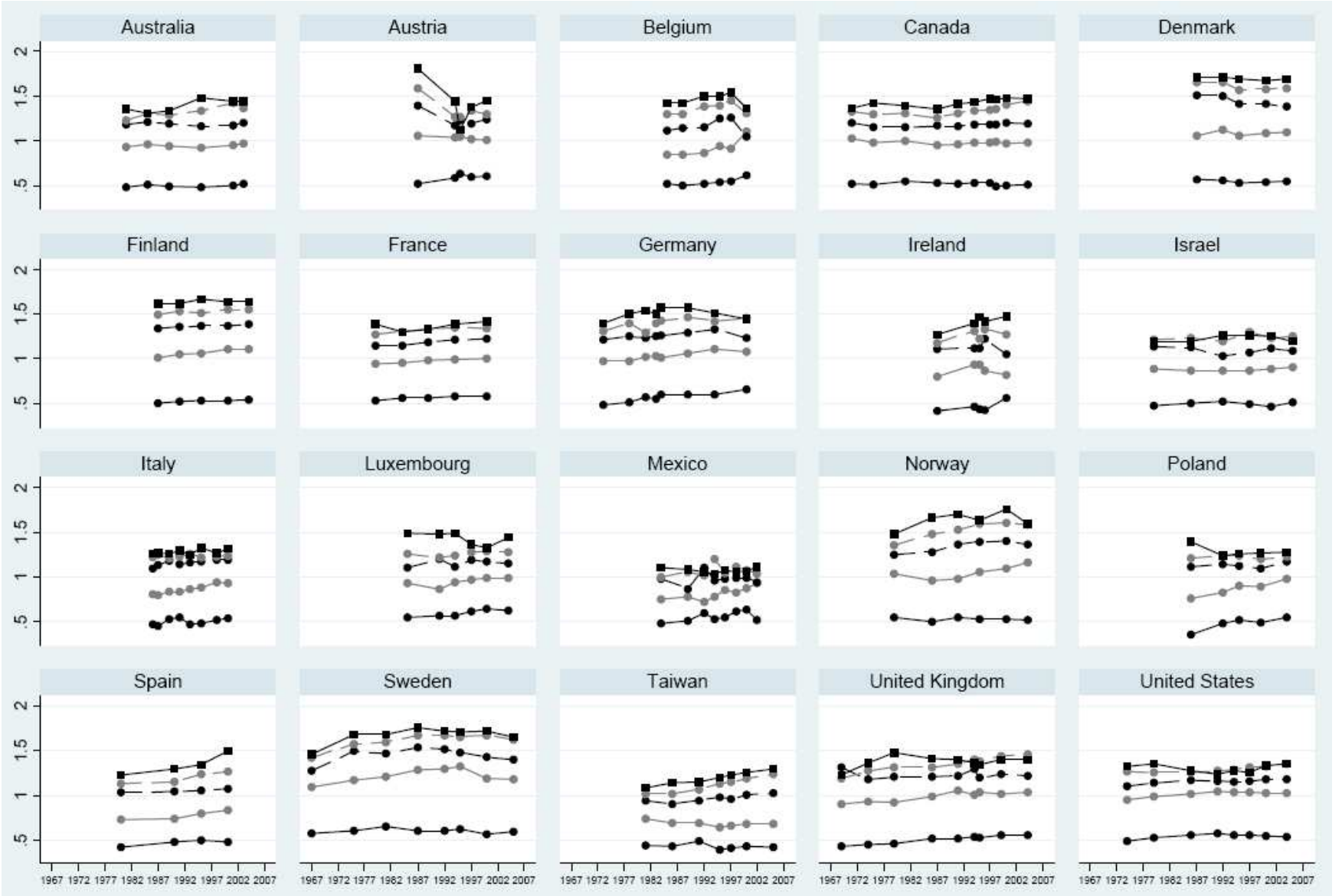
Note. 1 member (black solid line with circle); 2 members (grey solid line with circle); 3 members (black dashed line with circle); 4 members (grey dashed line with circle); 5 members or above (squares).

Figure 2. Composition of family sizes.



Note. 1 member (black solid line with circle); 2 members (grey solid line with circle); 3 members (black dashed line with circle); 4 members (grey dashed line with circle); 5 members or above (squares).

Figure 3. Income percentages according to family size.



Note. 1 member (black solid line with circle); 2 members (grey solid line with circle); 3 members (black dashed line with circle); 4 members (grey dashed line with circle); 5 members or above (squares).

Figure 4. Income share relative to population share by family size.