International Variation in Ageing and Economic Dependency: A Cohort Perspective

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Abstract

We present evidence on variation in demographic and economic dependency ratios for 45 countries. We argue that age- and gender-specific employment levels and the factors that cause variation in employment determine economic and financial challenges associated with population ageing to a greater extent than changes in the demographic composition per se. We also discuss cohort variation in employment and its possible effect on the challenges of population ageing, focusing on the implications of high youth unemployment, low female employment and the evolution of retirement patterns across cohorts. Taking a cohort perspective allows us to identify past employment patterns that lead us to conclude that several though chronologically younger populations might not be as well off as the analysis of their demographic structure alone would suggest.

Motivation

A young age composition and a larger population size is, for some commentators, destiny. Countries such as India or Turkey, although poorer today, are argued to have the advantage of a greater long term growth potential relative to China or Europe due to their younger age structures and growing population size - and the falling need to deal with an older, more dependent, age structure. Anjalika Bardalai from the *Economist Intelligence Unit (EIU)* argues that India will overtake China's economic growth by 2018. The reason given for this predicted change-of-fortune is supposedly India's youthful age structure and population momentum that leads to more rapid growth in the working age population (Times of India, 17. March 2010). Jim O'Neill, Goldman Sachs's chief global economist, states that *Turkey's demographics* "can sustain very high levels of growth" while, Ahmet Akarli also from Goldman Sachs argues that Turkey's economy can overtake Germany by 2050 (Bloomberg 7. April 2010). O'Neill suggested that the "Next 11" emerging countries are many of the most populous countries in the world: Bangladesh, Egypt, Indonesia, Iran, South Korea, Mexico, Nigeria, Pakistan, the Philippines, Turkey and Vietnam. "Some of these emerging countries have good demographics, based on a growing and younger population than countries in the west," John Hawksworth, chief economist at PricewaterhouseCoopers (PwC) (Guardian, 18. December 2012). Countries that have younger populations are often assumed *a priori* to see greater economic growth and higher capita income (except when child-dependency ratios are high) relative to countries with older populations (Lee and Hong 2012).

The possibly negative effects of rapid population growth, low female economic participation and weak labour market attachment of younger age groups are usually not taken into account in these projections. Many demographically younger countries continue to have low education levels, and younger cohorts could end up as "lost generations", with weak labour force attachment and few prospects of catching up. In addition, chronologically younger countries are often effectively older once health or functional level are controlled for, which is usually not taken into account (Sanderson and Scherbov 2005; Skirbekk, Loichinger, and Weber 2012).

Conventional ways of assessing the economic burden of ageing by looking at demography only, such as by the use of the OADR (Old age dependency ratio, the ratio between the 65+ population to the 15-64 population) are misleading as this ignores country and period-specific variation in individual characteristics and economic activity which can be more important than age-structures per se. For instance, a growth in female employment could in some countries more than offset the effect a growing number of seniors - facts that go unnoticed if only adult age structure is used to characterize the ability to cope with demographic change (OECD 2006; Boeri, Del Boca, and Pissarides 2005).

Several approaches have been applied to investigate differences in the burden of ageing between countries, which try to account for the fact that dependency is more than a question of chronological age. Differences in for instance investments in education, have led to a large variation across world regions in the physical and mental condition one experiences at older ages, and according to one definition when one becomes "old" can differ by more than 20 years depending on the nation (Skirbekk, Loichinger, and Weber 2012). Countries that are chronologically younger, such as India, can be effectively older than for instance the Nordic countries.

Carone (2005) presents economic dependency ratios for EU countries. Contrary to the demographic dependency ratio, total economic dependency is projected to *decline* in the majority of EU25 countries until 2025 and to increase only afterwards. However, in existing studies, only little focus is put on comparisons with non-European countries or the explanation of current variation in age- and cohort-specific activity rates.

Cohort-variation in economic activity can help explain a large international variation in economic dependency, where for instance some countries experienced an earlier transition from low to high female employment (following cohort replacement) decades before others will do the same. Hence, knowing and understanding cohort trends in employment is crucial to get an idea of what to possibly expect in the future, since economic participation rates early in life can determine economic participation over the entire life cycle (Gregg and Tominey 2005; Black, Tseng, and Wilkins 2010; Percheski 2008). If individuals entered the workforce at younger ages, they are more likely to be employed at older ages, while individuals who get accustomed to not work in early adult ages are less likely to seek employment later in adult life.

The contribution of the present study is as follows: First, we present evidence on the similarities and differences in the outcome when comparing countries based on either demographic or economic dependency. Second, we explain the observed international variation in economic activity, stressing the cohort dimension in addition to presenting evidence on age- and sex-specific economic activity levels.

Demographic and economic dependency ratios

The notion behind the construction of any dependency ratio is the idea that a given population consists of two groups: those who are producers and consumers of output, and those who are only consumers. The larger the share of the second group, the more output those in the first group must produce, given a certain consumption level. An often used proxy for this classification is the age-specific allocation of people into those two groups: those of working-age are the producers, whereas those above (and below) working-age are consumers. Hence, the old-age dependency ratio (OADR) is generally defined as the ratio of the number of people above working-age to the number of people of working-age, i.e. the ratio of the number of persons 65+ to the number of persons between ages 15 and 64.[1] This does not take into account variation in retirement ages, although UN (2011) additionally uses age 70 as the "cut off age" for when one is counted as "dependent". However, this still does not take into account that many are economically inactive in their adult years, while others work beyond typical pension ages.

$$\text{OADR} - \text{ Old age demographic dependency} = \frac{\text{number of persons } 65+}{\text{number of persons between 15 and 64}}$$

A more relevant measure of dependency is the notion of economic dependency. This measure takes account for the fact that not everybody of working age is actually working, just as not everyone beyond 65 is retired. The economic dependency ratio (EDR), which relates the number of non-workers to the number of workers in a given economy, provides a better representation of the share of the dependent population.[2]

$$\text{EDR} - \text{Economic Dependency Ratio} = \frac{\text{number of persons } 15+ \text{ who are not working}}{\text{number of persons } 15+ \text{ who are working}}$$

The total number of persons 15+ who are working is the result of age- specific employment rates. Age-specific employment rates are defined as the ratio between the number of employed persons

[1] Sometimes, the lower end of the working-age population is defined at age 20, rather than 15. The reason is that in many developed countries, people do not enter the labour force until that age, due to education. Since we do include the BRIC countries in our analysis, where many people still enter the labour force well below the age of 20, we take 15 as the lower cut-off age.

[2] "Worker" is everyone who is considered employed according to the ILO definition of employment, i.e. everyone age 15 and above who works for at least one hour per week (see resolution I of the Thirteenth International Conference of Labour Statisticians (Geneva, 1982) for details). Economic dependency has been defined in various ways in the literature, depending on what is considered to be the appropriate definition of activity and inactivity.. What we refer to as economic dependency is based on employment and has previously been called *effective economic dependency* (Mattil 2006).This is the strictest definition of economic dependency; when employment is replaced with labour force participation (i.e. the sum of the employed and unemployed), the resulting ratio is a measure *for potential economic dependency*.

and the total number of persons in the respective age-group. The profile of employment rates across age shows a reversed u-shape: lower rates for young and older persons, high rates for the middle-aged. To technically account for this age-specific variation, a more elaborate representation of the EDR is

$$\mathrm{EDR} = \frac{\sum_{15}^{65+} \mathrm{N_x} * (1 - \sum_{15}^{65+} \mathrm{ER_x})}{\sum_{15}^{65+} \mathrm{N_x} * \mathrm{ER_x}},$$

where N_x is the number of persons by 5-year age-groups and ER_x are the respective employment rates, sometimes also referred to as employment-to-population ratios.

In addition to age, employment rates also differ by sex, with men generally showing higher employment rates than women. The magnitude of these differences does vary greatly between countries though. To account for this variance, the formula above can be rewritten, including sex-specific rates:

$$\mathrm{EDR} = \frac{\sum_{15}^{65+} \mathrm{N_{x,m}} * \left(1 - \sum_{15}^{65+} \mathrm{ER_{x,m}}\right) + \sum_{15}^{65+} \mathrm{N_{x,f}} * (1 - \sum_{15}^{65+} \mathrm{ER_{x,f}})}{\sum_{15}^{65+} \mathrm{N_{x.m}} * \mathrm{ER_{x.m}} + \sum_{15}^{65+} \mathrm{N_{x.f}} * \mathrm{ER_{x.f}}}$$

Displaying economic dependency this way, it becomes clear that a lot of age- and sex-specific variation is responsible for the eventual degree of economic dependency. For example, country A with low economic activity of older persons could have a similar economic dependency ratio as country B with high employment of older workers, simply because employment of women is high in country A. As will be shown in the following sections, for potential future developments of economic dependency it does very well matter what combination of employment patterns is the basis for an observed level of economic dependency.

Data and method

We focus on both developed economies and larger industrializing countries that have shown substantial growth over recent periods: OECD members and/or EU27 countries and BRIC countries. Past and present economic dependency ratios can be calculated with aggregated employment data for persons aged 15+. For the cohort analysis, detailed data by sex and 5-year age-groups is used.

Age-specific population data is taken from the UN (2011).[3] Internationally comparable aggregate employment estimates for the calculation of economic dependency ratios come from the ILO's 'Key Indicators of the Labor Market' database (KILM). Age- and sex-specific employment rates over time are compiled from the OECD database. In contrast to the data for calculating the EDRs - which are

[3] We on purpose restrict our analysis to the years before the financial crisis. Developments during the years 2009-2013 would need to be treated differently, since employment changes during that period are in many countries due to cyclical, not structural, changes.

comparable between countries since definitions of employment are harmonized by the ILO - data for the cohort development of employment are not automatically internationally comparable. The definitions vary between countries, however, differences are minimal and for the most part do not affect the comparability of developments over time *within* a country.

Repeated cross-sectional surveys are commonly used to separate age-patterns from cohort trends and period effects (Alwin and Krosnick 1991; André et al. 2010; Lutz, Skirbekk, and Testa 2006; Skirbekk et al. 2013). This technique, which is applied for the present study, is relatively often used to look at employment trends.

Analysis of demographic and economic dependency – SELECTED RESULTS

Figure 1 compares OADR and EDR in 2008 for the 45 selected countries. The three countries with the highest OARD are Japan (0.33), Italy (0.31) and Germany (0.30). In these countries, about three people of working-age are facing one older person. The four countries with the youngest population, i.e. the lowest OADR, are India (0.08), Turkey (0.09), Mexico (0.10) and Brazil (0.10). In these countries, at least 10 people of working-age are facing one older person. The majority of countries falls between those two groups and have an OADR between 0.1 and 0.3.

Economic dependency is higher than demographic dependency in each of the 45 countries, and the range of economic dependency ratios is greater than the range of demographic dependency ratios (from 0.41 to 1.36 and from 0.08 to 0.33, respectively). 13 of the 45 countries have an EDR greater than 1, which means there is more than 1 person who is not working for every person that is. The two countries with the highest EDR are Turkey (1.36) and Italy (1.3), which is remarkable because Turkey is one of the countries with the lowest and Italy one with the highest old-age dependency ratios. As mentioned before, Japan, Italy and Germany have the highest OADR and based on the comparison of these countries' demographic situation alone, one might conclude that they share a similar ageing problem. However, looking at EDR, Japan - though being the oldest country in terms of old-age dependency - has the lowest economic dependency (0.85) of these three countries.

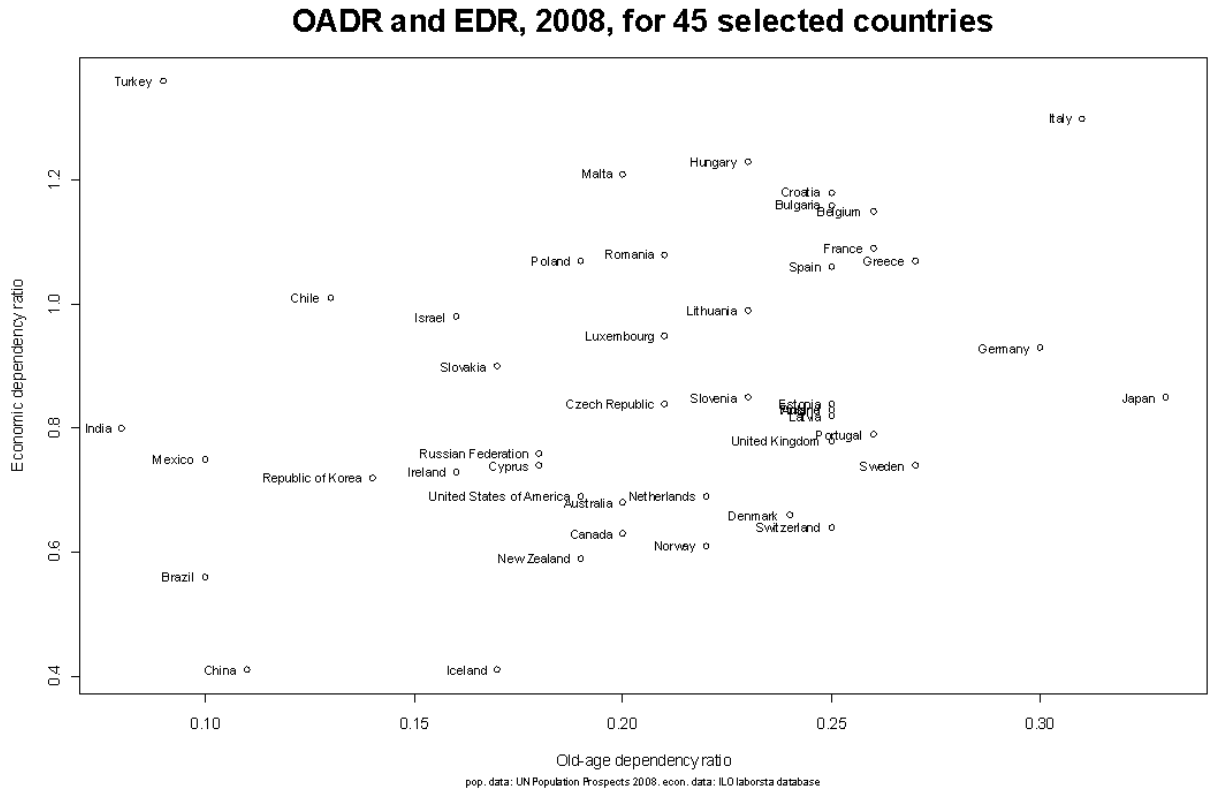


Figure 1: Old-age and economic dependency ratios, OECD/EU27/BRIC countries, 2008 (Population data: UN Population Prospects 2008. Employment data: ILO estimates, KILM database, table 2A).

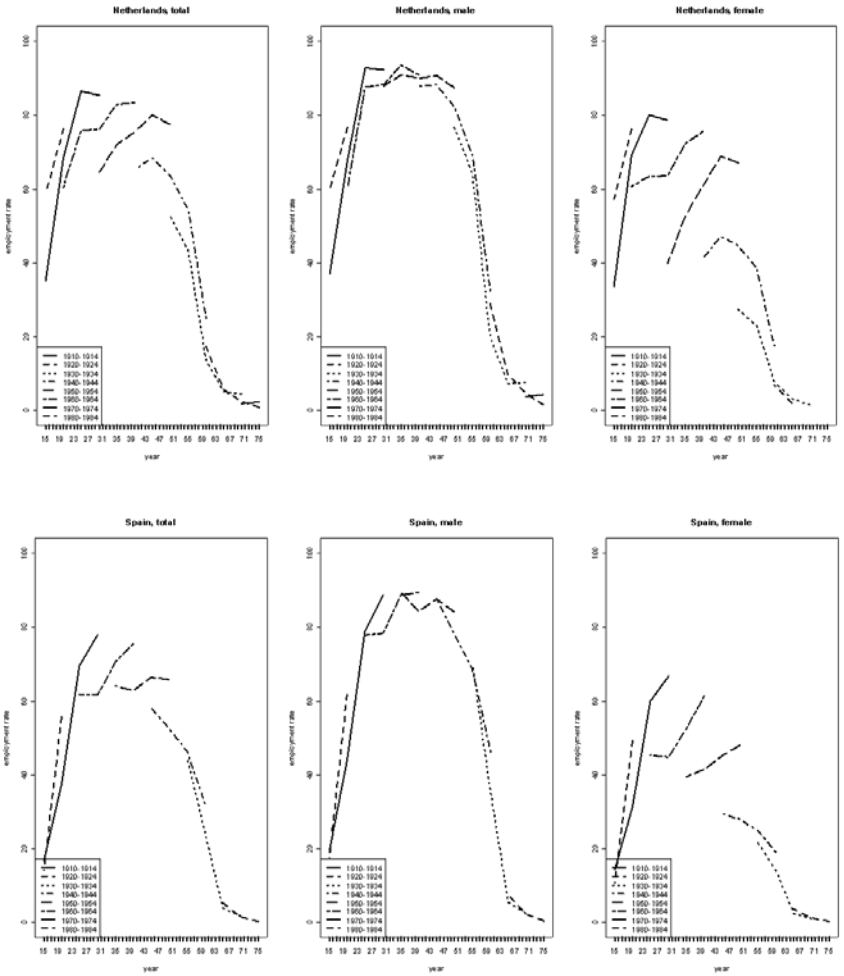
The discrepancy between demographic and economic dependency is by far greatest in Turkey and India: EDR is a multitude of OADR in these two countries (14.66 and 9.62, respectively). This means that OADR is not a very accurate proxy for economic dependency in these countries. The ratio of EDR to OARD is smallest for Iceland (1.33), Japan (1.57) and Switzerland (1.58), which means that in those countries, old-age dependency ratios capture economic dependency relatively well. This congruence comes from a combination of comparatively high employment rates of those between 15 and 64 years and (particularly in Iceland and Japan) high employment rates among the population 65+.

Cohorts as determinants of employment patterns – SELECTED RESULTS

Economic dependency is the result of age-and sex-specific employment rates, in combination with changes in the demographic composition of a population. On the macrolevel, employment variation between countries can be explained through business cycles, reservation wages, institutional factors such as skill levels of the population, property rights, openness to trade, flexibility of financial markets, labour market flexibility, employment protection level, active labour market programs, firm establishment costs, quality, coverage of education systems and labour market regulations (Blanchard and Wolfers 2000; Freeman 2007; Nickell and Layard 1999). At the same

time, age-specific employment rates tend to follow cohort-trends: Cohorts that have had high or low unemployment at younger ages tend to have higher or lower unemployment throughout their lives (Plane et al. 2001; Muench et al. 2009; Carone 2005).

Figure 2 depicts age- and sex-specific employment by cohorts for selected countries. The Netherlands, Spain and Italy experienced drastic increases in female employment during the last decades: women who belong to younger cohorts show significantly higher labour market attachment than women of older cohorts. In Ireland, the increase for males is less pronounced than for females but still noticeable. In contrast, women as well as men in Turkey and China who belong to younger cohorts have had lower employment rates than older cohorts.



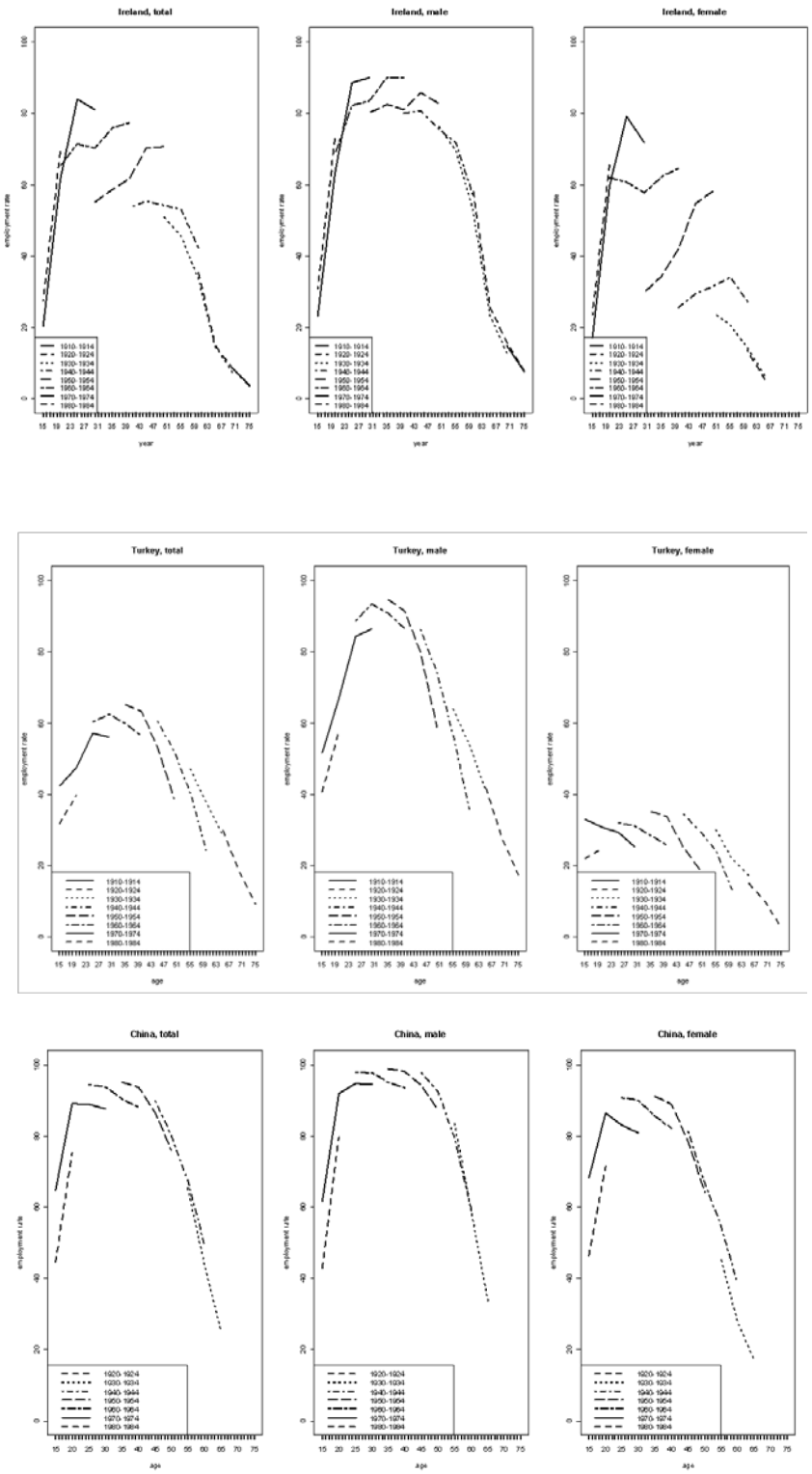


Figure 2: Cohort employment patterns for the Netherlands, Spain, Ireland, Turkey and China (source: employment/population ratios from OECD StatExtracts, http://stats.oecd.org/)

As shown many times before, trends in sex- and age-specific employment differ widely between nations. While countries early in the industrial transition tend to have relatively high employment levels and late retirement ages (OECD 2011; Kohli et al. 1991; Elu Terán 2006), the transition from primary to industrial and service sector jobs are related to lower employment levels and earlier retirement. However, longer education is associated with later retirement, where particularly tertiary education relates to a later age of labour market exit (Muench et al. 2009; Solem, Mykletun, and Mykletun 2001) and continued educational increases in many countries is likely to lead to longer working lives. At the same time, the better educated have a longer study period, which means that they postpone labour market entry. Data on employment and retirement differences across cohorts, highlight the importance of cohorts in determining ages at retirement (Percheski 2008; Joshi and Hinde 1993).

In sum, our analysis suggests that countries that have invested in the skills of subsequent birth cohorts, who have a culture and economic situation that facilitates the inclusion of women in the labour market, longer working lives for seniors and high levels of stable employment among the young are presumably better prepared for population ageing, even if they have a chronologically older population than other countries.

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