PROGRAM ON THE
GLOBAL DEMOGRAPHY
OF AGING AT HARVARD
UNIVERSITY

Working Paper Series

The long-term consequences of the global 1918 influenza pandemic: A systematic analysis of 117 IPUMS international census data sets

Sebastian Vollmer and Juditha Wójcik

December 2017

PGDA Working Paper No. 141

http://www.hsph.harvard.edu/pgda/working/

Research reported in this publication was supported by the National Institute on Aging of the National Institutes of Health under Award Number P30AG024409. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

The long-term consequences of the global 1918 influenza pandemic: A systematic analysis of 117 IPUMS international census data sets

Sebastian Vollmer, University of Goettingen

Juditha Wójcik, University of Mainz

Abstract

Several country-level studies, including a prominent one for the United States, have identified long-term effects of in-utero exposure to the 1918 influenza pandemic (also known as the Spanish Flu) on economic outcomes in adulthood. In-utero conditions are theoretically linked to adult health and socio-economic status through the fetal origins or Barker hypothesis. Historical exposure to the Spanish Flu provides a natural experiment to test this hypothesis. Although the Spanish Flu was a global phenomenon, with around 500 million people infected worldwide, there exists no comprehensive global study on its long-term economic effects. We attempt to close this gap by systematically analyzing 117 Census data sets provided by IPUMS International. We do not find consistent global long-term effects of influenza exposure on education, employment and disability outcomes. A series of robustness checks does not alter this conclusion. Our findings indicate that the existing evidence on long-term economic effects of the Spanish Flu is likely a consequence of publication bias.

Correspondence to: Juditha Wójcik, ewojcik@uni-mainz.de

1 Introduction

In recent years, the recognition of the impact of health conditions on economic outcomes has not only increased but extended into the investigation of how conditions before birth affect an individual's life path (Cutler and Lleras-Muney 2006). The most prominently cited hypothesis to link fetal shocks to outcomes in adulthood is the Fetal Origins Hypothesis stemming from British doctor David Barker (Barker 1998) who postulated that severe health conditions such as heart disease and diabetes in later adulthood could be linked to the in-utero environment to which the fetus was exposed to and more specifically to nutritional deprivation. This medical hypothesis linking health conditions at two stages in life was subsequently discovered by economists and used to evaluate numerous health shocks and their health as well as economic consequences (Almond and Currie, 2011)).

In a seminal paper, Almond (2006) was the first to assess the in-utero impact of the 1918 influenza pandemic on later-life outcomes. In his study of three Census waves from the United States he finds men and women exposed to the pandemic to be significantly less likely to graduate from high school as well as to have lower average income, lower socioeconomic status and being more likely to be disabled. His paper was followed by a number of other studies investigating the effects of the pandemic within a specific country. Specifically, Neelsen and Stratmann (2012) find that male Swiss birth cohorts exposed to the pandemic are worse off in terms of their educational attainment and less likely to be married compared to the common trend. Lin and Liu (2014) find that Taiwanese cohorts exposed to the pandemic display lower average educational attainment, are smaller during puberty and more susceptible to severe health conditions such as kidney disease and diabetes in later adulthood compared to surrounding cohorts. Karlsson et al. (2012) find Swedish cohorts exposed to the pandemic to experience elevated poverty rates. Nelson (2010) assesses the effect of the 1918 influenza pandemic for six metropolitan areas in western Brazil and finds that cohorts prenatally exposed to the pandemic are, on average, less likely to have graduated college, have less years of schooling and are less likely employed or in formal employment and earn lower average wages. Garthwaite (2008) finds evidence that the type of health condition experienced in adulthood depends on the gestational status of exposure to the 1918 pandemic. Finally, Fletcher (2014) finds similar results as Almond (2006) using a different data base.

Influenza is a particularly good case for investigating long-term effects of in-utero environment because exposure is quasi-random. Influenza is common in human populations and a review of the evidence found that exposure within the same age group is not determined by socioeconomic characteristics (Neelsen and Stratmann, 2012).[1] The influenza pandemic of 1918 occurred quite surprisingly across the world causing exogenous variation in fetal health between cohorts exposed to influenza in utero and those born shortly before and shortly after.

More virulent forms of influenza characterized by a high number of infections and deaths occur every once in a while leading to pandemics such as in 1889/90, 1918/19, 1957/8, 1968/9 and 1977/8. The influenza pandemic of 1918 – 1919, often called the 'Spanish' Flu, swept around the globe within a few months killing a multiple of the casualties of World War I and sparing only a few remote regions. As Spain was a neutral power during the war, newspapers were uncensored and, hence, articles of the disease and its spread were common whereas belligerent countries kept taps on their reports to avoid mass panics. This is usually considered the reason why this pandemic is referred to as the Spanish Flu (cf. Killingray and Phillips (2003a) and Almond (2006)). New modes of transportation of the era such as steamships and railways as well as the large movements of troops and civilians due to the War greatly facilitated the spread of the pandemic around the globe. In most countries, the diffusion happened along major transportation routes. Coastal countries were typically infected first through incoming ships carrying ill passengers or crews but even remote areas in sub-Saharan Africa were infected. As influenza was not a reportable disease patients were not detained and, hence, the pandemic spread unhindered (cf. Killingray and Phillips (2003a); Patterson and Pyle (1991)).

Despite the global importance of the 1918 pandemic, with around 500 million people infected worldwide (Taubenberger and Morens 2006), we are not aware of any global study that investigates the long-term effects of the 1918 influenza pandemic. This is clearly relevant because it could be that only those country-level studies were published, which found statistically significant long-term effects, whereas those that did not find statistically significant effects were not published. This paper attempts to close this gap by systematically reviewing 117 Census data sets provided by IPUMS International (Minnesota Population Center 2014) to investigate the long-term effect of the 1918 influenza pandemic for all countries for which suitable data exist. The advantage of IPUMS International over other sources of census data is the provision of harmonized country-specific census data allowing international comparisons across countries and time. Similarly to Almond (2006), the 1919 birth cohort is analyzed against a yearly trend with respect to four dependent variables, namely the completion of primary and secondary education as well as the disability and employment status at the time of enumeration. While we confirm Almond's findings for the United States, we do not find consistent negative

1 This is not true for mortality, here the evidence is inconclusive, but socioeconomic factors and particularly income might play a role (cf. Neelsen and Stratmann 2012). Therefore, selective mortality is a concern that will be discussed at a later stage.

effects of the 1918 influenza pandemic across different census data sets. It is therefore quite likely that the existing evidence, which quite universally links in-utero exposure to the 1918 influenza pandemic to adverse economic, educational or health outcomes in adulthood, is at least to some extent due to publication bias.

This paper is structured as follows: In the next section, we provide a brief historical background of the 1918 influenza pandemic. In section 3 we describe our data and identification strategy. In sections 4 and 5 we show our main findings along with a series of robustness checks. In section 6 we conduct a meta-analysis of country-level findings to explain heterogeneity in coutry-level results before we conclude.

2 Historical Backgound: The Influenza Pandemic of 1918/1919

The 1918/1919 influenza pandemic is usually thought of as having occurred in three waves[2], the first wave being a precursor to the deadly second wave and receiving only minor public attention in 1918 (Patterson and Pyle 1991). It is usually assumed that the virus of the first wave mutated leading to a much more virulent and deadly virus of the second wave (Killingray and Phillips 2003a). The third wave is usually described as a mild aftermath of the second wave or as "episodic and scattered winter outbreaks" (Patterson and Pyle 1991, p. 4) typically observed after epidemics and without any larger impact on mortality trends. A striking characteristic of this pandemic is the unusually high mortality rate among young adults observed almost universally across countries (Johnson and Mueller 2002).

The literature agrees that the most likely point of origin of the mutated virus is Brest in France in August 1918, at the time a major port of entry for American troops joining the war. From there, ships and trains carrying troops and cargo spread the virus around the globe within months. The British ship 'HMS Mantua' arriving in Freetown, Sierra Leone, on August 15, 1918 with 200 sick sailors brought influenza to West Africa. At the end of September 1918, 3 percent of the population of Sierra Leone are estimated to have died from influenza. From Freetown the virus spread south along the coast and into the continent. Two other ships carrying soldiers back from France brought the disease to Cape Town and influenza quickly spread into southern and central Africa (Killingray and Phillips 2003a). Simultaneously, an increased number of deaths from influenza was observed in Boston, USA where the pandemic spread across the

[2] A couple of authors (e.g. Johnson and Mueller (2002), Chowell et al. (2010) and Chowell et al. (2011), Ansart et al. (2009)), also describe outbreaks occurring in 1920 and claim that there were four waves based on calculations of excess mortality for 14 European countries. These outbreaks particularly happened in Scandinavia and some islands in the South Atlantic. Johnson and Mueller (2002) themselves suggest that this fourth wave might in fact be a single epidemic caused by a different strain of the virus.

country within two months from East to West (Killingray and Phillips 2003a). From Brest in France, influenza spread north, south and east infecting all of Europe and even remoter regions such as Iceland within weeks. In mid-October 1918, the pandemic peaked in Europe and even reached as far east as Russia and Hungary in September. Via ships as well as the Trans-Siberian railroad, influenza transmitted into Asia whereas both Latin America and Africa were primarily infected through major ports. By January 1919, the pandemic had circled the globe and reached all but a few remote regions that escaped the pandemic through rigorous maritime quarantines such as northern and eastern Iceland, American Samoa and St. Helena ((Patterson and Pyle 1991; Killingray and Phillips 2003a)).

Table 1 provides an overview of starting and end dates of the pandemic per country or region as found in the literature. It is not exhaustive or complete[3] as data on many countries and regions are not available (Patterson and Pyle 1991) but presents a first trial[4] at collecting global timing information of the pandemic. Especially for Latin America, dates are not found in any of the usually cited sources on the pandemic but instead are based on estimations of excess all-cause mortality (e.g. (Chowell et al. 2010, 2012)). Likely, studies or archived data exist but uncovering these is beyond the means of this paper. Specifically, dates in italics are taken from Ansart et al. (2009) who estimate influenza-driven mortality rates for a number of European countries based on all-cause mortality trends. Furthermore, some dates are taken from maps published in Patterson and Pyle (1991) showing the spatial diffusion of the pandemic. It should be noted that for the majority of countries there is some indication on when the pandemic reached the country but no end date and for those countries with end dates these are often reported in a different source than the one cited for the time of entry. Given a large amount of countries with several and at times contradicting starting points it is possible that starting and end points are based on different underlying definitions on the number and duration of waves within a country as well as different methods to conclude timings and, hence, are not necessarily consistent. However, in those cases where both starting and end point are given it seems that on average neither wave has lasted longer than five months and usually around three months. For completeness, Table 1 lists all dates uncovered by the authors of this study.

---

[3] Given that no information was found for a number of countries 'Never' is stated in Tables 1a, 1b and 1c if a source stated that a wave had not entered a country to make a distinction between countries not experiencing waves and those without information found.

[4] In an email correspondence, David Killingray, Emeritus Professor of Modern History, University of London, and co-editor of 'The Spanish Influenza Pandemic of 1918-1919: New Perspectives', a book on the findings of an interdisciplinary conference on the Spanish Flu held at the University of Cape Town, South Africa, in September 1998, confirmed that to his knowledge no data base on the global timing of influenza existed and that end dates in specific could be subjective as some countries experienced long fading-out phases due to many survivors of influenza dying of closely connected other diseases (Killingray 2015).

While the literature agrees that the Spanish Flu was one of the deadliest pandemics in human history the accurate death toll will likely never be known and estimates differ widely both in their results and methods used. As influenza was not a reportable[5] disease in 1918, no complete records are available and some of the few records are missing (Johnson and Mueller 2002). Most research relies on newspaper articles or reports by local doctors though both are likely myopic and only cover the situation in the immediate surroundings and at least the former type of source if not both may have been colored by war sentiments[6]. Furthermore, diagnosis tools were yet underdeveloped and the medical field was convinced that influenza was a bacterial disease[7] leading to both ineffective measures as well as misdiagnosis in many cases. Matters were further complicated by a simultaneous occurrence of pneumonia or other respiratory diseases, cardiovascular diseases, diabetes or renal disease possibly misleading doctors into false reporting of cases or inconsistencies in recording at times influenza and at others combined influenza and pneumonia deaths (Patterson and Pyle 1991; Johnson and Mueller 2002). Given that censuses or vital registration systems were not common in 1918 in large parts of the world and especially in populous colonial[8] countries and that even those that existed were inaccurate due to perturbations of the war such as constantly moving populations, changing border definitions and high mortality of other causes (war casualties, other infections, malnutrition, failing health care systems) it is to this day debated how many deaths are attributable to influenza (Ansart et al. 2009). Documents and reports on the number of deaths published during or shortly after the pandemic are typically of a rather speculative nature. Even if deaths were recorded properly in certain cases, usually in documented populations such as in soldier camps or prisons, estimations on the civilian population or general mortality rates are likely conjectures (cf. Johnson and Mueller 2002; Patterson and Pyle 1991)[9]. However, given the

5 During the war, quarantine efforts were (successfully) focused on known diseases such as bubonic plague and cholera. Influenza became a notifiable disease in some states after the pandemic and war and some effort was made to prevent future deadly outbreaks but only in 1947 an effective monitoring system based in London with a worldwide set of bases was inaugurated (Killingray and Phillips 2003a).

6 Rumours relating the disease to the war, on the other hand, were omnipresent and even medical staff engaged in spreading their own version of the origin of the pandemic. The war propaganda termed it a weapon of the enemy (Killingray and Phillips 2003a).

7 The medical field had not yet identified the influenza virus (this occurred in 1933) and the common belief was that influenza was caused by “Pfeiffer's bacillus”. The knowledge of viruses at the time was very limited and, hence, a lot of research at the time was ill-directed (Killingray and Phillips 2003a).

8 Mortality and morbidity rates are for most developing countries / former colonies crude estimates based on either or both the death rate of a neighboring country or region and an estimate of the total population (in absence of Census data) (cf. Killingray and Phillips 2003a) thus leading to a large variation in what researchers claim to be the total death toll of the pandemic.

9 Johnson and Mueller (2002), for example, mention that remote areas or ethnic minorities were often ignored in reports drafted during the pandemic. (Chandra 2013) mentions inFluential studies on influenza on which postulated mortality numbers and rates are based on though sources are missing. Lastly, the pandemic was followed by a pandemic of encephalitis lethargica now believed to be a direct consequence of influenza and

enormous rate of diffusion across time and space, authors typically agree that most of the world was indeed exposed to influenza and that the effect was detrimental even if records are less than accurate or inexistent (cf. Johnson and Mueller, 2002).

Killingray and Phillips (2003a), Johnson and Mueller (2002) and Patterson and Pyle (1991) agree that mortality rates have been highest in Africa and Asia[10] with India[11] thought to have experienced the highest influenza-specific mortality rate of up to 6.7 percent. Fiji, Botswana, and Ghana encountered death rates in the vicinity of 5 percent with Tonga at 10 percent and Western Samoa[12] even at 25 percent. Markedly higher mortality rates were found in indigenous populations such as the Maori in New Zealand, the Aborigines in Australia, the Inuit[13] in Canada and Native Americans in the USA. On the other hand, North America, Europe and Australia experienced much lower mortality rates of about 0.5 percent. Europe[14] is estimated to have had between 2 and 2.5 million deaths (Patterson and Pyle 1991) and the USA 550,000 deaths (Crosby 2003; Patterson and Pyle 1991) or even 675,000 deaths (Killingray and Phillips 2003a). In Canada, influenza spread from one coast to the other within a month and one in six Canadians are thought to have contracted the disease with between 30,000 and 50,000 dying as a result (Herring and Sattenspiel 2003).

Regarding continents, Patterson and Pyle (1991) deduce 1.9 – 2.3 million deaths in Africa (14.2 – 17.7 per thousand), 19 - 33 million deaths in Asia (19.7 – 34.2 per thousand), 2.3 million in Europe (4.8 per thousand) and 766,000 – 966,000 deaths (8.4 – 10.6 per thousand) in Latin America leading these authors to estimate global mortality at 30 million or a rate of 16.6 per thousand worldwide. Other figures from previous studies cited by Patterson and Pyle (1991) vary between 15 – 100 million deaths and rates between 8.3 – 55.2 per thousand though the extend or completeness of these previous studies is unclear. Killingray and Phillips (2003a) agree with 30 million deaths but caution that this is only a rough estimate given the lack of data for larger areas and populations. Johnson and Mueller (2002) estimate 50 million deaths but admit that this might be "as much as 100 percent understated" (Johnson and Mueller 2002).

---

killing an approximate half million between 1919 and 1928 (Patterson and Pyle 1991; Oxford 2003; Johnson 2003) complicating the definition of influenza deaths.

10 While for China there is very little evidence Killingray and Phillips (2003a) quote a source that the Chinese mortality rate was about 1 percent.

11 Undoubtedly weakened by the food shortages due to rationing and large exports by the British as well as malaria (Killingray and Phillips 2003a).

12 In contrast, US-controlled Eastern Samoa escaped influenza through a maritime quarantine (Killingray and Phillips 2003a).

13 Among the Canadian Inuit influenza death rates were so high that entire villages seized to exist (Johnson 2003).

14 Killingray and Phillips (2003a) state more than 200,000 deaths in Great Britain, 250,000 in Germany and up to 450,000 deaths in Russia.

3 Data & Identification Strategy

We use 117[15] census data sets from 53 countries collected between 1960 and 1990 provided by IPUMS International (Minnesota Population Center 2014). 1960 is the first year for which IPUMS provides census data and 1990[16] was chosen subjectively as a cutoff point to reduce the extend of a possible bias arising from attrition of individuals exposed to the 1918 influenza pandemic in-utero. In the following, italics indicate variable names used by IPUMS and this study. For each Census year (*year*), the age (*age*), year of birth (*birthyr*), nativity status (*nativty*), educational attainment (*edattan*), employment disability (*disemp*) and employment status (*empstat*) were downloaded if available.

Table 2 gives an overview and some characteristics of the 117 data sets used in this study. 19 countries are represented by one Census wave, 13 by two, 14 by three, five by four and two by 5 data sets, respectively. The percentage of population covered by the respective Census wave varies from 0.091 percent of the population for India 1983, an Employment Survey, to 25 percent for West Germany 1970 and East Germany 1981 with the majority of data sets covering 10 percent of the respective population.

27 data sets provide the year of birth of each respondent. For the remaining 90 data sets, the year of birth is computed. In the following, *birthyr*[17] refers to the year of birth as recorded by the Census enumeration and reported by IPUMS International whereas *birthyear* refers to the year of birth calculated as *year (of Census enumeration)* minus *age*. Contrary to Almond (2006), who uses IPUMS USA, IPUMS International (for all Census waves without *birthyr* including those for the USA) does not provide the quarter of birth or any further information on a respondent's date of birth and, hence, *birthyear* likely includes some measurement error given that Census enumeration does not necessarily take place at the beginning of a year. For the 27 data sets with *birthyr* included we use this variable.

All data sets include the gender of the respondent. 97 data sets include an indicator for being born in the country of the respective Census.[18] In the analysis, only native born respondents are included if the distinction can be made. For data sets without this indicator present, no

[15] Status on June 17th, 2015 as IPUMS international continuously expands both its list of variables and Census data sets.

[16] The earliest birth cohorts included in the subsequent analysis presented in the following chapter have been born in 1910 and would, hence, be 80 years old in 1990.

[17] *birthyr* is computed for Fiji 1966, 1976, 1986 by the statistical office for unknown dates of birth (cf. IPUMS International).

[18] IPUMS International reports that for Canada 1981, institutionalized respondents were not asked about their place of birth and, hence, have no nativity status. For France and the United States, native-born respondents exclude those born outside the continental boundaries of the country. For Thailand 1980, a respondent's nativity status is based on the respective mother's permanent residence at the time of birth.

distinction could be made and an appropriate indication is included in Table 2.

The quality of data varies greatly between the 117 data sets with some data sets displaying significant (age) heaping[19], others containing large amounts of missing data for either or both the identifying variables of *birthyr* and *age*, and some data sets not being representative of their country (cf. Table 2). To assess the quality of each data set two characteristics are investigated, firstly the percentage of missing entries in the year of birth (*birthyr* or *birthyear*, respectively) and secondly Myers' Blended Index of Digit Preference (Hobbs 2004) to detect heaping within these variables. We choose to use a data-driven approach which is depicted in Figure 1 and described in the following in the order from left to right of Figure 1.

Initially, the distribution of missing observations in *birthyr* (Figure 2a) and *age* (Figure 2b) across data sets is considered. Figure 2a displays the distribution of missing entries in *birthyr* in percent relative to the respective complete data set downloaded from IPUMS International. The height of each bar and the digits above each bar show the number of data sets out of 117 for which the percentage of missing entries given on the abscissa is true. Out of 117 data sets, 90 do not include *birthyr*, hence, 100 percent are missing as stated earlier. 21 data sets have less than 1 percent missing in *birthyr* and 6 data sets have 5-51 percent missing entries in *birthyr*[20]. Given the sharp increase from below one to five percent, 1 percent is chosen as a cutoff to distinguish better from worse data sets for this variable. This cutoff threshold is shown in the appropriate field in Figure 1 and represented by the red line in Figure 2a, respectively.

As a second measure of quality Myers' Blended Index of Digit Preference is used: For the 27 data sets with *birthyr* included Myers' Blended Index based on *birthyr* and calculated for birth cohorts 1910 to 1929[21] varies between 0.92 and 24.28 (not shown). Out of the 21 data sets with less than 1 percent missing in *birthyr* Myers's Blended Index varies between 0.92 and 10.53. Hobbs (2004) states that the Index increases with the extend of heaping ranging from zero representing no digit preference to 90 representing complete preference for a single digit. Hence, low values as close as possible to zero should be preferred. However, Hobbs (2004) does not give any advice on a threshold value but instead cautions that a certain amount of heaping might simply be the consequence of larger birth cohorts and, therefore, falsely perceived as heaping. In absence of a clear rule the distribution of Myers's Blended Index for

[19] IPUMS International confirms that for both *birthyr* and *age*. For age, digit preference is most prevalent for developing countries and the elderly.

[20] IPUMS International reports Cameroon 1976 to have a large number of unknown birth dates as respondents provided their age instead of their date of birth. For Guinea, IPUMS International reports over 70 percent of missing values in *birthyr*. For Indonesia 1976 and 1980, IPUMS International reports 31 and 50 percent missing values, respectively.

[21] To calculate Myers' Belnded Index the range on which it is based has to end with the last digit 9. Hence, for our interval of 1910-1928 the range 1910-1929 is the closest possible range.

the 21 data sets is investigated and no sharp increases are found. Therefore, all 21 data sets are considered good quality. Thus, effectively, data sets with the reported year of birth are solely categorized based on the percentage of missing observations in this variable. The threshold values found in this first part of the classification process are used in the subsequent parts as well.

Of the six data sets with 5-52 percent missing observations in *birthyr* Myers's Blended Index is below 10 for two data sets and above 16 for four data sets. As these six data sets are already deemed of less quality based on the number of missing entries, no further distinction is made and they are classified as medium-quality data.

For the 90 data sets without the reported year of birth, this is computed as the *year of Census enumeration* minus the *age*[22] of respondents. Of these 90[23] data sets, eight (Ireland 1971 / 1979 / 1981 / 1986, Israel 1972 / 1983, The Netherlands 1969 / 1971) have age grouped into five-year intervals (coded as 100 percent missing in *age* in Figure 2b) making these unsuitable for the subsequent analysis and constituting the lowest category in our classification. Pakistan 1981 has age reported in intervals according to IPUMS International though upon closer examination, this is not the case in the range of interest, 1910 - 1928. Hence, Pakistan 1981 is included in the analysis.

The remaining 82 data sets have less than two percent missing entries in *age* (which translates into the same for *birthyear*) without any sharp increases. Hence, 2 percent[24] are chosen as a cutoff point. Myers' Blended Index based on *age* varies between 0.92 and 60.34 across all 82 data sets (not shown). As these 82 data sets will be used in the year-of-birth analysis along with the 21 data sets of good quality including *birthyr*, the same threshold for Myers' Blended Index is applied as above, namely all data sets with an Index value up to 11 are deemed good quality and the remainder as somewhat less reliable in terms of quality. This leads to 44 data sets of good quality, 38 in the middle category and 8 in the lowest category among those with the computed year of birth.

In total, across both year-of-birth variables, 65 data sets are of good quality, 44 are considered of medium quality and 8 as unsuitable for further analysis. Out of the 65 data sets, 51 include

[22] *age* in France 1962 is constructed by IPUMS International as the age achieved in 1962 based on the age since the last birthday and for Greece, age was constructed probabilistically. Top codes are also present between 85 and 99 or 100 but these never interfere with the range of interest of this study.

23 Pakistan 1981 has *age* reported in intervals according to IPUMS International though upon closer examination, this is not the case in the range of interest, 1910 - 1928. Hence, Pakistan 1981 is included in the analysis.

[24] This seemingly less strict threshold does not conflict with the one for data sets with birthyr as there are no data sets with missing values between 1 and 5 percent.

the variable *nativity*[25] and 14 do not. In the medium category, 39[26] data sets include *nativity* and 5 do not. Figure 3 scatters the percentage of missing observations against Myers' Index for the respective year-of-birth variable by continent. In summary, the classification process is driven by the quality of the European and Northern American data sets which allows for a comparison of Asian, Latin American and African data sets. The overall pairwise correlation between the two indicators of quality equals 0.06 (0.50 across data sets with *birthyr* and 0.14 in data sets with *birthyear*). Across European data sets, the correlation equals 0.05 while it amounts to 0.18 in Latin American data sets and -0.09 in both African and Asian data sets.

Table 2 displays characteristics of all data sets including which of the two year-of-birth variables is available, the density of the underlying Census wave in percent and its total number of observations, a comment given by IPUMS International if available, the category based on the process described above as well as which dependent variables and whether the nativity status are available.

Concerning the dependent variables, IPUMS International provides the harmonized educational attainment (*edattan*[27]) as a categorical variable consisting of the four categories 'less than primary education completed[28]', 'primary education completed', 'secondary education completed' and 'higher education completed' based on the United Nations definition of six years of primary schooling and six years of secondary schooling (cf. Minnesota Population Center (2014). This categorical variable is one of the most widely available measures among IPUMS International Censuses and was hence chosen above other less frequently available measures of education. Two binary variables, namely *primary* and *secondary*, are generated from *edattan*, respectively equaling one if the respondent achieved at least the level of education of the respective category but less than the following category. From a historical perspective, the lower threshold of primary education is a relevant one for all the countries we are analyzing: In 1930 (when the 1910 cohort was 20 years old and therefore largely finished with education), Western Europe had an average of 6.2 years of education, the USA, Canada and Australia had 8.5 years of education while the other world regions were much below this (just 2.7 in Eastern

25 Nativity is assessed by the same routine as described above and a threshold value of 4 percent of missing entries defined leading to 93 data sets with good quality, 4 with medium quality (7-75 percent missing) and 20 with nativity not provided by IPUMS International. Out of the 51 data sets with good year-of-birth data and nativity available, only Jamaica 1982 has lower quality in terms of nativity. The distinction is disregarded in the subsequent analysis.

26 Out of the 39 data sets only Dominican Republic 1960 and Morocco 1982 have nativity of medium quality. The distinction is disregarded.

27 It should be carefully noted that this variable only considers completed degrees according to the above classification. Therefore, a respondent with, for example, eleven years of schooling would be reported as having only a primary school degree as opposed to a nearly completed secondary degree education. For some data sets, university completion pools those with university and technical degrees.

28 This category comprises both those with some primary education and those without any formal education.

Europe (Poland and Russia each 2.5) and 2 or less in developing regions). Within Western Europe, Italy and Spain had 3.9 and 3.8 years of education, on average, making primary education a meaningful threshold even in Europe. In 1950 (when the 1928 cohort was roughly finished with education), the average years of education in Spain (4.9) and Italy (5.0) as well as Russia (5.0) and Poland (3.2) were still below the 6-years-threshold that divides our education variables into primary and secondary education. Western Europe is calculated at 7.0 years of education and USA / Canada and Australia at 9.6 years of education, on average, in 1950 (Zanden et al. 2014).

The employment status (*employed*) is generated from the categorical variable *empstat*[29] and equals one if a respondent is employed at the time of Census enumeration. Finally, the disability status is represented by the binary variable *workdisability*[30] which equals one if a respondent is unable to work due to a disability. Hence, *workdisability* represents a subcategory of the employment status as it gives a reason for why a respondent is inactive. In general, health measures are not as prevalent in the Censuses considered in this study and *workdisability*, though being available in only 33 of the Censuses used, is still the most frequent of the health measures available on IPUMS International. The main focus of this study is on the four dependent variables *primary*, *secondary*, *workdisability* and *employed*.

IPUMS International provides harmonized data allowing for comparisons across countries and years. Despite the harmonization efforts, slight differences in the definition of these variables exist for some samples and the harmonization process may even mask underlying country-specific differences or changes in enumeration processes or definitions within a country over time. Hence, data sets are never pooled and all specifications are estimated separately for each Census sample. Another advantage of this approach compared to a pooled fixed effects analysis is that both significant and insignificant effects are displayed, the latter of which may potentially be interesting in the light of a potential publication bias with regards to country-specific analyses.

Following Almond (2006), exposure to influenza should specifically affect those in utero in 1918 during the second deadly wave. Hence, the cohort born in 1919 harbors the majority of the prenatally exposed and should, therefore, differ from surrounding cohorts. Given that IPUMS International only provides yearly data this is equivalent to an Intent-to-Treat approach with the 1919 birth cohort defined as the most likely to be treated. As in Almond (2006), deviations of the set of four binary dependent variables from the squared cohort trend are

29 *empstat* also includes the categories *unemployed* and *inactive*.
30 The underlying IPUMS variable is *disemp*.

estimated. Each binary dependent variable is regressed onto a constant, an indicator for being born in 1919[31] capturing the in-utero exposure to influenza, the squared cohort trend and a binary variable indicating the respondent's gender. Each specification is estimated for the native-born[32] sample when the corresponding indicator is available. Otherwise all respondents are included. Contrary to Almond (2006) who compares the influenza cohort against the cohorts born between 1912 - 1922[33] we opt for the larger, more general trend of 1910 - 1928 which also centers the influenza cohort in the middle given equal weight to outcomes of those born before and after 1919. All specifications are estimated using Ordinary Least Squares with heteroskedasticity-robust standard errors. Specifically, we estimate the following equation:

$$y_i = \beta_0 + \beta_1 * YOB_{1919} + \beta_2 * YOB_i + \beta_3 * YOB_i^2 + \beta_4 * male_i + \varepsilon_i \qquad \text{eq. 1}$$

where y_i is one of the four dependent variables mentioned above and YOB_{1919} is the binary exposure or treatment variable where

$$YOB_{1919} = \begin{cases} 1 & if\ i\ is\ born\ in\ 1919 \\ 0 & else. \end{cases}$$

Hence, our coefficient of interest is β_1. Our hypothesis is that the influenza cohort is worse off compared to the general trend. Therefore, we expect β_1 to be negative when analyzing the indicators of educational attainment and employment status but positive regarding the disability outcome. We estimate our specification separately for each data set.

4 Results

Figures 4a through 4d display the coefficient of interest and its corresponding 95% confidence interval for each data set that incorporates the dependent variable under investigation, respectively. The coefficients are displayed sorted by data quality category, the continent of Census enumeration, country and year of Census enumeration. Every coefficient is individually obtained from our main specification and no weights are applied. We show all of our coefficients multiplied by 100 for better readability.

[31] Table 1 reveals that the pandemic struck in the fall and winter of 1918 and in some cases lasted until early 1919. Hence, the 1919 birth cohort would comprise most of the exposed respondents.
[32] If an appropriate variable is available. Otherwise, a comment is included in the regression tables.
[33] Almond (2006) does not provide a reason for not centering his exposed cohort. We give equal weight to the pre- and post-pandemic cohorts and use a wider interval to allow taking out the effect of WWI. We assess Almond's (2006) interval as a robustness check and find that our results are robust to this change.

To give a more aggregated understanding of the effects found across our Census data sets we additionally show the weighted average coefficient (in short: AWC) for each category of data quality. The AWC is the constant from a random-effects meta-analysis model where all coefficients, weighted by the inverse of their total estimation variance, are regressed onto themselves, for good- as well as medium-quality data sets, respectively. Secondly, given the repeated testing of the same hypothesis, false discoveries are a potential concern. Benjamini and Hochberg (1995) as well as Fink et al. (2014) suggest controlling for the false discovery rate which is the expected proportion of falsely rejected hypotheses and show that this is superior to controlling the familywise error rate when testing the same hypothesis multiple times. The (Simes-) Benjamini-Hochberg procedure calls for ordering all p-values from smallest to largest leading to a rank. P-values are then divided by their rank and compared to a modified significance level computed as the desired significance level (5% in our case) divided by the number of hypotheses tested. All coefficients for which the adjusted p-value is smaller or equal to the modified alpha level are deemed statistically significant. The consequence of this procedure is obtaining a stricter threshold value (adjusted significance level) which minimizes the false discovery rate (FDR) while being less restrictive than traditional multiple-hypothesis adjustments controlling the familywise error rate such as the Bonferroni procedure. Figures 4a through 4d show the results from the adjustment as 'not FDR robust', i.e. counting coefficients that are significant at the five percent level in the original analysis but which are not significant after the FDR adjustment at the five percent level.

Primary Education

Figure 4a displays the deviation of the influenza cohort from the general trend with respect to completed primary education rates, i.e. coefficients and 95 percent confidence intervals for being born in 1919. Among good-quality data sets, 33 out of 59 coefficients or the majority are always insignificant at the five percent level. Only 22 coefficients are significant after adjusting for multiple testing.

Moreover, among significant coefficients, Figure 4a displays both positive and negative coefficients, namely 10 negative and 12 positive significant coefficients. Among the 18 European data sets, 8 (6 negative, 2 positive) display significant differences between the 1919 and surrounding cohorts. While the five French Censuses and the Romanian sample show a negative difference between the 1919 and surrounding cohorts bordering Germany shows that the 1919 cohort did better than those born before or after the pandemic. Among the 6 Northern American data sets, 3 significant but positive differences are found: Samples from the USA show mixed results as the 1919 cohort is estimated to be more likely to have achieved primary education in the 1960, 1980 and 1990 Censuses but not in the 1970 sample. For neighboring Canada, however, no difference between the cohorts is found in the two available samples.

Among the 25 good-quality Latin American samples, only 7 are associated with significant differences of the Flu cohort and among these the majority is positive meaning that the 1919 birth cohort was more likely to complete primary education than those born before or after the pandemic. Furthermore, among these only few countries show a consistent pattern of coefficients across their Census waves. Curiously, an effect is found in the Argentinian 1980 but not in the 1970 sample and the Brazilian Flu cohort enumerated in 1970 differs from the trend but not their counterparts from the 1980 Brazilian sample. Similarly, a positive deviation from the trend is found in the Chilean 1960 sample but the respective coefficient in the 1970 and 1983 Censuses is negative and insignificant. The Censuses from Panama display positive effects but only in their later waves.

In the 10 Asian samples both positive and negative significant results are found as well: For the China 1990 sample, a significant negative effect is found but this cannot be confirmed for the 1982 Census. While there are negative deviations of the Flu cohort in the Malaysian samples as well as the Vietnam 1989 Census, the Philippines 1990 Census is associated with a positive deviation of the Flu cohort.

In summary, among good-quality data sets, we observe a majority of insignificant coefficients and no clear pattern among the few significant coefficients. The AWC (= - 0.11), our aggregate measure of coefficients, is statistically insignificant (p-value = 0.54) leading us to conclude that there is no global influenza effect for primary education.

Among medium-quality data sets, 26 out of 44 or the majority of coefficients is statistically different from zero and among these 20 are positive and 6 negative. Coefficients are also generally much larger in absolute terms than those from good-quality data sets. Not surprisingly, the AWC of medium-quality samples is positive (= 1.89) and statistically different from zero at the 1%-level. Given, that these coefficients might be biased due to poor data quality (heaping and missing observations) we are cautious in attributing these results to the pandemic.

Secondary Education

Figure 4b displays the estimated difference between the influenza and surrounding cohorts with respect to completion rates of secondary education. Overall, with a few exceptions, coefficients and confidence intervals are very small and hover around zero. The majority of coefficients in both good- (50 out of 63) as well as medium-quality data (35 out of 44) is insignificant. Among good data sets only 10 coefficients are significant after the FDR adjustment and among these both 4 positive and 6 negative coefficients can be found.

When considering continents, European data sets are associated with only 5 significant out of 21 coefficients: Among French samples, only the Census of 1990 shows a statistically significant difference between the influenza and other cohorts though in the opposite direction of the hypothesis. In contrast, two German samples show significant and negative results but a third German data set displays an insignificant and slightly positive coefficient. The Hungarian Flu cohort deviates positively from the general trend in the 1970 and 1980 but not in the 1990 Census. Interestingly, we do not find significant deviations for the Swiss samples which is in line with Neelsen and Stratmann (2012) who find no significant difference between the Flu and surrounding cohorts regarding the completion of higher secondary school (in their study, significant differences are found only for a lower educational threshold, namely graduating from vocational school, but not for the other education thresholds investigated).

Among the 6 Northern American samples, only the 3 US samples mentioned earlier display significant coefficients. The influenza cohort is estimated to have obtained less secondary education in the 1960, 1980 and 1990 USA Censuses which is in line with Almond (2006) findings. [34] However, Canadian samples do not show any differences between the 1919 and other birth cohorts.

Among the 26 Latin American samples of good quality, only 2 significant coefficients appear: Brazil 1970 (but not 1980) displays a positive coefficient thereby contradicting the findings of Nelson (2010) who finds negative deviations in his. Our results, however, are more representative and estimated based on younger cohorts compared to Nelson (2010) who uses data from the six largest metropolitan areas rather than a nationally representative sample and data collected between 1986-1998 yielding observations between the ages of 64-86. Chile 1982 is associated with a negative deviation of the Flu cohort compared to the trend but this is not confirmed in the earlier two Chilean samples. Among Asian good-quality data sets, no significant differences between the 1919 and surrounding cohorts is found. Unsurprisingly, the average of coefficients in good-quality data sets is close to zero (= -0.03) and statistically not significant (p-value = 0.59).

[34] The coefficient in the 1960 US sample equals -0.97, in 1980 it is estimated as -0.53 and in 1990 as -0.78 and all three are significant at the 1%-level. Since IPUMS International does not provide the quarter of birth (in contrast to IPUMS USA) we cannot adjust our computed year of birth variable to reflect the time of the Census enumeration as Almond (2006) does. Therefore, our USA coefficients (here, displayed multiplied by 100) are smaller in magnitude compared to Almond’s as our cohort definition likely includes a larger share of never-exposed respondents thus biasing our coefficients toward zero. Nonetheless, we find similar results as Almond 2006).

A similar picture emerges for medium-quality data sets where the majority of coefficients (35 out of 44) is insignificant and only 2 negative significant and 6 positive significant coefficients are found. Again, the average of coefficients is insignificant and close to zero (= 0.27, p-value = 0.15) leading us to the conclusion that there is no distinct global influenza effect despite the fierceness of the pandemic.

Disability

Figure 4c shows no significant difference between the influenza and other cohorts regarding the likelihood of having a disability preventing work at the time of Census enumeration. Both averages of coefficients are statistically insignificant and estimated close to zero. Among good data sets the influenza cohort from Saint Lucia 1980 is estimated to be less likely to have disabilities whereas the corresponding cohort from China 1990 and Vietnam 1989 are more likely to have disabilities. It should be noted that the oldest respondents in the samples with significant coefficients are aged 70 (Saint Lucia 1980), 79 (Vietnam 1989) and 80 (China 1990), respectively, which is above the usual retirement age. Hence, in these cases, it is questionable whether the culprit is the pandemic or rather a change in the underlying trend against which the Flu cohort is compared to. In the three good-quality samples were all respondents are below the retirement age (Brazil 1970, Thailand 1970, Venezuela 1971) we do not detect significant differences between the influenza and surrounding cohorts. Among medium-quality Censuses no significant coefficients remain after the FDR adjustment. Unfortunately, IPUMS International does not provide other health measures available for the majority of the Censuses that we investigate.

Employment

Regarding the likelihood of being employed Figure 4d displays no difference, on average, between the 1919 and surrounding cohorts. The majority of coefficients obtained from good-quality data is statistically insignificant as measured by the AWC (= 0.11, p-value = 0.75).

For this indicator Figure 4d distinguishes between Censuses that would include respondents over the age of retirement. Since we are comparing the 1919 cohort to the trend of the 1910-1928 birth cohorts this trend should not be compromised by other factors. Given that retirement thresholds vary across countries and time we opt for a general distinction: Our oldest respondents are those born in 1910 and are 65 years old in 1975. We therefore distinguish between Censuses collected before or in 1974 (where the oldest respondents are not yet 65 years old) or thereafter. Again, this distinction only affects how coefficients are displayed; the complete set of coefficients is shown.

Among the 55 coefficients from good-quality data sets, only 22 significant coefficients are found. However, among these significant coefficients, both positive (12) and negative (10) coefficients exists. Upon a closer look, however, only two coefficients are obtained from Censuses enumerated before 1975: Brazil 1970 displays a negative effect of -0.80 (which is in line with Nelson's (2010) result) and Greece 1971 is associated with a coefficient equaling -1.88 (both significant at 1%).

Among medium-quality data a slightly negative and statistically significant average of coefficients is detected across all data sets. However, similarly as for good data sets, only 1 (Brazil 1960, negative coefficient) out of 7 significant coefficients is obtained from a Census enumerated before 1975 and the majority (26 coefficients) of results is always estimated to be insignificant.

In conclusion, our Census-level analysis of four main dependent variables does not confirm the generally accepted finding that the influenza pandemic of 1919 had a long-lasting effect of those in-utero during the pandemic. While we find a few significant differences between the influenza and surrounding cohorts in some data sets the majority of our results is insignificant and among significant estimates there are always both positive and negative coefficients.

5 Robustness Checks

In the following, we describe a series of robustness checks and the corresponding results for all four main dependent variables. All graphs can be found in the Appendix.

<u>Heterogeneity by gender</u>

Firstly, we divide our samples by gender to investigate whether a certain global influenza effect is present but masked by using aggregate samples. Given the era covered in our analysis gender differences in education and labor market participation at least in some countries are likely. Hence, we split each of our samples by gender and estimate equation 1 separately for each gender (excluding the gender dummy). Overall, the AWC is always insignificant among good-quality samples across all four dependent variables in both gender subsamples further stabilizing our conclusion that there is no overall influenza effect on the cohort level. In general, it can be observed that the same amount or even less coefficients are significant among good-quality data sets when reducing the data to gender subsamples:

For primary education (Figure 5a and 5b), only 11 significant coefficients (3 negative, 8 positive) are detected among good-quality female subsamples and 7 significant coefficients (5 negative, 2 positive) among male subsamples compared to 22 in general samples. A clear pattern cannot be observed: While both genders differ from their surrounding cohorts for Germany (East) 1981[35] and Brazil 1970[36], females seem to drive the effect found in our main specification in the samples of Germany (West) 1970, Romania 1977, United States 1980, Chile 1960, Panama 1980, Philippines 1990 and Vietnam 1989. Males, on the other hand, drive the general effect in the cases of France 1968 / 1982 / 1990, Argentina 1980 and Malaysia 1970. In the case of France 1962 / 1975, United States 1960 / 1990, Panama 1990, Venezuela 1971 and China 1990 a significant difference between the influenza and surrounding cohorts is only found in the general specification controlling for gender while it cannot be confirmed in either of the two gender subsamples. In two female subsamples, namely Puerto Rico 1970 and Uruguay 1963, an effect is found only in the subsample but not in the general one.

Regarding completed secondary education (Figure 5c and 5d) 10[37] female subsamples (4 positive, 6 negative) and 1 male subsample (France 1990, positive) exhibit significant differences between the influenza and surrounding cohorts compared to 10 significant coefficients in good-quality general samples.

For cohort differences concerning disabilities preventing work (Figure 5e and 5f) 3 significant coefficients are found among female (1 positive, 2 negative) and 5 among male (3 positive, 2 negative) subsamples compared to 3 in good-quality full samples.

Concerning the employment status (Figure 5g and 5h), 8 female subsamples (3 negative, 5 positive) and 22 male subsamples (10 negative, 12 positive) show significant differences between the influenza and surrounding cohorts though when excluding Censuses enumerated after 1974 none of the female and only 2 (Greece 1971, Brazil 1970; both negative) of the male subsamples are associated with significant differences.

Among medium-quality data, the AWCs for completed primary education are significantly different from zero and positive in both gender subsamples though this is in the opposite direction of the hypothesis. Regarding secondary education, only the AWC in medium-quality female subsamples is significant and negative whereas males do not differ, on average, across samples in medium-quality data. Regarding the disability status no differences between the Flu

35 Influenza males are less likely whereas influenza females are more likely to finish primary education leading to a positive significant coefficient in the general sample.

36 All three coefficients are positive significant

37 7 (Germany (East) 1981, Germany (West) 1970, Hungary 1970, United States 1960 / 1980 / 1990, Brazil 1970) effects found in the general samples are driven by females while 3 (Greece 1971, Switzerland 1970, Costa Rica 1973) effects are only found in female subsamples but not in the general samples.

and other cohorts can be found among medium-quality subsamples and the AWC for the employment status is significant and negative in male medium-quality subsamples though this is driven by samples with respondents over the retirement age as no significant coefficients can be detected among male subsamples collected in or before 1974.

Reducing the Interval to 1912-1922

Secondly, we reduce the trend against which the 1919 cohort is compared to the one used by Almond (2006) as well as Nelson (2010) and Neelsen and Stratmann (2012), namely to the cohorts born 1912-1922. Again, we estimate equation 1 separately for each general sample. In summary, we now obtain the same amount of significant cohort differences for the health (Figure 6c) and employment status (Figure 6d) but even less significant coefficients for both of the education thresholds. Specifically, we now only obtain 10 significant coefficients (4 negative, 6 positive) compared to 22 in our main specification for primary education (Figure 6a). Among European data sets only Romania 1977 yields a significant (and negative) deviation of the 1919 birth cohort while we do not detect any significant coefficients in data sets from the USA. Among Latin American good-quality data sets we find 5[38] significant (and positive) deviations and among Asian good-quality samples 4[39] significant (3 negative, 1 positive) coefficients. Regarding secondary education (Figure 6b), we only obtain 5 significant coefficients or half the number we find in our samples when estimating our main specification. Specifically, we find negative deviations from the trend for Germany (West) 1970 though not in any of the other German samples as well as for Romania 1977 and the United States samples of 1980 and 1990 and a positive deviation for Brazil 1970 though not for the other Brazilian samples. Upon closer examination each of these general sample effects is driven by the respective female subsample while its male counterpart is insignificant (not shown).

Unsurprisingly, the AWC for each of the four dependent variables remains insignificant in good-quality data. This reassures us that our results are not systematically different from those found by other authors simply because we use more cohorts in our comparison group. The AWC is insignificant for secondary education and the disability status across general samples and both gender subsamples both for good- as well as medium-quality data sets. For the employment status, the AWC is negative and significant at the 5%-level for male subsamples which in turn affects the AWC in medium-quality general samples (negative, significant at 10%-level). The

[38] Argentina 1980, Brazil 1980, Chile 1960, Panama 1980, Panama 1990

[39] Malaysia 1970, Malaysia 1980, Philippines 1990, Vietnam 1989

general as well as both gender subsamples of medium quality display a positive AWC (significant at the 1%-level) for primary education.

Excluding WWI birth cohorts

As a third robustness check we exclude the cohorts born during the First World War, namely those born between 1914[40] and 1918. The analysis, hence, uses equation 1 but now compares the cohort born in 1919 against the cohorts born in 1910 – 1913 and 1920 – 1928. We find no change to the overall picture we obtain from our main analysis. Specifically, the AWC in good-quality samples remains insignificant for each of our four main dependent variables. For primary education (Figure 7a), we now find 5 more significant coefficients (Austria 1981, Germany (East) 1971, Panama 1970, Venezuela 1990, Thailand 1970) compared to our main analysis but again fail to find a clear pattern: Of the 27 out of 59 significant coefficients we obtain 13 negative but 14 positive significant coefficients. For secondary education (Figure 7b), we find 2 more significant coefficients (Germany (East) 1971, China 1990) than in our main specification giving us a total of 7 negative and 5 positive coefficients among general good-quality samples. Regarding disabilities preventing work (Figure 7c) and the employment status (Figure 7d) the results are not affected by excluding cohorts born during WWI. In medium-quality data the AWC is insignificant for *workdisability* and *secondary* (though the latter is significant at the 10%-level) and significant for *primary* (positive) and *employed* (negative) though as discussed above the latter entails data sets with respondents over the age of retirement. In summary, the overall picture we obtain for our four main dependent variables is not altered by restricting birth cohorts to those born before or after WWI.

Controlling for 1918 and 1920 birth cohorts

While the literature generally identifies the second wave of the Spanish Flu pandemic as the lethal one even terming it ‘the pandemic’ most countries experienced an earlier first and/or a third wave as well. These are described as much less lethal and comparable to seasonal Flu outbreaks rather than of the impact of a pandemic. To check whether our main results are biased by comparing our treatment cohort to a trend incorporating (potentially) exposed cohorts we reestimate equation 1 but include a dummy for being born in 1918 as well as one for being born in 1920. Thus, we explicitly control for the two cohorts surrounding our influenza cohort. In other words, we net out the effect these two cohorts have on the general trend against which

[40] As WWI started at the end of July 1914 a fraction of those conceived before the war and hence in utero during the first months of the war were born in 1914.

our Flu cohort is compared to. We again focus on the effect of being born in 1919 on the respective dependent variable. In general, the results of this robustness check are similar to our main results:

For primary education (Figure 8a), we again find an insignificant AWC among good-quality data and a positive significant AWC in medium-quality samples which is of comparable magnitude as in our main specification. In both quality categories, even less significant coefficients are found compared to our main specification and again we find both positive and negative significant coefficients. More specifically, among good-quality data we now only obtain 12 significant (22 in main specification) coefficients among which 7 are positive and 5 negative. Among European data sets only 2 coefficients withstand this robustness check with regards to their magnitude and statistical significance, namely Germany (East) 1981 (but Germany (East) 1971 is insignificant) displaying a positive coefficient and Romania 1977 which is again associated with a negative coefficient. More importantly, when we control for the cohorts of 1918 and 1920 all 5 French coefficients that were significant and negative in the main specification lose their significance and are estimated to equal zero. Thus, with only 2 remaining significant coefficients of opposite signs we conclude that there is no Spanish Flu effect in Europe. Among Northern American data sets, the USA 1980 and 1990 samples continue to be associated with a positive coefficient but the USA 1960 sample coefficient loses significance under the FDR-adjustment in this robustness check and the 1970 sample is again associated with an insignificant coefficient. Among Latin American samples, only 4 samples (Argentina 1980, Brazil 1970, Panama 1990, Venezuela 1971) produce significant coefficients under this robustness check. While each of these coefficients is positive and of similar magnitude to its counterpart in the main specification a significant coefficient is not obtained from any of the respective other samples from the same country. Finally, among Asian data sets we find 4 negative coefficients from China 1990, Malaysia 1970 and 1980 and Vietnam 1989 which are again similar to the equivalent coefficients obtained from the main specification.

For secondary education (Figure 8b) the picture remains similar to our main specification when controlling for the two cohorts surrounding our Flu cohort. The majority of coefficients is insignificant both among good- and medium-quality data with only 6 and 7 significant coefficients in both categories, respectively. In contrast to our main specification results, the AWC among good-quality data is significant and slightly negative in this robustness check. Compared to the main specification, 6 (4 positive) out of 10 significant coefficients from our main specification (France 1990, Germany (East) 1981, Germany (West) 1970, Hungary 1970 / 1980, Brazil 1970) become insignificant leaving only negative significant coefficients (USA

1960 / 1980 / 1990, Chile 1982) when netting out the effects of the 1918 and 1920 cohort. This in turn drives the AWC to become negative though being the result of only 6 significant out of 63 coefficients among good-quality samples. The two additional negative coefficients stem from Portugal 1981 and China 1990 which do not display significant coefficients in the main specification. While it is remarkable that we obtain a negative significant AWC the overall picture does not suggest a global effect of the pandemic. Among medium-quality samples, the AWC remains insignificant and only 7 significant (5 positive, 2 negative) coefficients are detected out of 44 coefficients.

Regarding our health measure (Figure 8c), the overall picture is not altered by this robustness check. Both AWCs are estimated as insignificant and only 3 coefficients among good-quality data are estimated as significant. While the coefficients from Saint Lucia 1980 (negative) and China 1990 (positive) withstand the robustness check, Vietnam 1989 loses its significance under the FDR-Adjustment and Portugal 1981 is associated with a positive coefficient when controlling for the two surrounding cohorts. Given only 3 significant coefficients (out of 11) with different signs we cannot confirm a global Flu effect regarding our health measure.

With respect to our labor market measure (Figure 8d) both AWCs are estimated as insignificant. Among both categories of quality the majority of coefficients is estimated as insignificant and among significant coefficients the majority stems from samples collected after 1974 thus incorporating a comparison group comprising retired respondents. Among earlier Censuses only 3 coefficients in good-quality data are statistically significant out of which Greece 1971 and Brazil 1970 are estimated as negative whereas Malaysia 1970 as positive.

Placebo regressions

We also perform placebo regression analyses to further exclude that our main results are due to chance. Instead of defining exposure to the pandemic as those born in 1919 we define two placebo exposures, namely being born in 1918 (respondent was in utero before the pandemic) and being born in 1920 (respondent was in utero after the pandemic), and reestimate equation 1 replacing the dummy for being born in 1919 with either of the placebo exposures.

For the placebo birth cohort of 1918 (Figure 9a, 9c, 9e and 9f), the AWC is always insignificant across both quality categories except for primary education in medium-quality data sets where the AWC is significant and positive and of similar magnitude as in the respective main specification case. This positive significant medium-quality AWC is driven by 22 significant coefficients (17 positive, 5 negative) which is strikingly similar to the medium-quality case for primary education in the main specification where 26 coefficients (20 positive, 6 negative) are positive. This leads us to conclude that the positive AWC in medium-quality data is not due to the Spanish Flu pandemic but perhaps rather due to war-induced population changes that affected the educational distribution of several birth cohorts.

For the placebo birth cohort of 1920 (Figure 9b, 9d, 9f and 9h), the AWC is always insignificant across both quality categories except for secondary education in good-quality data sets where the AWC is significant and negative as all 7 of the significant coefficients are negative (USA 1960 / 1970 / 1980 / 1990, Brazil 1970 / 1980, Philippines 1990).

When comparing the two placebo regression analyses with our main results we find several data sets associated with cohort effects of similar size and sign for both the 1919 as well one or both of the placebo cohorts suggesting that at least in these cases the Flu cohort does not differ from the trend due to the in-utero exposure to the Spanish Flu. Specifically, for primary education among good-quality data we identify 9 out of 22 significant coefficients of the same sign and similar magnitude as in the main specification. Of these, 6 coefficients are both significant in the 1918 and 1919 regression (France 1962 / 1968 / 1975 / 1982 / 1990, Venezuela 1971) and 3 coefficients are significant in both the 1919 and 1920 regressions (Romania 1977, USA 1960 / 1970). For secondary education, we find 4 out of 10 significant coefficients among good-quality data in either of the two placebo regressions, namely Germany (East) 1971 in the 1918 regression and USA 1960 / 1980 / 1990 for the 1920 placebo regression. For *workdisability*, we count 2 out of 3 such cases, namely China 1990 which is associated with a positive coefficient in all three specifications and Vietnam 1989 which displays a significant coefficient in both the 1918 and 1919 regression. For *employed*, there are no similar significant coefficients in the placebo as well as in the main specification

In conclusion, among good-quality data, we are left with only 13 significant (22 minus 9 from placebo regressions) out of 59 coefficients for *primary*, 6 significant (10 minus 4) out of 63 coefficients for *secondary*, 1 significant (3 minus 2) out of 16 for *workdisability* and 2 significant coefficients for *employed* from Censuses enumerated before 1975 that could be associated with an in-utero effect of the Spanish Flu and these vary with respect to their sign.

<u>Other dependent variables</u>

So far we have limited ourselves to dependent variables that are most frequently available in all data sets. Our last robustness check verifies whether we find similar pictures for five additional binary dependent variables. Again, we estimate equation 1 and repeat out main analysis for these five dependent variables and find a majority of insignificant deviations of the 1919 cohort from the trend.

The AWC for both good- and medium-quality data for the binary dependent variable *university* (stemming from the categorical variable *edattan*, hence being from the same source variable as *primary* and *secondary*; *university* is equal to one if the respondent obtained a university degree, zero otherwise) is insignificant and only 3 significant (and negative) coefficients out of 63 good-quality data sets are counted (Romania 1977, Venezuela 1990, Malaysia 1980) while 51 are insignificant (Figure 10a). For *illiterate* (equal to one if the respondent is illiterate, zero otherwise), the AWC in good-quality data is insignificant with 14 significant out of 35 coefficients (4 positive, 16 negative) while the AWC in medium-data is negative and significant (30 significant coefficients out of 41 with 26 negative and 4 positive) (Figure 10b).

Regarding *disability* which is a binary variable indicating a general disability status no significant coefficients are found among good-quality data and 3 significant out of 8 coefficients in medium-quality data (2 positive, 1 negative). Consequently, both AWCs are insignificant (Figure 10c).

For both additional labor market statuses (both categories of *empstat* similarly to *employed*; *unemployed* equals one if the respondent is unemployed, zero otherwise, and *inactive* equals one if the respondent does not seek labor market participation and zero otherwise, at the time of Census enumeration) the AWCs are insignificant. For *unemployed*, no significant coefficients are found among good-quality data and only 2 coefficients are significant in data sets enumerated before 1975 in medium-quality data (Figure 10d). For *inactive*, 2 positive and significant coefficients (Greece 1971, Brazil 1970) are found in good-quality data sets enumerated before 1975 and 2 in medium-quality data sets enumerated before 1975 (Brazil 1960, Haiti 1971) (Figure 10e).

In general, the picture conveyed across the five additional dependent variables is similar to our main results and even less evidence for a global Spanish Flu effect is found.

In summary, our robustness checks confirm our notion that there is little evidence for a clear in-utero effect of the Spanish Flu across the world. However, we further our analysis in the following section.

6 Meta-level analysis

To detect patterns among our coefficients we perform a series of meta-analyses of our coefficients of interest obtained from the data sets and described in the section above. Specifically, we use our coefficients of interest collected from the analysis of individual Census data sets as the (meta) dependent variable for the meta-analysis. We then run random-effects meta-analysis models[41] (cf. van Ewijk and Sleegers 2010) where we regress these coefficients, weighted by the inverse of their respective estimation variance, onto a set of meta regressors in order to find determinants of coefficient sizes. Essentially, this treats our estimates as a random sample from all possible estimates and the model allows for systematic differences between coefficients from different data sets. We estimate regressions of the form

$$\beta_{1,j} = \alpha_0 + \sum_k \alpha_k * X_j + e_j + u_j \qquad \text{eq. 2}$$

where $\beta_{1,j}$ is the coefficient of interest from the main specification weighted by its total variance. $\propto_0$ is the constant and can be interpreted as the average weighted coefficient and X_j is a matrix of country-specific meta-regressors described below. For each dependent variable analysis we compute the general AWC (column 1), investigate whether it changes when including country dummies (column 2), check whether the Census year explains coefficient sizes (column 3), estimate whether the continent or quality of data drive coefficient sizes (columns 4-6), investigate which of the two determinants of data quality matters (column 7) and whether not having the reported year of birth (column 8) or the nativity status (column 9) plays a role in explaining coefficient sizes. In column 10 we investigate whether the information on the timing of the pandemic drives our AWCs and in columns 11 and 12 we estimate whether countries that experienced World War I produce different coefficients than non-affected countries[42]. Tables 4a through 4b show the corresponding results for each of our four dependent variables.

Primary Education

Column 1 of Table 4a shows the average weighted coefficient (AWC) of interest across all coefficients for the dependent variable *primary* denoted as the constant. Regressing this meta-dependent variable onto a constant yields the average weighted coefficient of interest, computed across all 103 data sets (in the graphs the AWC is always computed for each quality category). We obtain a statistically significant and slightly positive AWC meaning that across all 103 data

41 Typically, these models are used in meta-analysis, i.e. to compute a pooled estimate from results collected from a series of published studies. Usually, these studies differ slightly in their methodology. Furthermore, the authors of the meta-analysis may not recover all information from certain studies, both of which is accounted for in the model. In our case, the same methodology is used for each data set and no uncertainty exists since we perform the individual analyses ourselves. Hence, our meta-analysis estimates should be more precise then the traditional study-based meta-analyses.

42 Apart from the results shown here we performed a serious of related meta-analyses and always found similar results to the ones presented here.

sets the 1919 birth cohort is more likely to have achieved primary education compared to the general trend. Column 2 adds country dummies to account for the number of estimates collected from the same country. The AWC reduces to roughly one third of its raw size and loses significance.

When controlling for the year of Census enumeration (Column 3) both the AWC and the respective meta-coefficient are estimated as insignificant. We conclude that our coefficients from later Census years do not differ from those of data sets enumerated in earlier Censuses which somewhat assures us that there is no bias due to attrition of observations at older ages.

In columns 4, 5 and 6 we investigate whether data quality and/or the continent of the Census determine the coefficient size. As these are mutually exclusive dummy variables we cannot estimate a constant / AWC in these cases. Our results convey that coefficients in medium-quality data sets are larger (more positive) than those from good-quality data sets and this difference is statistically significant at the one percent level (F-Test and p-value reported at the bottom of Table 4a). When looking for differences in coefficient sizes due to the origin of data sets Latin American and Asian Census data sets are found to yield positive coefficients of interest whereas European, Northern American and African data sets do not show systematically different results for the influenza cohort compared to the respective general trend. The F-Test of the equality of these five meta-coefficients returns a p-value below five percent. In a further step we interact the quality of the data with the continent of enumeration and find that only medium-quality data sets from Latin America and Asia are associated with positive coefficients of interest whereas their good-quality counterparts are computed to have average coefficients close to zero. For European and Northern American (only good quality) and African data sets (only medium quality) such a distinction cannot be made. This leads us to the conclusion that there are in fact no in-utero effects of the influenza pandemic with respect to completion rates of primary education. While this is likely not the relevant education threshold for European and Northern American data sets (e.g. due to mandatory primary education) it certainly is for developing countries of the enumerated time span. As we only find the 1919 cohort to differ in medium-quality data sets we tend to think that this is a biased effect due to heaping and missing observations rather than the true in-utero influenza effect.

In columns 7, 8 and 9 we investigate whether certain data properties explain coefficient sizes and find that the driver behind the difference between medium- and good-quality data set coefficients is the intensity of heaping in the reported or computed year of birth (*myers_year*) rather than the percentage of missing observations (*p_miss_year*). Specifically, the worse the heaping in a given data set the larger the coefficient of being exposed to the Spanish Flu in utero. Above and beyond the difference between medium- and good-quality data the use of the computed year of birth rather than the reported year of birth does not explain coefficient sizes (column 8 controls for medium-quality data, the use of the computed year of birth and the interaction of these) and this result is also true for using the index of heaping instead of the indicator for medium-quality data (not shown). Similarly, data sets without the nativity status do not yield different coefficients of Flu exposure over and above the difference between medium- and good-quality data (column 9).

Column 10 investigates whether the accuracy of the information on the timing of the Spanish Flu as displayed in Table 1b matters for the size of the coefficients. Based on this table we create three indicators, namely *bothdates* equaling one if for a given country both the beginning and the end of the second wave is known and zero otherwise. *startdate* equals one if only the beginning is known but the end of the pandemic is unclear and *nodate* equals one if neither the start nor the end of the second wave is reported in the table. While having some information on the timing is associated with larger coefficients an F-Test of the equality of these three coefficients reveals no statistical difference between them with a p-value of 0.86. A test of the equality of having both versus only the start date (not shown) confirms that there is no statistical difference between the Flu cohorts in countries with and without information on the exact timing of the pandemic. This is perhaps not surprising as we cannot claim that Table 1 is complete.

Finally, columns 11 and 12 investigate the impact of World War I on our coefficients. The indicator *belligerent* equals one for countries that declared and actively participated in the war whereas *non_belligerent* is equal to one for countries that were neutral or never participated in the war despite declaring their allegiance to other countries. While column 11 suggests that non-war countries are associated with larger coefficients compared to countries actively participating in the war column 12 shows that it is again the quality of the data sets and not their participation in the war that drive the size of coefficients. We obtain similar results both in terms of (meta-) coefficient sizes and significance levels for indicators of food shortages or the introduction of rations (not shown) as well as an indicator for battle fields within a country though on a slightly smaller sample size[43] as we could not recover these data for all of our countries.

In summary, the meta-analysis for coefficients obtained from the regression of primary education further cements our view that data issues are the culprit behind misleadingly significant coefficients rather than a global Spanish Flu effect.

[43] Running the entire meta-analysis on these smaller samples yields qualitatively similar results.

Secondary Education

Table 4b repeats the meta-analyses of Table 4a for coefficients of interest from the analysis of completion rates of secondary education. As expected based on Figure 4b columns 1, 2 and 3 show no average difference between the 1919 and surrounding cohorts. The year of Census enumeration does not play a role in explaining coefficient sizes assuring us that attrition from the sample at older ages does not systematically bias our results, at least across our data sets. We do not find any differences between good- and medium-quality data sets but again the index of heaping is associated with slightly increasing coefficients sizes which again demonstrates that the quality of data matters. Furthermore, we do not find statistical differences between coefficients from different continents but Northern American influenza cohorts seem to be slightly worse off than the general trend regarding their completion rates of secondary education (which is in line with Almond (2006) findings). However, these meta-coefficients are not statistically different from each other as revealed by the F-Test.

Moreover, none of our other meta-regressors is a statistically significant predictor of coefficient sizes over and above the effect of data quality and the AWC is insignificant in all meta-specifications. Hence, we do not find any global influenza effect regarding educational attainment.

Disability

Similarly, Table 4c displays the results of the meta-analyses of the coefficients obtained from the analysis of the dependent variable *workdisability*. The AWC is insignificant in all meta-specifications except when introducing country indicators (column 2). Neither the Census year, nor the continent or quality of data explain coefficient sizes. While the use of the computed rather that the reported year of birth does not impact coefficient sizes the availability of the nativity status is associated with different coefficient sizes. The reported F-Test assesses the equality of medium-quality data sets with and without the nativity status and concludes that these yield different coefficients of influenza exposure. However, the coefficient of *medium_no_nativity* displaying the interaction between medium-quality and non-available nativity status is identified on only three observations. When excluding the interaction term neither nativity, the quality of data or the AWC are estimated as statistically significant (not shown).

In Table 4c data sets without any information on the timing of the pandemic are associated with significantly smaller coefficients of exposure but this coefficient is identified based on only 2 out of 33 observations (Dominican Republic 1970, Saint Lucia 1980). Lastly, we do not find a differences in the effect of Flu exposure between participants and non-participants of World War I (columns 11 and 12) and this also holds for indicators of food shortages, the introduction of rations or battle fields within the country (results not shown).

Employment

Table 4d presents the results of the meta-analysis of the coefficients from the analysis of the employment status. Again, and not surprising given Figure 4d, the AWC is insignificant in all specifications. None of our meta-regressors explains coefficient sizes with the exception of the availability of the nativity indicator. Data sets that do not report the birth place or country (where, therefore, the sample could not be reduced to native-born respondents) are associated with negative coefficients of interest and this holds over and beyond the effect of data quality as well as when reducing the coefficients to those obtained from data sets enumerated before or in 1974.

7 Conclusions

This study attempts to analyze the effect of the 1918 influenza pandemic on a global level thereby complementing various studies based on single countries. In summary, no clear pattern could be detected regarding the effects of in-utero exposure to the deadly second wave of the influenza pandemic on educational attainment, disability rates and employment shares. While for a few data sets significant differences between the influenza and surrounding cohorts can be found these are in the minority and further subdivide into positive and negative effects suggesting no clear pattern. The meta-analysis further confirms our notion that there are no global in-utero effects of the 1918 Spanish Flu across nine dependent variables despite its global embrace. Our results are robust to reducing the trend against which the 1919 cohort is compared against to 1910 – 1913 & 1919 – 1928 (i.e. excluding the birth cohorts of the war born 1914 – 1918) and to reducing it to the trend used in Almond (2006), namely 1912 – 1922.

Limitations of this study arise from unobserved heterogeneity. A first limitation pertains to the data used. While the harmonization effort of IPUMS International made this research possible the very nature of harmonization also introduces a certain measurement error. Despite largely comparable educational categories some underlying country-specific educational standards remain. Underlying differences in the employment and disability indicators are possible as well but less likely. In an attempt to exclude mixing definitions, each data set was therefore analyzed separately and a meta-analysis was chosen over a fixed effects analysis which would have netted out data set-specific differences. Still, the categories of *edattan* provided by IPUMS International are relatively brought and each subsume a large fraction of the educational spectrum thereby possibly disguising true effects. A subsequent analysis could investigate country-specific education variables instead of harmonized variables to assess whether effects can be found in the original data sets.

A second possible limitation of this study arises from measurement error in the definition of exposed versus unexposed cohorts. As discussed above the literature on influenza timings is not always unanimous in the definition of waves, their duration and their timing. Hence, measurement error is not unlikely and furthermore augmented as only yearly birth data are available for a majority of countries making a more distinct analysis impossible. Garthwaite (2008) points to the importance of defining small cohorts to investigate the impact of influenza as fetal health reacts differently at different points in gestation. Hence, using broader cohorts could possibly lead to effects canceling each other out and thus to insignificant results. The meta-analysis comes to our defense as we cannot detect differences in coefficient sizes depending on whether we have data on the exact timing of the deadly wave. Secondly, our analysis presents an ITT-approach in which both the share of the 1919 birth cohort never exposed prenatally (born in the last quarter of 1919) and the share of those that were born in the earlier quarters of 1919 but by uninfected mothers attenuate the effect of the truly exposed cohort. While we cannot claim causality for this matter our results compare to the country-specific studies. While these studies find Flu effects we cannot confirm these on a global basis using the same specification and even find less significant coefficients than in our main specification when reducing the interval to the one used in the studies. Furthermore, our results indicate that there were no global long-term effects on the cohort level even if individual effects may exist.

A possible reason for insignificant results could also be due to selective mortality. In Bombay, India, stillbirths are reported to have risen by 50 percent during the height of the pandemic (cf. Ramanna 2003, p. 89). If those fetuses in bad health were stillborn than the resulting population of surviving fetuses would display a positive selection in terms of health and, therefore, negative effects would only surface if the effects of health shocks overcompensate those of the positive selection (cf. Almond and Currie 2011). Insignificant results could therefore truly mean the absence of effects or a form of estimation bias. Another source of error is discussed by Almond and Currie (2011) who admit that disentangling the effects of in-utero shocks from those occurring during infancy might prove difficult. For example, Echeverri (2003) writes that influenza also increased the death rate among post-partum women in Spain (cause: puerperal septicaemia) which could mean that infants that survived fetal exposure to influenza could still be affected by influenza albeit in an indirect manner[44]. In this case, influenza would not operate through the channel proposed by the Fetal Origins Hypothesis but through economic deprivation in childhood. It is impossible, with the data at hand, to distinguish between these effects.

Lastly, the role of the First World War is unclear. Possible influences could be ranging from malnutrition of pregnant mothers thereby depriving their unborn child (though this is another field of research concerning the Fetal Origins Hypothesis, here, it would mask the effect of influenza) to selective marriage and, thus, selective fertility and forgone births among the parent generation. In Britain, officially 2500 pregnant women died of influenza yielding 2500 forgone births though both numbers are likely heavily understated as both influenza victims and aborted or stillborn pregnancies were not necessarily recorded during war and pandemic times. Johnson (2003) concludes that an estimated 5000 averted births can be attributed to influenza in Britain alone. For Sweden, Boberg-Fazlic et al. (2017) find an immediate fertility reduction due to morbidity and mixed fertility responses due to mortality which depends on the socioeconomic characteristics of parents. Brown and Thomas (2011) find that the parent generation of those deemed exposed to influenza were significantly less literate and displayed a lower economic status than the parent generations of the surrounding cohorts. This would likely constitute a significant difference in endowments between the cohorts exposed to influenza in utero and those who were not but these differences would not accrue to the effect of influenza while likely still posing long-term differences. Disentangling these two effects is impossible in the analysis presented here and a detailed analysis of this notion in a global fashion could prove insightful. Our meta-analysis does not indicate that our results are driven by whether or not a country was affected by World War I.

This being said, most of the above-mentioned limitations also apply to the various published studies which found significant adverse effects of in-utero exposure to the 1918 influenza pandemic on later life outcomes. Studying all comparable census data sets that are available for countries around the world we conclude that previous evidence on lasting negative impacts of the of in-utero exposure to the 1918 influenza pandemic is likely a consequence of publication bias.

44 In Spain, the official death toll of influenza equals 165,024 deaths though Echeverri (2003) concludes that influenza through indirect channels (increased mortality of other respiratory diseases, misreported causes of deaths as well as the increase in all cause-specific deaths despite Spain being neutral) caused up to 257,082 deaths (excluding the Canary islands).

References

Almond, Douglas. 2006. “Is the 1918 Influenza Pandemic Over? Long-Term Effects of In Utero Influenza Exposure in the Post-1940 U.S. Population.” *Journal of Political Economy* 114 (4):672–712. https://doi.org/10.1086/507154.

Almond, Douglas, and Janet Currie. 2011. “Killing Me Softly: The Fetal Origins Hypothesis.” *Journal of Economic Perspectives* 25 (3):153–72.

Ansart, S., C. Pelat, P.-Y. Boelle, F. Carrat, A. Flahault, and A.-J. Valleron. 2009. “Mortality Burden of the 1918–1919 Influenza Pandemic in Europe.” *Influenza and Other Respiratory Viruses* 3:99–106. https://doi.org/10.1111/j.1750-2659.2009.00080.x.

Barker, David J. 1998. “In Utero Programming of Chronic Disease.” *Clinical Science* 95 (2):115–28.

Benjamini, Yoav, and Yosef Hochberg. 1995. “Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing.” *Journal of the Royal Statistical Society. Series B (Methodological)* 57 (1):289–300.

Boberg-Fazlic, Nina, Maryna Ivets, Martin Karlsson, and Therese Nilsson. 2017. “Disease and Fertility: Evidence from the 1918 Influenza Pandemic in Sweden.” *IZA Discussion Papers* 10834. http://hdl.handle.net/10419/170818.

Böhm, A. 1918. “Zur Epidemiologie Der Herrschenden Grippeepedemie.” *Wien. Med. Wschr.* 45:1974.

Brown, Ryan, and Duncan Thomas. 2011. “On the Long Term Effects of the 1918 US Influenza Pandemic.” Unpublished Manuscript. Duke University. https://sites.duke.edu/ryanbrown/files/2013/09/1918Flu_Brown_Thomas_20131.pdf.

Chandra, Siddharth. 2013. “Mortality from the Influenza Pandemic of 1918–19 in Indonesia.” *Population Studies: A Journal of Demography,* 67 (2):185–93. https://doi.org/10.1080/00324728.2012.754486.

Chowell, Gerardo, Cécile Viboud, L. Simonsen, M. A. Miller, J. Hurtado, G. Soto, R. Vargas, M. A. Guzman, M. Ulloa, and C. V. Munayco. 2011. “The 1918–1920 Influenza Pandemic in Peru.” *Vaccine*, Historical Influenza Pandemics, 29 (July):B21–26. https://doi.org/10.1016/j.vaccine.2011.02.048.

Chowell, Gerardo, Cécile Viboud, Lone Simonsen, Mark A. Miller, and Rodolfo Acuna-Soto. 2010. “Mortality Patterns Associated with the 1918 Influenza Pandemic in Mexico: Evidence for a Spring Herald Wave and Lack of Preexisting Immunity in Older Populations.” *The Journal of Infectious Diseases* 202 (4):567–75. https://doi.org/10.1086/654897.

Chowell, Gerardo, Cécile Viboud, Lone Simonsen, Mark A. Miller, Rodolfo Acuna-Soto, Juan M. Ospina Díaz, and Abel Fernando Martínez-Martín. 2012. “The 1918–19 Influenza Pandemic in Boyacá, Colombia.” *Emerging Infectious Diseases* 18 (1):48–56. https://doi.org/10.3201/eid1801.101969.

Crosby, Alfred W. 2003. *America’s Forgotten Pandemic: The Influenza of 1918*. 2nd ed. Cambridge University Press.

Cutler, David M., and Adriana Lleras-Muney. 2006. “Education and Health: Evaluating Theories and Evidence.” *NBER Working Paper*, no. 12352 (July). http://www.nber.org/papers/w12352.

Echenberg, Myron. 2003. “‘The Dog That Did Not Bark’: Memory and the 1918 Influenza Epidemic in Senegal.” In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 230–38. Routledge Chapman & Hall.

Echeverri, Beatriz. 2003. “Spanish Influenza Seen from Spain.” In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 173–90. Routledge Chapman & Hall.

Ellison, James G. 2003. "'A Fiece Hunger': Tracing the Impacts of the 1918-19 Influenza Epidemic in Tanzania." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 221–29. Routledge Chapman & Hall.
Ewijk, Reyn van, and Peter Sleegers. 2010. "The Effect of Peer Socioeconomic Status on Student Achievement: A Meta-Analysis." *Educational Research Review* 5 (2):134–50. https://doi.org/10.1016/j.edurev.2010.02.001.
Fink, Günther, Margaret McConnell, and Sebastian Vollmer. 2014. "Testing for Heterogeneous Treatment Effects in Experimental Data: False Discovery Risks and Correction Procedures." *Journal of Development Effectiveness* 6 (1):44–57. https://doi.org/10.1080/19439342.2013.875054.
Fletcher, Jason M. 2014. "Examining the Long Term Mortality Effects of Early Health Shocks." *US Census Bureau Center for Economic Studies Paper* CES-WP-14-19 (March). https://doi.org/http://dx.doi.org/10.2139/ssrn.2423544.
Frey, K. 1919. "Influenza." *Korresp. Bl. Schweiz. Ärzte* 27:1006.
Garthwaite, Craig. 2008. "The Effect of In-Utero Conditions on Long Term Health: Evidence from the 1918 Spanish Flu Pandemic." Available at http://www.kellogg.northwestern.edu/faculty/garthwaite/htm/fetal_stress_garthwaite_053008.pdf.
Gouzien. 1920. "La Pandémie Grippale de 1918-1919 Dans Les Colonies Francaises." *Bull. Off. Internat. Hyg. Publ., Paris* 7:686–724.
Herring, D. Ann, and Lisa Sattenspiel. 2003. "Death in Winter: Spanish Flu in the Canadian Subarctic." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 156–72. Routledge Chapman & Hall.
Hobbs, Frank B. 2004. "Age and Sex Composition." In *The Methods and Materials of Demography*, edited by David. A. Swanson and Siegel, 125–74. Emerald Group Publishing.
Hunziker, H. 1919. "Epidemiologie Der Grippe." *Korresp. Bl. Schweiz. Ärzte* 49:551–53.
Iijima, Wataru. 2003. "Spanish Influenza in China. 1918-1920: A Preliminary Probe." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 101–9. Routledge Chapman & Hall.
Johnson, Niall P. 2003. "The Overshadowed Killer: Influenza in Britain in 1918-19." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 132–55. Routledge Chapman & Hall.
Johnson, Niall P., and Juergen Mueller. 2002. "Updating the Accounts: Global Mortality of the 1918-1920" Spanish" Influenza Pandemic." *Bulletin of the History of Medicine* 76 (1):105–15.
Karlsson, Martin, Therese Nilsson, and Stefan Pichler. 2012. "What Doesn't Kill You Makes You Stronger? The Impact of the 1918 Spanish Flu Epidemic on Economic Performance in Sweden." *IFN Working Paper* 911 (March). http://dx.doi.org/10.2139/ssrn.2051009.
Killingray, David. 2015. "1918 Influenza Pandemic Dates," May 18, 2015.
Killingray, David, and Howard Phillips. 2003a. "Introduction." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 1–26. Routledge Chapman & Hall.
Koenen, Eckhard. 1970. "Die Grippepandemie 1918/19." Universität zu Köln.
Lin, Ming-Jen, and Elaine M. Liu. 2014. "Does in Utero Exposure to Illness Matter? The 1918 Influenza Epidemic in Taiwan as a Natural Experiment." *Journal of Health Economics* 37 (September):152–63. https://doi.org/http://dx.doi.org/10.1016/j.jhealeco.2014.05.004.

Mayer, K. 1919. "Über Schutzkörpermangel Bei Grippe Nach Beobachtungen Über Die Grippe 1918 Unter Den Deutschen Truppenteilen in Konstantinopel." *Münch. Med. Wschr.* 17:461.
McCracken, Kevin, and Peter Curson. 2003. "Flu Downunder: A Demographic and Geographic Analysis of the 1919 Epidemic in Sydney, Australia." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 110–31. Routledge Chapman & Hall.
McLane, John Ryan. 2013. "Setting a Barricade against the East Wind: Western Polynesia and the 1918 Influenza Pandemic." University of Otago.
Minnesota Population Center. 2014. "Integrated Public Use Microdata Series, International: Version 6.3 [Machine-Readable Database]. Minneapolis: University of Minnesota, 2014."
Neelsen, Sven, and Thomas Stratmann. 2012. "Long-Run Effects of Fetal Influenza Exposure: Evidence from Switzerland." *Social Science & Medicine* 74 (1):58–66. https://doi.org/http://dx.doi.org/10.1016/j.socscimed.2011.09.039.
Nelson, R. E. 2010. "Testing the Fetal Origins Hypothesis in a Developing Country: Evidence from the 1918 Influenza Pandemic." *Health Economics* 19:1181–1192. https://doi.org/doi: 10.1002/hec.1544.
Nolf et al. 1919. "L'édidémie de Grippe à l'armée de Campagne Belges (Mai-Décembre 1918)." *Arch. Méd., Paris* 1:149.
Oxford, John S. 2003. "A Virologist's Foreword." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, xvii–xix. Routledge Chapman & Hall.
Patterson, K. David, and Gerald F. Pyle. 1991. "The Geography and Mortality of the 1918 Influenza Pandemic." *Bulletin of the History of Medicine* 65 (1):4–21.
Ramanna, Mridula. 2003. "Coping with the Influenza Pandemic: The Bombay Experience." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 86–98. Routledge Chapman & Hall.
Rice, Geoffrey W. 2003. "Japan and New Zealand in the 1918 Influenza Pandemic: Comparative Perspectives on Official Responses and Crisis Management." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 73–85. Routledge Chapman & Hall.
Rosenfeld, S. 1921. "Die Grippeepidemie Des Jahres 1918 in Österreich." *Veröff. Volksgesd. Amt., Wien* 13:5 ff.
Taubenberger, Jeffery K., and David M. Morens. 2006. "1918 Influenza: The Mother of All Pandemics." *Emerging Infectious Diseases*, no. 12.1:15–23.
Vaughan, Warren Taylor. 1921. "Influenza: An Epidemiologic Study." *American Journal of Hygiene Monograph* 1–3:65–95.
Zanden, Jan Luiten van, Joerg Baten, Marco Mira d'Ercole, Auke Rijpma, Conal Smith, and Marcel Timmer. 2014. *How Was Life?: Global Well-Being since 1820*. OECD Publishing. doi: 10.1787/9789264214262-en.
Zylberman, Patrick. 2003. "A Holocaust in a Holocaust: The Great War and the 1918 'Spanish' Influenza Epidemic in France." In *The Spanish Influenza Pandemic of 1918-1919: New Perspectives*, edited by David Killingray and Howard Phillips, 1 edition, 191–201. Routledge Chapman & Hall.

Appendix

Table 1a Timing of First Wave of Influenza Pandemic

Beginning	End	Country / Region
March 5 1918[1,48]		USA
March 1918[1] April 1918[48] April / May 1918[39]	August 1918[39]	France
March 1918[1] May 1918[48] End of May[66]	August 1918[12] June 1918[66]	China
March 1918[1]		Japan
March 1918[66]		Hongkong
April 1918[55] April 2, 1918[55]	May 1918[55] June 3, 1918[55]	Mexico (Mexico City) Mexico (Toluca)
April 1918[1]		Germany (western front)
May 1918[1] June 1918[48]	August 1918[3]	Germany
May 1918[2]		Belgium
May 1918[1] June 1918[48]	August 1918[4]	Great Britain
May 1918[1,48,57] June 1918[38]	August 1918[38] June/July 1918[57]	Spain
May 1918[48]		Portugal
May 1918[1,48]		Greece
May 1918[1,48]		Egypt
May 1918[1]		Tahiti and Society Islands
2nd Half May 1918[44] June 15 1918[1]	August 1918[5,43]	Switzerland
May 1918[48] June 1 1918[1] June 10 1918[33] July 1918[48] Spring / summer 1918[65]	July 1918[11,33]	India
April - June 1918[48] June 15 1918[1] 1918[60]	Sept. 1918[6] 1920[60]	Italy
June 15 1918[1]	July 1918[7]	Austria
June 1918[48]		Scandinavia
June 15 1918[45] Midsummer's eve (June), 1918[54]	July 1918[45]	Sweden Southern Sweden
June 15 1918[1]	July 1918[4]	Norway
June 16 1918[1] June 1918[48] Never[56]		Brazil
June 1918[9]		Puerto Rico
June 25 1918[1]		St. Pierre and Miquelon
June 25 1918[1]		Martinique
June 1918[48] July 1918[48] August 1918[36] Never[49]		Australia
June 1918[48]		New Zealand
June 1 1918[1]		Philippines
July 1918[51] June / early July 1918[51]	Early Sept. 1918[51]	Malaysia
June / early July 1918[51]	Early Sept. 1918[51]	Singapore
June 1918[48] July 1918[51]	Sept. 1918[51]	Western islands of Dutch East Indies (Indonesia)
June / early July 1918[51]	Early Sept. 1918[51]	Northern Sumatra
June / July 1918[48]?		Poland
June / July 1918[48]?		Romania
June / July 1918[48]?		Hungary
June / July 1918[48]?		Balkan States
June / July 1918[48]?		Czechoslovakia
July 1918[1,48]	August 1918[8]	Turkey (including parts of Syria)
July 1918[1]	August 1918[10]	Guadelupe
July 1918[64,67]	Sept. 1918[64,67]	Chile (Concepción)
July 1918[64]	Sept. 1918[64]	Peru (Lima)
July 9, 1918[63]		Canada
June 1 1918[1,48]		Indochina (Cambodia, Eastern Thailand, Southern Laos and Middle and Southern Vietnam)
July 1918[1] July 1918[1]		Tonking (Northern Vietnam) Annam (central Vietnam)
July 1918[1]		Cochinchina (Southern Vietnam and Eastern Cambodia)
July 1918[1]		Cambodia
July 1918[1]		Laos
Middle of July 1918[51]		Western Borneo (Kalimantan)
July 1918[1]		Côte d'Ivoire
July 1918[48]		Northern Africa
Never[48]		Russia
Never[48]		Sub-Saharan Africa
Never[51]		Eastern islands of Dutch East Indies (Indonesia)
Never[59]		Columbia

continued on the next page...

Table 1b Timing of Second Wave of Influenza Pandemic

Beginning	End	Country / Region
January 1918[42] October 1918[48]	*June 1919[42]*	*Finland*
Early August 1918[48] *August 1918[39,42]* Early Sept. 1918[13]	February 1919[14] April 1919[42]	France
August 1918[48] Early Sept. 1918[13]	January 1919[68]	USA(Boston)
October 1918[68]	January 1919[68]	USA

continued on the next page...

Table 1b	Timing of Second Wave of Influenza Pandemic	
Beginning	**End**	**Country / Region**
August 1918[48] August 28, 1918[62]		Sierra Leone (Freetown)
August 1918[48,62]		Gambia
August 1918[48]		Guinea Bissau
August 1918[48] Early Sept. 1918[13]		Guinea
August 1918[48]? October 1918[13]	Early Nov. 1919[21]	Côte d'Ivoire
August 1918[35] *October 1918[32]* 1918[60]	December 1918[32] 1920[60]	Japan
August 1918[42] Sept. 1918[13,48]	*February 1919[42]*	Italy
August / Sept. 1918[45] Early Sept. 1918[13,42] Sept. / October 1918[48] Sept. 1918[54]	December 1918[45] *May 1919[42]*	Sweden
Early Sept. 1918[13] Sept. 1918[48]	February 1919[17]	Austria
Early Sept. 1918[13] Sept. 1918[48]	December 1919[18]	Greece
July 1918[42] Early Sept. 1918[13] Sept. 1918[48] Late Sept. 1918[44]	December 1918[44] January 1919[19] *June 1919[42]*	Switzerland
June 1918[42] Early Sept. 1918[13,38,48] Sept. 1918[57]	December 1918[38,57] *February 1919[42]*	Spain
Sept. / October 1918[48] *March 1918[42]*	*June 1919[42]*	Portugal
Early Sept. 1918[13,42] Sept. 1918[48]	*May 1919[42]*	Norway
Early Sept. 1918[48]		Haiti
Early Sept. 1918[48]		Nicaragua
Early Sept. 1918[48]		El Salvador
Early Sept. 1918[48]		Honduras
Early Sept. 1918[48]		Costa Rica
Early Sept. 1918[13,34] Sept. 7-14, 1918[65]	January 1919[34] January 1919[65]	India
Early Sept. 1918[13,41]	December 1918[41]	Senegal
Early Sept. 1918[62]		French West Africa (Dakar) (Senegal)
Sept. 1918[62]		East African coast
Sept. 1918[13,48]		Belgium
Sept. 1918[13]		St. Pierre and Miquelon
Sept. 1918[13]		French Somaliland (Djibouti)
Sept. 15, 1918[13] Sept. 1918[48]		South Africa
Sept. 1918[62]		South Africa (Durban)

continued on the next page...

Table 1b	Timing of Second Wave of Influenza Pandemic	
Beginning	**End**	**Country / Region**
Sept. 8, 1918[37] Sept. 19 1918[13] End of Sept. 1918[63]	End of Winter 1918[37]	Canada (including Inuit populations in Alaska)
Sept. 19 1918[13,48] *March 1919[42]*	January 1919[16,42]	Germany
Sept. 29, 1918[58]	February 1, 1919[58]	Prussia (Arnsberg and surrounding districts) (Northern Germany)
2nd Half Sept. 1918[13] Late October 1918[48]		Hungary
2nd Half Sept. 1918[13] Sept. 1918[48]		Balkan States
Sept. 1918[48]		Russia
Sept. 1918[48]		North Africa
Sept. 1918[48]		Venezuela
Sept. 1918[48]		Colombia
October 20, 1918[59]	January 26, 1919[59]	Colombia (Boyacá)
Sept. 1918[48]		Israel
Sept. 1918[48]		Palestina
Sept. 1918[48]		Jordan
Sept. 1918[48]		Iraq
Late Sept. 1918[48]		Jamaica
Late Sept. 1918[48]		Panama
Late Sept. 1918[48]		Belize
Late Sept. 1918[48]		Guatemala
Late Sept. / October 1918[48]		Mexico
October 1918[55]	December 1918[55]	*Mexico (Mexico City)*
October 1, 1918[55]	December 23[55]	*Mexico (Toluca)*
Late Sept. 1918[13]	December 1918[15]	Great Britain
Sept. 1918[48] *October 1918[42]*	*April 1919[42]*	England and Wales
Sept. 1918[48] *October 1918[42]*	*April 1919[42]*	Scotland
Sept. 1918[48] *October 1918[42]*	*April 1919[42]*	Denmark
Autumn 1918[46] Sept. / October 1918[48] Sept. 14, 1918[53,56] October 8 1918[13]	January 1919[53]	Brazil
Sept. 1918[48] October 1918[13]		Egypt
Sept. / October 1918[48]?		Kenya
Sept. 15, 1918[13] Sept. 1918[48]	January 1919[20]	French West Africa (Mauritania, Senegal, Mali, French Guinea, Côte d'Ivoire, Burkina Faso, Benin, Niger)
Sept. / October 1918[48]? October 1918[40]	January 1919[40]	Tanzania
October 1918[62]		Southern Rhodesia (Zimbabwe)

continued on the next page...

Table 1b — **Timing of Second Wave of Influenza Pandemic**

Beginning	End	Country / Region
October 1918[62]		Uganda
October 1918[13]	May 1919[21]	Mauritania
October 7 1918[21]	December 11 1918[21]	Dahomey (Benin)
October 1918[13]	February 24 1919[22]	Niger
October 22, 1918[62]		Togo (Lomé)
October 1918[48]		Sri Lanka
October 1918[48]		Bangladesh
October 1918[48]		Turkey
October 1918[13] Nov. 1918[48]		(French) Equatorial Africa (Chad, Central African Republic, Republic of the Congo, Gabon, Cameroon)
October 15 1918[13]	At least until December 1918[23]	Cameroon
October 1918[13]		Gabon
October 1918[13]		Ghana (Gold Coast)
August 31, 1918[62]		Ghana (Cape Coast)
October 10 1918[13] October 1918[48]	At least until December 1918[24]	German South-West Africa (Namibia)
October 1918[48]		Peru
October 20 1918[13,48]		Iceland (parts)
October 1918[48]		Poland
October 1918[32,48]	December 1918[32]	New Zealand
October 1918[48]		Philippines
October 1918[48,62]		Bechuanaland Protectorate (Botswana)
October 1918[48]		Swaziland
Late October 1918[43]	(December) 1918[43]	Taiwan
October 1918[48] Early Nov. 1918[13]	April 1919[27]	Indochina (Cambodia, Eastern Thailand, Southern Laos, Middle and Southern Vietnam)
October 1918[48] Early Nov. 1918[13]		Guyana
October 1918[51] Nov. 1918[48]?	December 1918[51]	Indonesia
October / Nov. 1918[48]?		Nepal
October / Nov. 1918[48]?		Pakistan
October / Nov. 1918[48]		Argentina
October / Nov. 1918[48] October 16, 1918[67] Nov. 1918[64]	February 1919[67]	Chile
December 1918[67]	January 1919[67]	Chile (Concepción)
Nov. 1918[67]	February 1919[67]	Chile, Peru, Colombia, Argentina, Uruguay
1918[35] Sept. 1918[48]	January 1919[28] 1920[35]	China
Early Nov. 1918[47,52,61]	January 1919[47]	Fiji
Early Nov. 1918[13]		Martinique

continued on the next page...

Table 1b — **Timing of Second Wave of Influenza Pandemic**

Beginning	End	Country / Region
Early Nov. 1918[13]		Guadelupe
Early Nov. 1918[13,61]		Tahiti and Society Islands (French Polynesia)
Early Nov. 1918[62]		French Upper Volta (Burkina Faso)
Early Nov. 1918[13]	January 1919[25]	Republic of the Congo
Nov. 1918[13]		Belgian Congo (Democratic Republic of the Congo)
Nov. 1918[48]		Angola
Nov. 1918[48] October 1918[62]		Nyasaland Protectorate (Malawi)
Nov. 1918[48] April 1919[13]	Late August 1919[29]	Madagascar
Nov. 1918[48]		Bolivia
Nov. 1918[48]		Ecuador
Nov. 1918[48]?		Malaysia
Nov. / December 1918[61]		Tasmania, Nauru, Tonga, Guam, Western Samoa, New Zealand
December 14 1918[26]	August 1919[26]	Chad
2^{nd} Half of December 1918[25]	January 15 1920[25]	Ubangi-Shari (Central African Republic)
January 1919[36,48,61]	August 1919[36]	Australia (Sydney)
January 1919[36,48,61]	December 1919[36]	Australia (Continental)
March 1918[42]	*January 1919*[42]	Bulgaria
April 1919[13]	May 1919[30]	Réunion
October 1918[66] 1918[35]	December 1918[66] 1920[35]	Hongkong
1918[35]	1920[35]	Taiwan
1918[35]	1920[35]	Southern Manchuria
Never[48,61]		American Samoa
Never[50]		St. Helena
Never[63]		Tristan da Cuntia
Never[48]		Northern and Eastern Iceland

Table 1c — **Timing of Third Wave of Influenza Pandemic**

Beginning | End | Country / Region
Table 1c — Timing of Third Wave of Influenza Pandemic

Beginning	End	Country / Region
Winter 1918 / 1919[39] February 1919[31]	Winter 1918 / 1919[39]	France
1918[60]	1920[60]	Italy
January 1919[38,57] April 1920[42]	June 1919[38,57]	Spain
January 1919[51]	February 1919[51]	Indonesia (parts of)
February 1919[44] April 1920[42]	March 1919[44]	Switzerland

continued on the next page...

Table 1c	Timing of Third Wave of Influenza Pandemic	
Beginning	**End**	**Country / Region**
March 1919[45] Late spring 1919[54]	April 1919[54]	Sweden
April 1920[42]		Finland
April 1920[42]		Denmark
April 1920[42]		Germany
(April) 1919[43]	(January) 1920[43]	Taiwan
July 17, 1921[61]		New Caledonia
July 1919[64,67] Spring 1920[67]	February 1920[64,67] Summer 1921[67]	Chile
August 1919[67]	February 1920[67]	Chile (Concepción)
August 1919[61]		Tasmania
Around August 1919[64]		Uruguay, Chile, Colombia, Argentina, Peru
1919[32]	1919[32] 1921[35]	Japan
January 1, 1920[55]	March 11, 1920[55]	Mexico (Toluca)
February 1920[55]	March 1920[55]	Mexico (Mexico City)
Never[59]		Colombia (Boyacá)

Sources for Tables 1a, 1b, 1c

1	Koenen (1970), Tabelle 1, p. 10
2	Nolf et al. (1919) Koenen (1970), p. 15
3	Koenen (1970), p. 18
4	Koenen (1970), p. 19
5	Hunziker (1919) in Koenen (1970), p. 20
6	Frey in Koenen (1970), p. 20
7	Böhm (1918) in Koenen (1970), p. 21
8	Mayer (1919) in Koenen (1970), p. 21
9	Koenen (1970), p. 21
10	Vaughan (1921-1924) in Koenen (1970), p. 22
11	Gouzien (1920) in Koenen (1970), p. 22
12	Vaughan (1921-1924) in Koenen (1979), p. 22
13	Koenen (1970), Tabelle 2, p. 24
14	Koenen (1970), p. 27
15	Koenen (1970), p. 29
16	Koenen (1970), p. 34
17	Rosenfeld in Koenen (1970), p. 36
18	Vaughan (1921-1924) in Koenen (1970), p. 37
19	Koenen (1970), p. 38
20	Koenen (1970), p. 50
21	Koenen (1970), p. 51
22	Koenen (1970), p. 52
23	Koenen (1970), p. 53
24	Koenen (1970), p. 59
25	Koenen (1970), p. 60
26	Gouzien (1920) in Koenen (1970), p. 61
27	Gouzien (1920) in Koenen (1970), p. 64
28	Koenen (1970), p. 65
29	Gouzien (1920) in Koenen (1970), p. 66
30	Gouzien (1920) in Koenen (1970), p. 67
31	Koenen (1970), p. 65
32	Rice (2003), p. 74
33	Ramanna (2003), p. 86-87
34	Ramanna (2003), p. 88
35	Iijima (2003)
36	cf. McCracken and Curson (2003)
37	Herring and Sattenspiel (2003), p. 156
38	Echeverri (2003)
39	Zylberman (2003), p. 192
40	Ellison (2003), p. 224
41	Echenberg (2003), p. 230
42	Ansart et al. (2009)
43	Lin and Liu (2013)
44	Neelsen and Stratmann (2012)
45	Karlsson et al. (2012)
46	Nelson (2010)
47	McLane (2013)
48	Patterson and Pyle (1991)
49	Johnson and Mueller (2002)
50	Killingray and Johnson (2003)
51	Chandra (2013)
52	Rice (2005)
53	Nelson (2010)
54	Bengtsson & Helgartz (2015)
55	Chowell et al. (2010)
56	Massad et al. (2007)
57	Trilla et al. (2008)
58	Nishiura (2007)
59	Chowell et al. (2012)
60	Percoco (2014)
61	McLead et al. (2008)
62	Patterson (1983)
63	Dickin McGinnis (1977)
64	Chowell et al. (2014a)
65	Chandra & Kassens-Noor (2014)
66	Cheng & Leung (2007)
67	Chowell et al. (2014b)
68	Almond (2006)

Table 2

Table 2: Data set characteristics															
		availability of variable													
Country	Year	age	birthyr	nativity	primary	secondary	workdisability	employed	Density	N	Category	Continent	enddate	WWI	IPUMSComment
Argentina	1970	Yes	No	Yes	Yes	Yes	No	Yes	2	466892	good	Latin America	unknown	neutral	
Argentina	1980	Yes	No	Yes	Yes	Yes	No	Yes	10	2667714	good	Latin America	unknown	neutral	
Austria	1971	Yes	Yes	No	Yes	Yes	No	Yes	10	749894	good	Europe	later	belligerent	
Austria	1981	Yes	Yes	No	Yes	Yes	No	Yes	10	756556	good	Europe	later	belligerent	
Bolivia	1976	Yes	No	Yes	Yes	Yes	No	Yes	10	461699	middle	Latin America	unknown	belligerent	
Brazil	1960	Yes	No	Yes	Yes	Yes	No	Yes	5	3001439	middle	Latin America	december	belligerent	Excludes 11 states in the north
Brazil	1970	Yes	No	Yes	Yes	Yes	Yes	Yes	5	4953759	good	Latin America	december	belligerent	
Brazil	1980	Yes	No	Yes	Yes	Yes	Yes	Yes	5	5870467	good	Latin America	december	belligerent	
Burkina Faso	1985	Yes	No	No	Yes	Yes	Yes	Yes	10	884797	middle	Africa	later	belligerent	
Cameroon	1976	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	736514	middle	Africa	december	belligerent	
Cameroon	1987	Yes	No	Yes	Yes	Yes	Yes	Yes	10	897211	middle	Africa	december	belligerent	
Canada	1971	Yes	No	Yes	Yes	Yes	No	Yes	1	214019	good	Northern America	december	belligerent	Persons not organized into hhs
Canada	1981	Yes	Yes	Yes	Yes	Yes	No	Yes	2	486875	good	Northern America	december	belligerent	Persons not organized into hhs
Chile	1960	Yes	No	Yes	Yes	Yes	No	Yes	1	88184	good	Latin America	unknown	neutral	Persons not organized into hhs
Chile	1970	Yes	No	Yes	Yes	Yes	No	Yes	10	890481	good	Latin America	unknown	neutral	
Chile	1982	Yes	No	Yes	Yes	Yes	Yes	Yes	10	1133062	good	Latin America	unknown	neutral	
China	1982	Yes	No	No	Yes	Yes	No	Yes	1	10039191	good	Asia	later	belligerent	
China	1990	Yes	Yes	No	Yes	Yes	Yes	Yes	1	11835947	good	Asia	later	belligerent	
Colombia	1964	Yes	No	Yes	Yes	Yes	No	Yes	2	349652	middle	Latin America	unknown	belligerent	Persons not organized into hhs
Colombia	1973	Yes	No	Yes	Yes	Yes	No	Yes	10	1988831	middle	Latin America	unknown	belligerent	
Colombia	1985	Yes	No	Yes	Yes	Yes	No	Yes	10	2643125	middle	Latin America	unknown	belligerent	
Costa Rica	1963	Yes	No	Yes	Yes	Yes	No	Yes	6	82345	good	Latin America	unknown	belligerent	Persons not organized into hhs
Costa Rica	1973	Yes	No	Yes	Yes	Yes	No	Yes	10	186762	good	Latin America	unknown	belligerent	
Costa Rica	1984	Yes	No	Yes	Yes	Yes	No	Yes	10	241220	good	Latin America	unknown	belligerent	
Dominican Republic	1960	Yes	No	Yes	Yes	Yes	No	Yes	6.6	201556	middle	Latin America	missing	belligerent	Persons not organized into hhs
Dominican Republic	1970	Yes	No	Yes	Yes	Yes	Yes	Yes	6.8	272090	middle	Latin America	missing	belligerent	Persons not organized into hhs
Dominican Republic	1981	Yes	No	Yes	Yes	Yes	No	Yes	8.5	475829	good	Latin America	missing	belligerent	
Ecuador	1962	Yes	No	Yes	Yes	Yes	No	Yes	3	136443	middle	Latin America	unknown	belligerent	Persons not organized into hhs
Ecuador	1974	Yes	No	Yes	Yes	Yes	No	Yes	10	648678	middle	Latin America	unknown	belligerent	
Ecuador	1982	Yes	No	Yes	Yes	Yes	No	Yes	10	806834	middle	Latin America	unknown	belligerent	
Ecuador	1990	Yes	No	Yes	Yes	Yes	Yes	Yes	10	966234	middle	Latin America	unknown	belligerent	
Fiji	1966	Yes	Yes	Yes	No	No	No	No	10	47579	good	Asia	later	belligerent	
Fiji	1976	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	57214	good	Asia	later	belligerent	
Fiji	1986	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	72158	good	Asia	later	belligerent	
France	1962	Yes	Yes	Yes	Yes	Yes	No	Yes	5	2320901	good	Europe	later	belligerent	
France	1968	Yes	Yes	Yes	Yes	Yes	No	Yes	5	2487778	good	Europe	later	belligerent	
France	1975	Yes	Yes	Yes	Yes	Yes	No	Yes	5	2629456	good	Europe	later	belligerent	
France	1982	Yes	Yes	Yes	Yes	Yes	No	Yes	5	2631713	good	Europe	later	belligerent	
France	1990	Yes	Yes	Yes	Yes	Yes	No	Yes	4.2	2360854	good	Europe	later	belligerent	
Germany (East)	1971	Yes	No	No	Yes	Yes	No	No	5	4089856	good	Europe	later	belligerent	
Germany (East)	1981	Yes	No	No	Yes	Yes	No	No	25	4278563	good	Europe	later	belligerent	
Germany (West)	1970	Yes	Yes	No	Yes	Yes	No	No	25	3094845	good	Europe	later	belligerent	Persons not organized into hhs
Germany (West)	1987	Yes	Yes	No	Yes	Yes	No	No	5	3160224	good	Europe	later	belligerent	
Greece	1971	Yes	Yes	No	Yes	Yes	No	Yes	10	845483	good	Europe	december	belligerent	
Greece	1981	Yes	Yes	No	Yes	Yes	No	Yes	10	923108	good	Europe	december	belligerent	
Guinea	1983	Yes	No	Yes	Yes	Yes	Yes	Yes	10	457837	middle	Africa	unknown	belligerent	
Haiti	1971	Yes	No	Yes	Yes	Yes	No	Yes	10	434869	middle	Latin America	unknown	belligerent	
Haiti	1982	Yes	No	No	Yes	Yes	Yes	Yes	2.5	128770	middle	Latin America	unknown	belligerent	Data missing for some arrondissements
Hungary	1970	Yes	No	No	Yes	Yes	No	No	5	515119	good	Europe	unknown	belligerent	
Hungary	1980	Yes	No	No	Yes	Yes	No	No	5	536007	good	Europe	unknown	belligerent	
Hungary	1990	Yes	No	No	Yes	Yes	No	Yes	5	518240	good	Europe	unknown	belligerent	
India	1983	Yes	No	No	Yes	Yes	No	Yes	.091	623494	middle	Asia	later	belligerent	Employment Survey
India	1987	Yes	No	No	Yes	Yes	Yes	Yes	.094	667848	middle	Asia	later	belligerent	Employment Survey
Indonesia	1971	Yes	No	Yes	Yes	Yes	No	Yes	.54	634642	middle	Asia	december	belligerent	
Indonesia	1976	Yes	Yes	Yes	Yes	Yes	No	Yes	.22	281170	middle	Asia	december	belligerent	Intercensal Survey
Indonesia	1980	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	7234577	middle	Asia	december	belligerent	
Indonesia	1985	Yes	No	Yes	Yes	Yes	Yes	Yes	.37	605858	middle	Asia	december	belligerent	Intercensal Survey
Indonesia	1990	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.51	912544	middle	Asia	december	belligerent	
Ireland	1971	Yes	No	Yes	Yes	Yes	No	Yes	10	296878	bad	Europe	missing	belligerent	Age is grouped into categories
Ireland	1979	Yes	No	No	No	No	No	No	10	337686	bad	Europe	missing	belligerent	Age is grouped into categories
Ireland	1981	Yes	No	Yes	Yes	Yes	Yes	Yes	10	344291	bad	Europe	missing	belligerent	Age is grouped into categories
Ireland	1986	Yes	No	Yes	No	No	Yes	Yes	10	355020	bad	Europe	missing	belligerent	Age is grouped into categories
Israel	1972	Yes	No	Yes	Yes	Yes	No	Yes	10	315608	bad	Asia	unknown	belligerent	Age is grouped into categories
Israel	1983	Yes	No	Yes	Yes	Yes	No	No	10	403474	bad	Asia	unknown	belligerent	Age is grouped into categories
Jamaica	1982	Yes	No	Yes	Yes	Yes	Yes	Yes	10	223668	good	Latin America	unknown	belligerent	
Kenya	1969	Yes	No	Yes	Yes	Yes	No	No	6	659310	middle	Africa	unknown	belligerent	Nairobi oversample, weighted by district and age
Kenya	1979	Yes	No	Yes	Yes	Yes	No	No	6.7	1033769	middle	Africa	unknown	belligerent	Persons not organized into hhs
Kenya	1989	Yes	No	Yes	Yes	Yes	Yes	Yes	5	1074098	middle	Africa	unknown	belligerent	
Liberia	1974	Yes	No	Yes	Yes	Yes	No	No	10	150256	middle	Africa	missing	belligerent	
Malawi	1987	Yes	No	Yes	Yes	Yes	No	Yes	10	798669	middle	Africa	unknown	belligerent	
Malaysia	1970	Yes	No	Yes	Yes	Yes	No	Yes	2	175997	good	Asia	unknown	belligerent	Excludes two states: Sabah and Sarawak
Malaysia	1980	Yes	Yes	Yes	Yes	Yes	No	Yes	2	182601	good	Asia	unknown	belligerent	Excludes two states: Sabah and Sarawak
Mali	1987	Yes	No	Yes	Yes	Yes	No	Yes	7	785384	middle	Africa	later	belligerent	
Mexico	1960	Yes	No	Yes	Yes	Yes	No	No	1.5	502800	middle	Latin America	unknown	belligerent	Persons not organized into hhs
Mexico	1970	Yes	No	Yes	Yes	Yes	No	Yes	1	483405	middle	Latin America	unknown	belligerent	
Mexico	1990	Yes	No	Yes	Yes	Yes	Yes	Yes	10	8118242	middle	Latin America	unknown	belligerent	
Mongolia	1989	Yes	Yes	Yes	Yes	Yes	No	No	10	190631	good	Asia	missing	belligerent	Highly clustered sample design
Morocco	1982	Yes	No	Yes	Yes	Yes	Yes	Yes	5	1012873	middle	Africa	missing	belligerent	
Netherlands	1960	Yes	No	Yes	No	No	No	No	1.2	143251	bad	Europe	missing	neutral	Age grouped into categories, persons not organized into hhs
Netherlands	1971	Yes	No	Yes	No	No	No	No	1.2	159203	bad	Europe	missing	neutral	Age grouped into categories, persons not organized into hhs
Nicaragua	1971	Yes	No	Yes	Yes	Yes	No	Yes	10	189469	middle	Latin America	unknown	belligerent	
Pakistan	1973	Yes	No	Yes	Yes	Yes	No	Yes	2	1453332	middle	Asia	unknown	belligerent	Excludes 4 districts in NWFP; many headless households (fragments)
Pakistan	1981	Yes	No	No	Yes	Yes	No	No	10	8433058	middle	Asia	unknown	belligerent	Age grouped into categories, persons not organized into hhs
Panama	1960	Yes	No	Yes	Yes	Yes	No	Yes	5	53553	good	Latin America	unknown	belligerent	
Panama	1970	Yes	No	Yes	Yes	Yes	No	Yes	10	150473	good	Latin America	unknown	belligerent	
Panama	1980	Yes	No	Yes	Yes	Yes	Yes	Yes	10	195577	good	Latin America	unknown	belligerent	
Panama	1990	Yes	No	Yes	Yes	Yes	No	Yes	10	232737	good	Latin America	unknown	belligerent	
Philippines	1990	Yes	No	Yes	Yes	Yes	No	Yes	10	6013913	good	Asia	unknown	belligerent	
Portugal	1981	Yes	No	Yes	Yes	Yes	Yes	Yes	5	492289	good	Europe	unknown	belligerent	
Puerto Rico	1970	Yes	No	Yes	Yes	Yes	No	No	1	27212	good	Latin America	missing	belligerent	
Puerto Rico	1980	Yes	No	Yes	Yes	Yes	No	No	5	160219	good	Latin America	missing	belligerent	
Puerto Rico	1990	Yes	No	Yes	Yes	Yes	No	Yes	5	177655	good	Latin America	missing	belligerent	
Romania	1977	Yes	Yes	Yes	Yes	Yes	No	No	10	1937021	good	Europe	unknown	belligerent	Excludes 2 counties: Alba and Arad
Saint Lucia	1980	Yes	No	Yes	No	Yes	Yes	Yes	10	11451	good	Latin America	missing	belligerent	
Senegal	1988	Yes	No	Yes	Yes	Yes	No	Yes	10	700199	middle	Africa	unknown	belligerent	
Spain	1981	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	2084221	good	Europe	december	neutral	Persons not organized into hhs
Switzerland	1970	Yes	No	Yes	No	Yes	No	Yes	5	312538	good	Europe	december	neutral	
Switzerland	1980	Yes	No	Yes	No	Yes	No	Yes	5	317803	good	Europe	december	neutral	
Switzerland	1990	Yes	No	Yes	No	Yes	No	Yes	5	342797	good	Europe	december	neutral	
Tanzania	1988	Yes	No	Yes	Yes	Yes	Yes	Yes	10	2310424	middle	Africa	later	belligerent	
Thailand	1970	Yes	No	Yes	Yes	Yes	Yes	No	2	772169	good	Asia	later	belligerent	
Thailand	1980	Yes	Yes	Yes	Yes	Yes	Yes	No	1	388141	middle	Asia	later	belligerent	
Thailand	1990	Yes	Yes	Yes	Yes	Yes	Yes	No	1	485100	middle	Asia	later	belligerent	
Turkey	1985	Yes	No	Yes	Yes	Yes	No	Yes	5	2554364	middle	Asia	unknown	belligerent	
Turkey	1990	Yes	No	Yes	Yes	Yes	No	Yes	5	2864207	middle	Asia	unknown	belligerent	
United States	1960	Yes	No	Yes	Yes	Yes	No	Yes	1	1799888	good	Northern America	december	belligerent	
United States	1970	Yes	No	Yes	Yes	Yes	No	Yes	1	2029666	good	Northern America	december	belligerent	
United States	1980	Yes	No	Yes	Yes	Yes	No	Yes	5	11343120	good	Northern America	december	belligerent	
United States	1990	Yes	No	Yes	Yes	Yes	No	Yes	5	12501046	good	Northern America	december	belligerent	
Uruguay	1963	Yes	No	Yes	Yes	Yes	No	Yes	10	256171	good	Latin America	missing	belligerent	
Uruguay	1975	Yes	No	Yes	Yes	Yes	No	Yes	10	279994	good	Latin America	missing	belligerent	
Uruguay	1985	Yes	No	Yes	Yes	Yes	No	Yes	10	295915	good	Latin America	missing	belligerent	
Venezuela	1971	Yes	No	Yes	Yes	Yes	Yes	Yes	2	1158527	good	Latin America	unknown	neutral	
Venezuela	1981	Yes	No	Yes	Yes	Yes	Yes	Yes	10	1441266	good	Latin America	unknown	neutral	
Venezuela	1990	Yes	No	Yes	Yes	Yes	Yes	Yes	10	1803953	good	Latin America	unknown	neutral	
Vietnam	1989	Yes	Yes	No	Yes	Yes	Yes	Yes	5	2626985	good	Asia	later	belligerent	
Zambia	1990	Yes	No	Yes	Yes	Yes	No	Yes	10	787461	middle	Africa	missing	belligerent	
No. of data sets included		109	27	90	103	107	33	91							

Figure 1

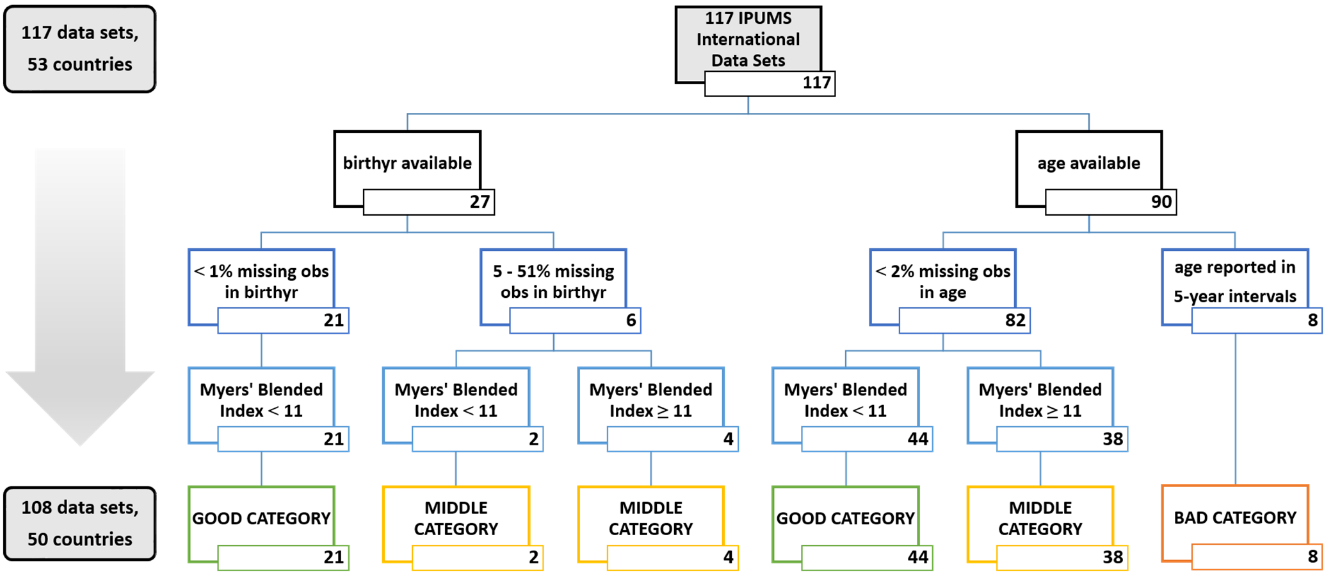


Figure 2a

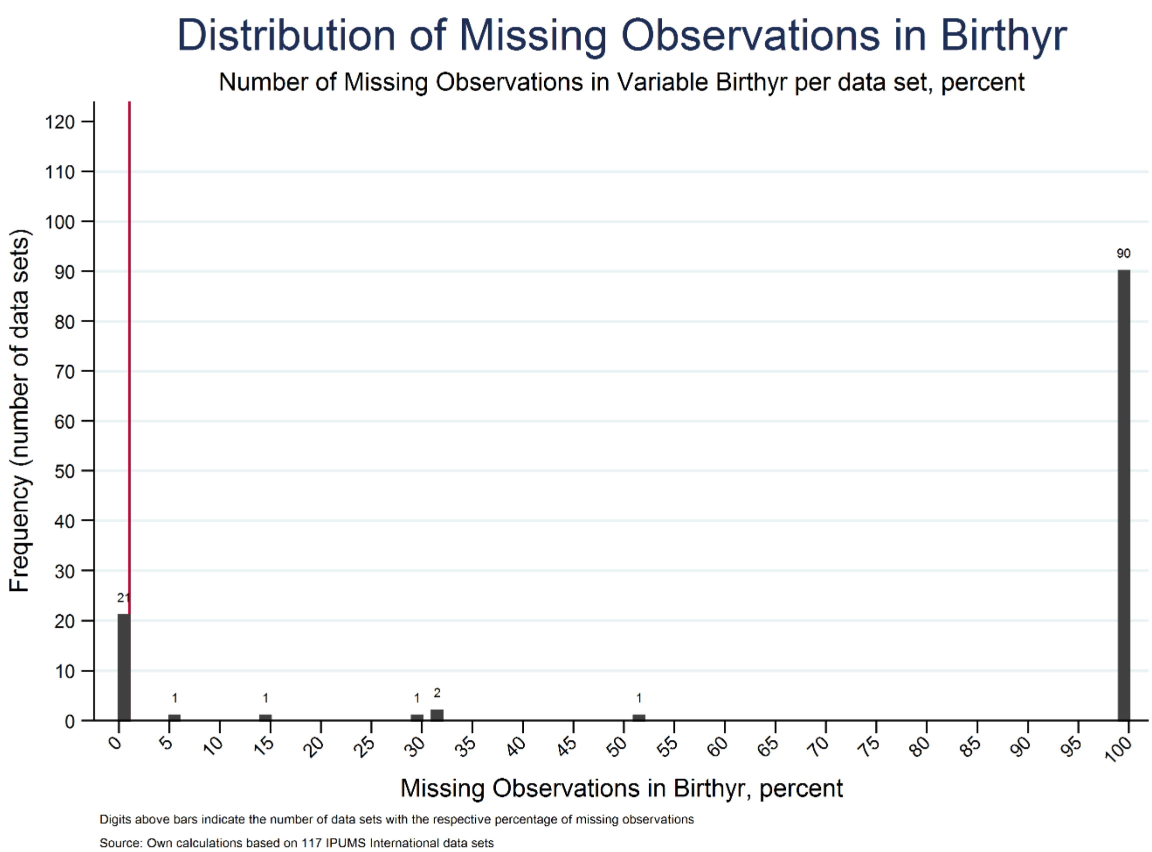


Figure 2b

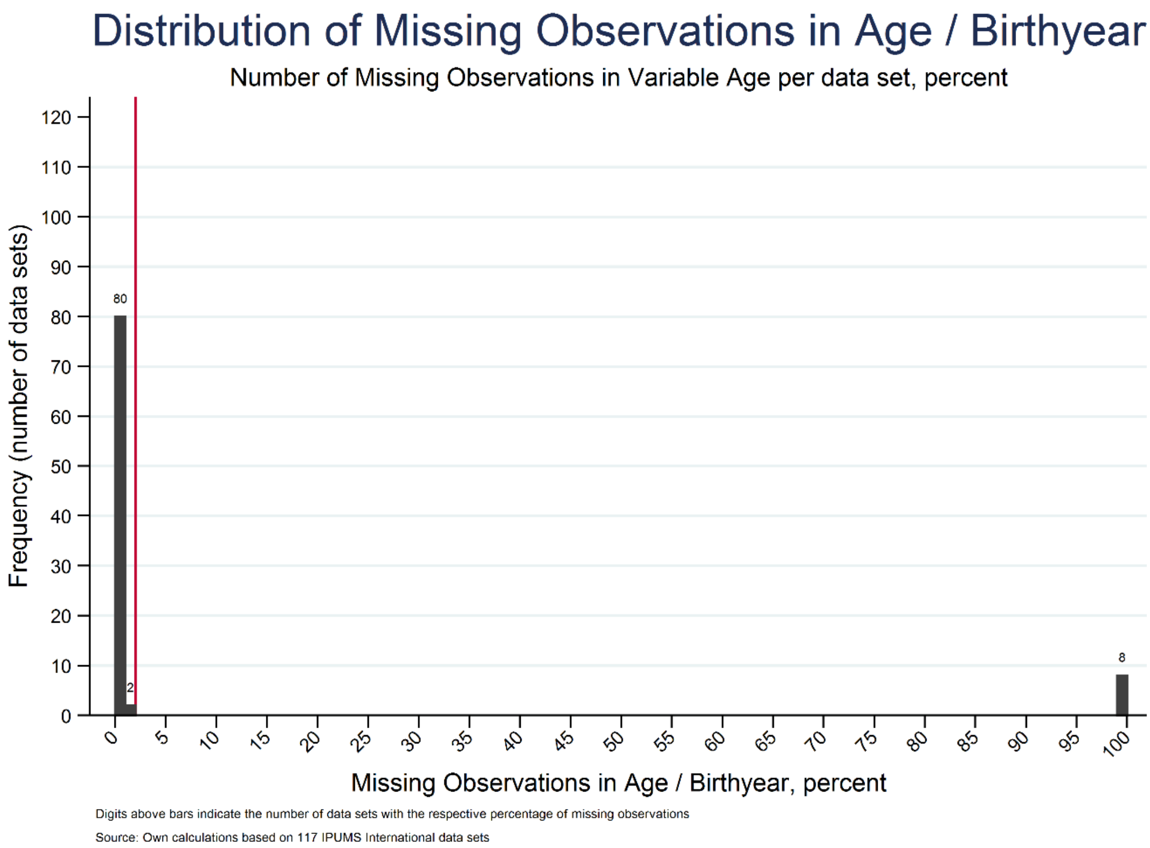


Figure 3

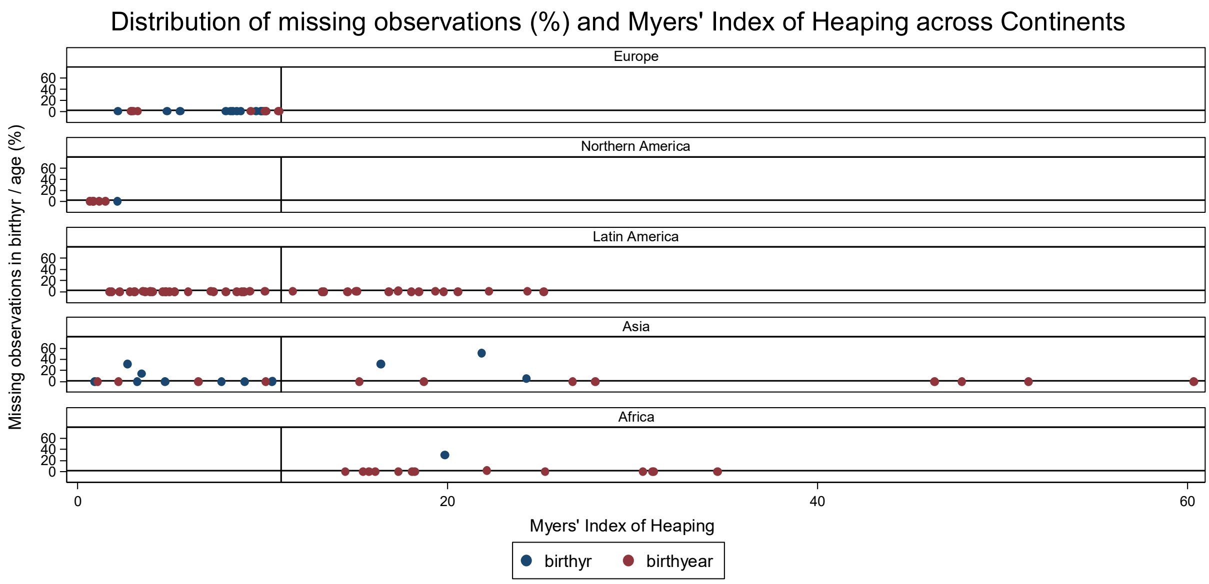
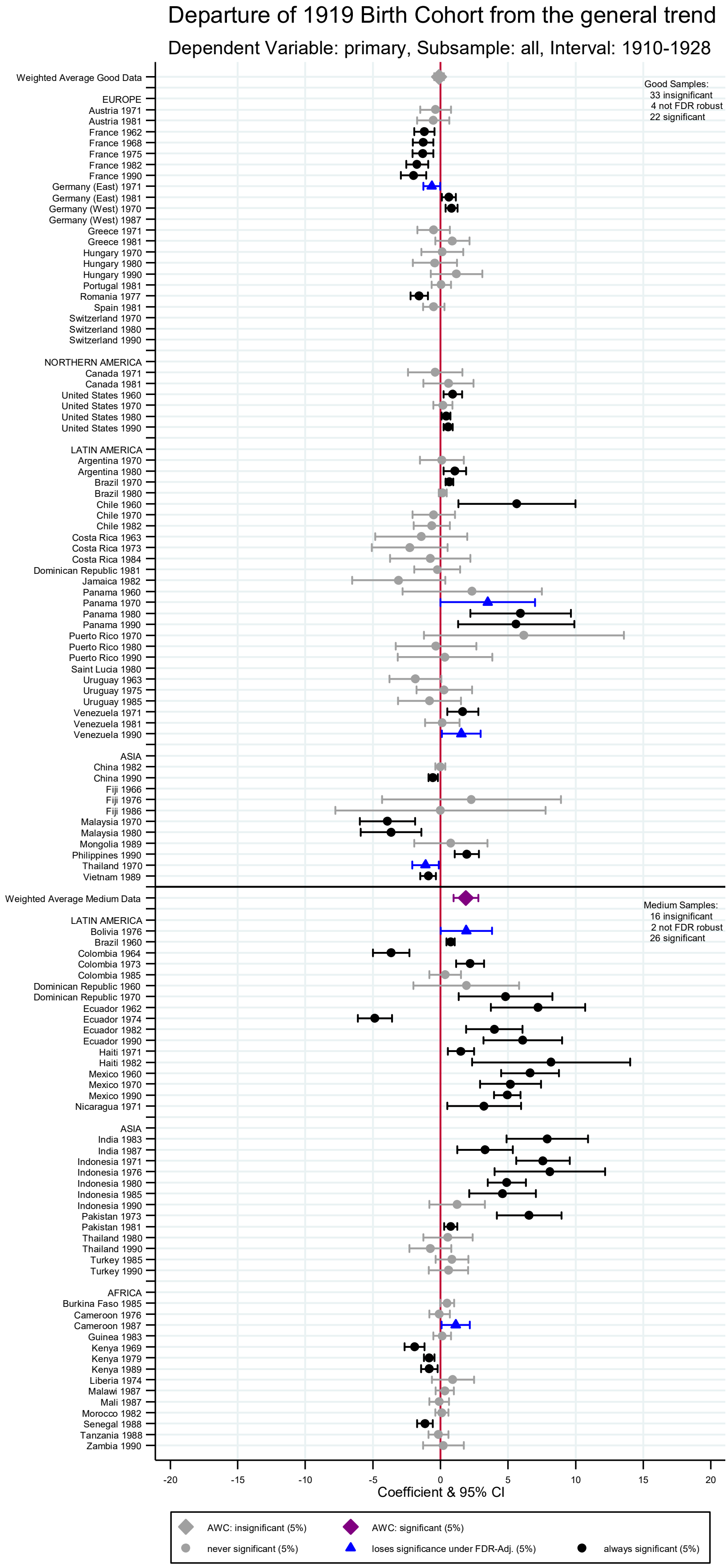


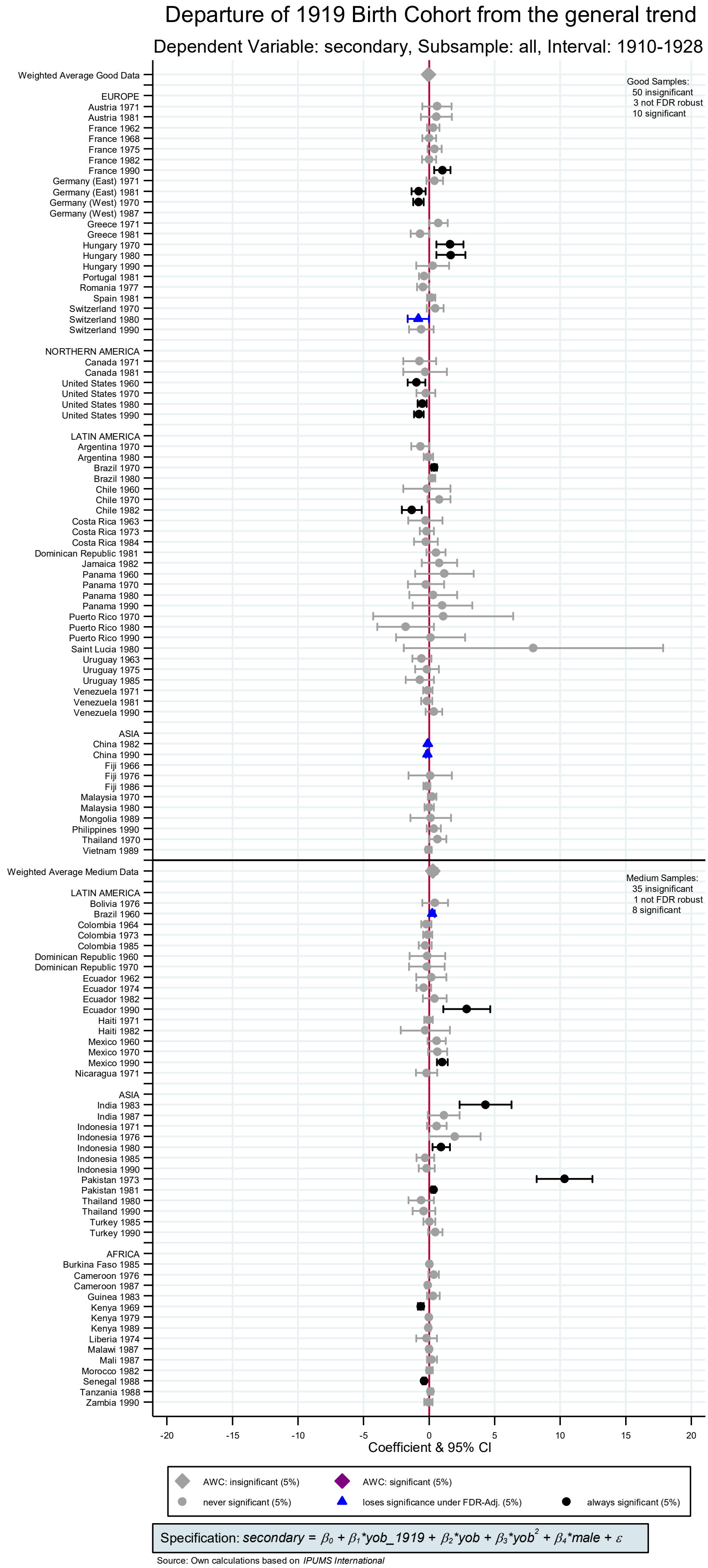
Figure 4a



Specification: *primary* = $\beta_0 + \beta_1$*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε

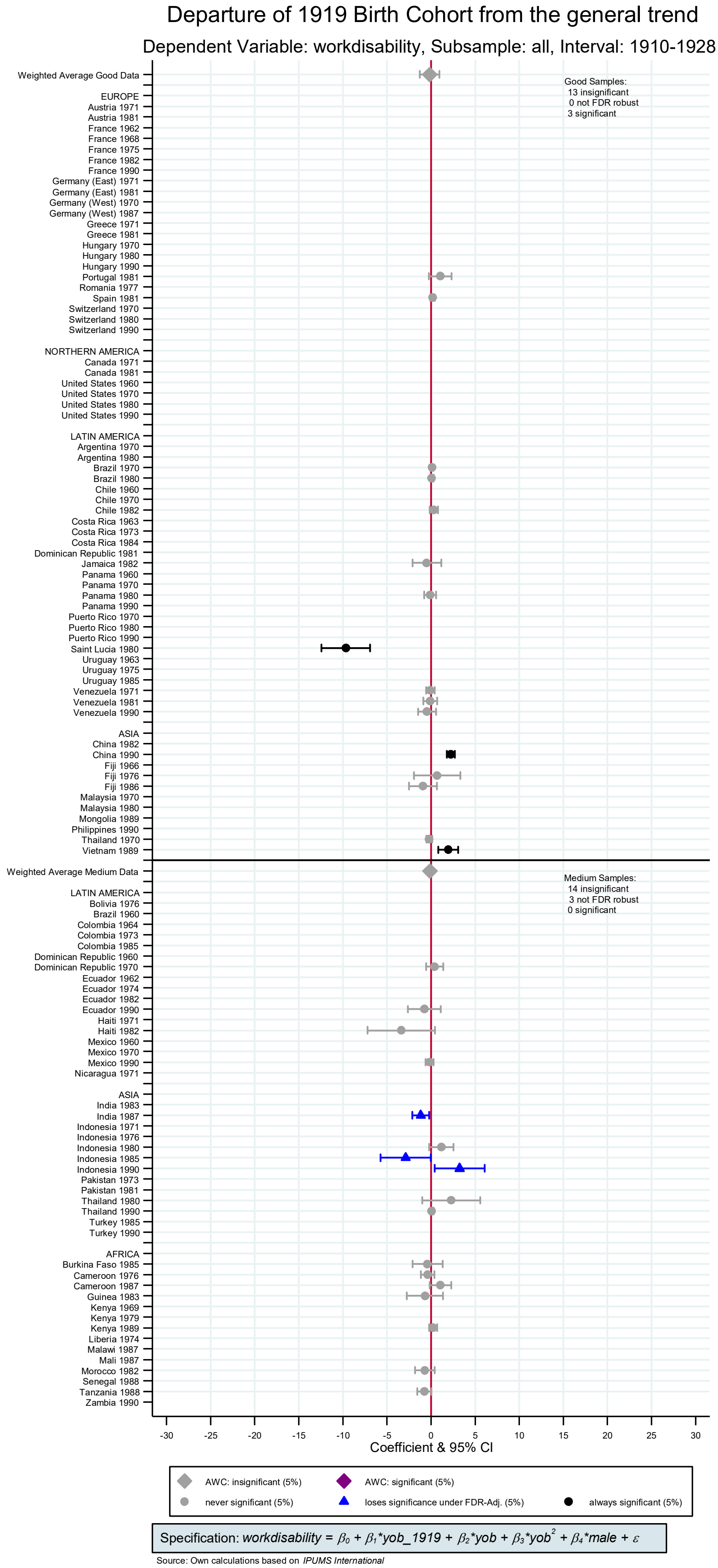
Source: Own calculations based on *IPUMS International*

Figure 4b



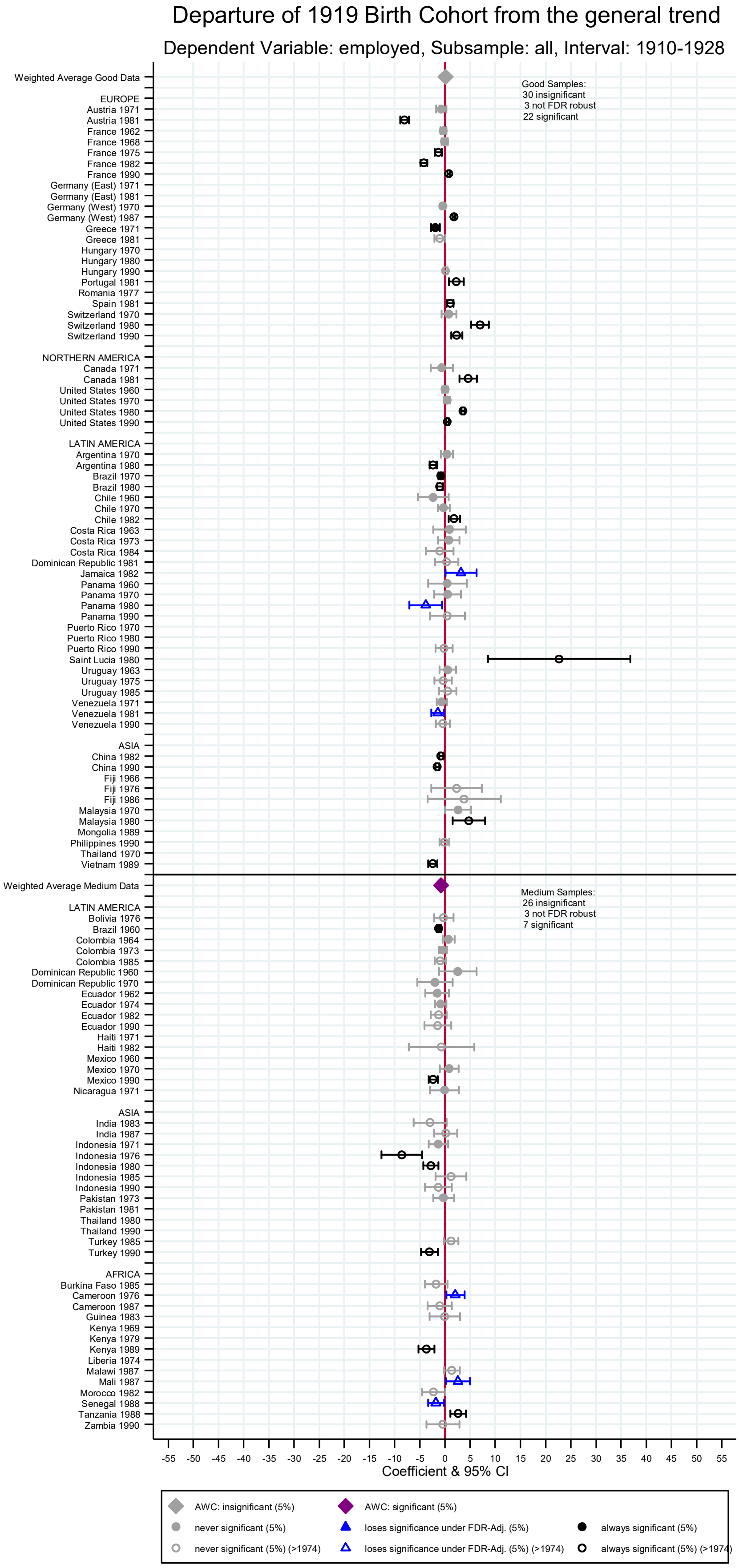
Departure of 1919 Birth Cohort from the general trend
Dependent Variable: secondary, Subsample: all, Interval: 1910-1928
Good Samples: 50 insignificant 3 not FDR robust 10 significant
Medium Samples: 35 insignificant 1 not FDR robust 8 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: secondary = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on IPUMS International

Figure 4c



Departure of 1919 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
13 insignificant
0 not FDR robust
3 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
14 insignificant
3 not FDR robust
0 significant
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: workdisability = β0 + β1*yob_1919 + β2*yob + β3*yob² + β4*male + ε
Source: Own calculations based on IPUMS International

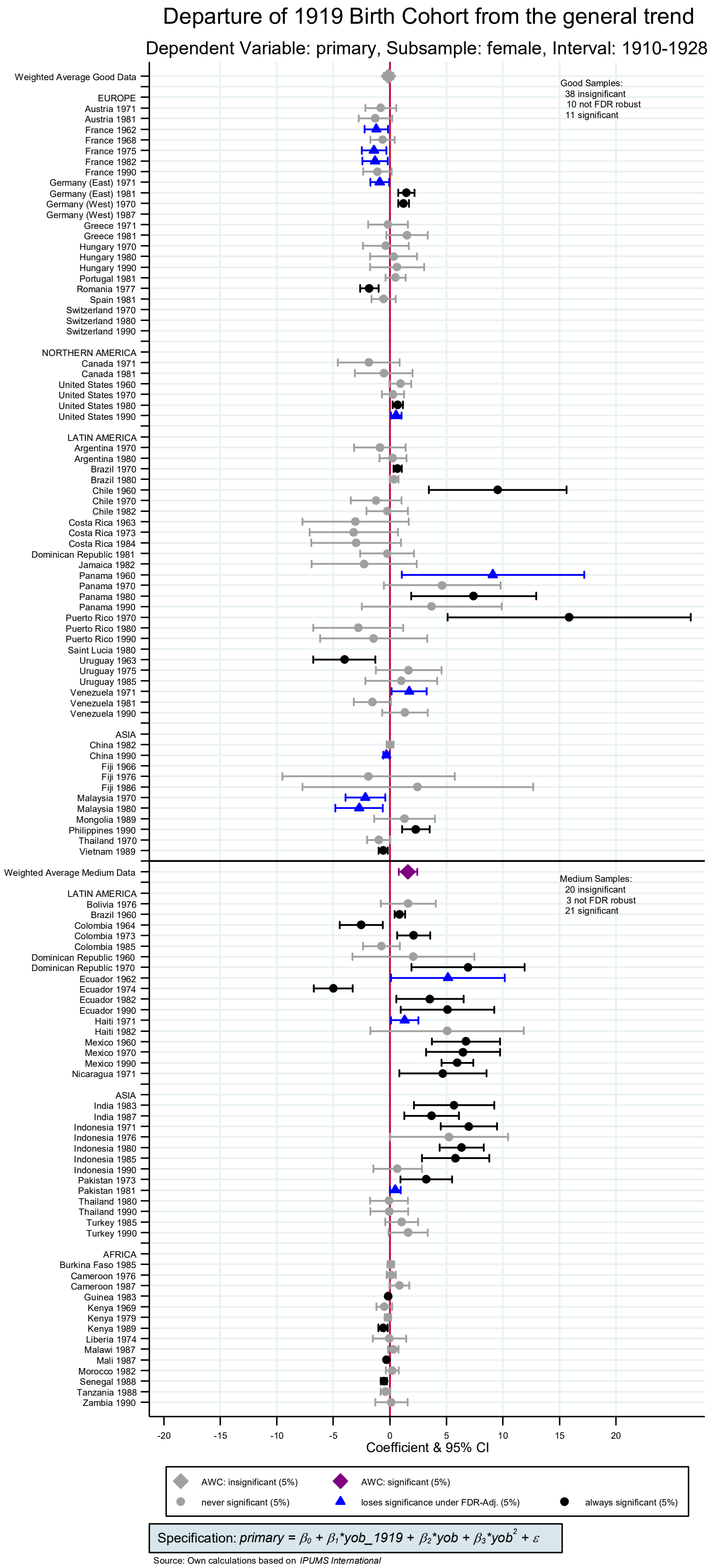
Figure 4d



Specification: *employed* = $\beta_0 + \beta_1$**yob_1919* + β_2**yob* + β_3**yob*^{2} + β_4**male* + ε

Source: Own calculations based on *IPUMS International*

Figure 5a



Departure of 1919 Birth Cohort from the general trend
Dependent Variable: primary, Subsample: female, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
38 insignificant
10 not FDR robust
11 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
20 insignificant
3 not FDR robust
21 significant
-20
-15
-10
-5
0
5
10
15
20
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: primary = β0 + β1*yob_1919 + β2*yob + β3*yob2 + ε
Source: Own calculations based on IPUMS International

Figure 5b

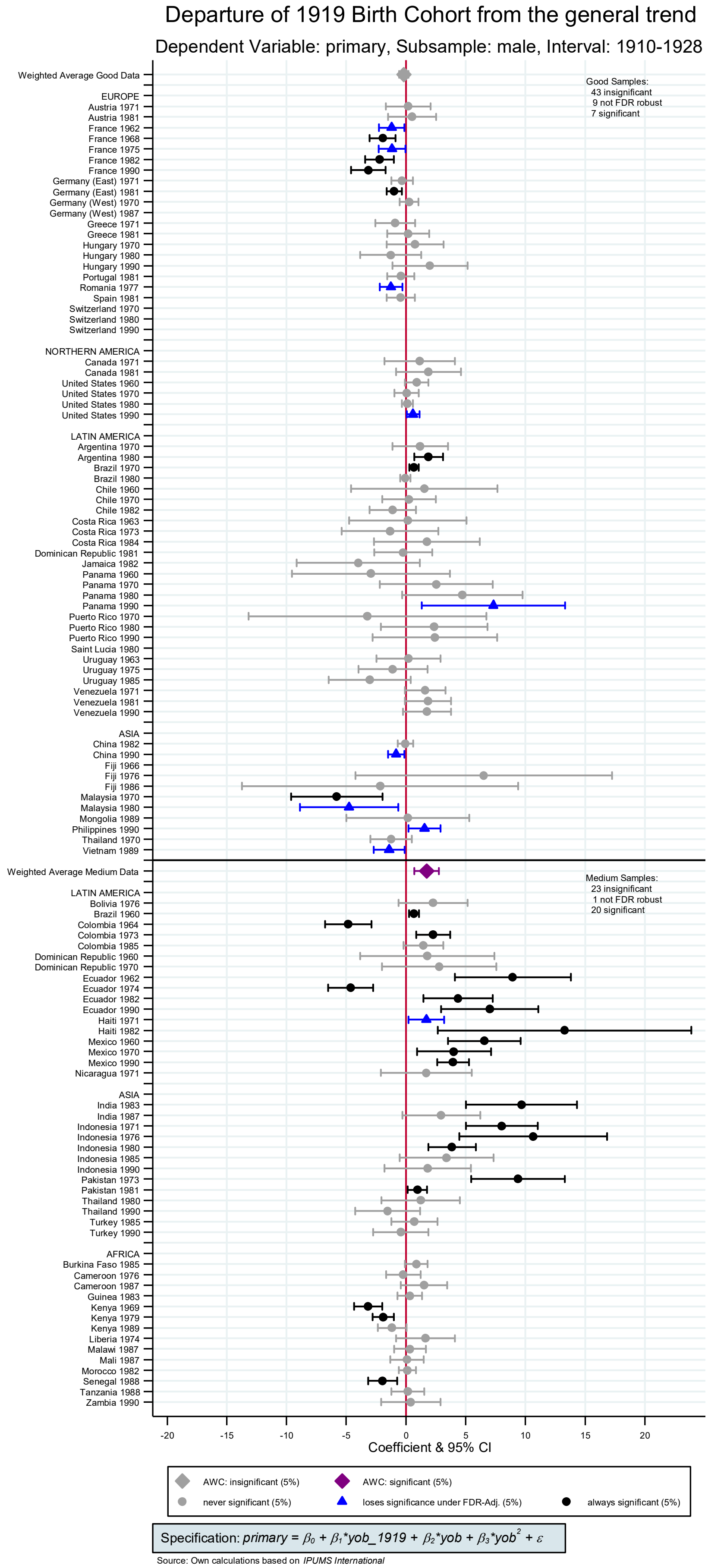

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: primary, Subsample: male, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
43 insignificant
9 not FDR robust
7 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
23 insignificant
1 not FDR robust
20 significant
-20
-15
-10
-5
0
5
10
15
20
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: *primary* = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + ε
Source: Own calculations based on *IPUMS International*

Figure 5c

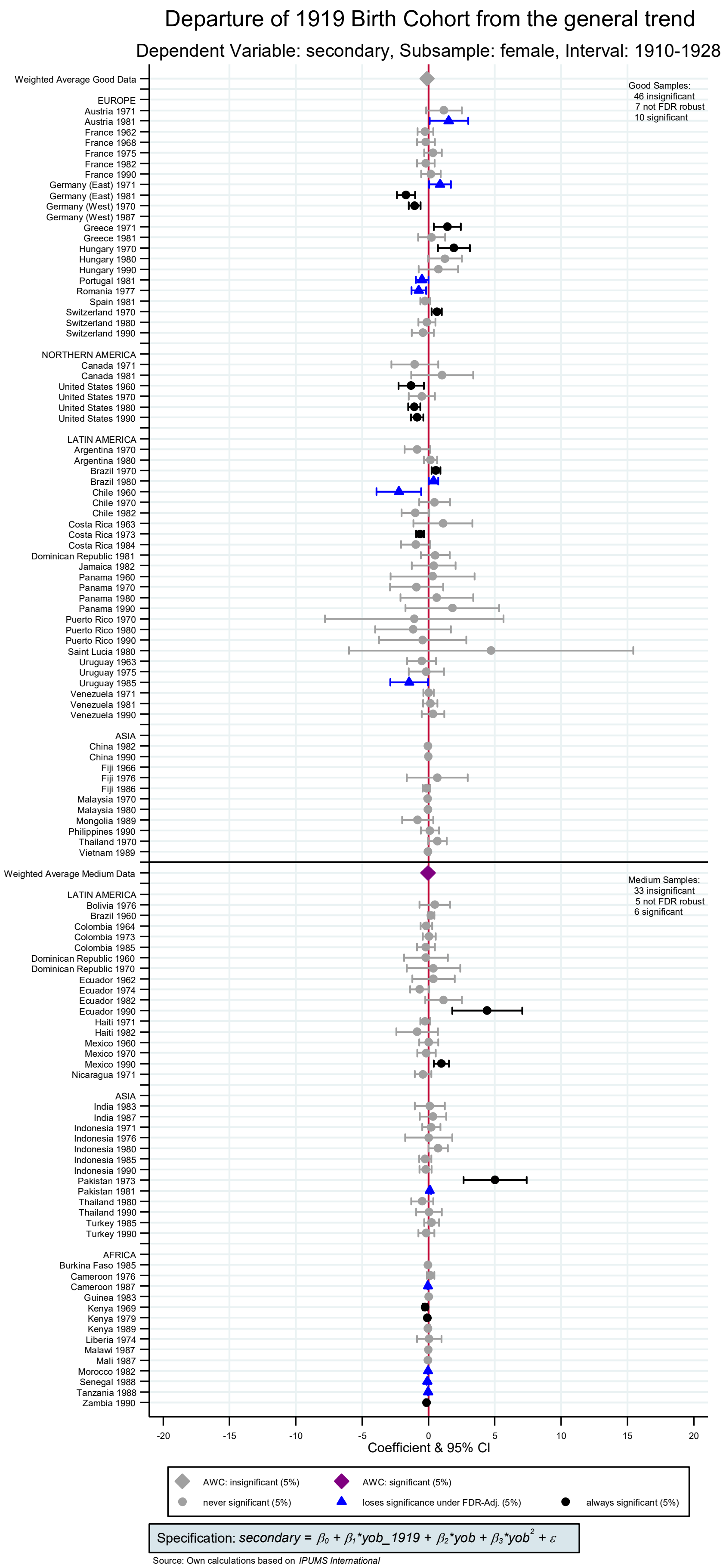

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: secondary, Subsample: female, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
46 insignificant
7 not FDR robust
10 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
33 insignificant
5 not FDR robust
6 significant
-20
-15
-10
-5
0
5
10
15
20
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: *secondary* = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + ε
Source: Own calculations based on *IPUMS International*

Figure 5d

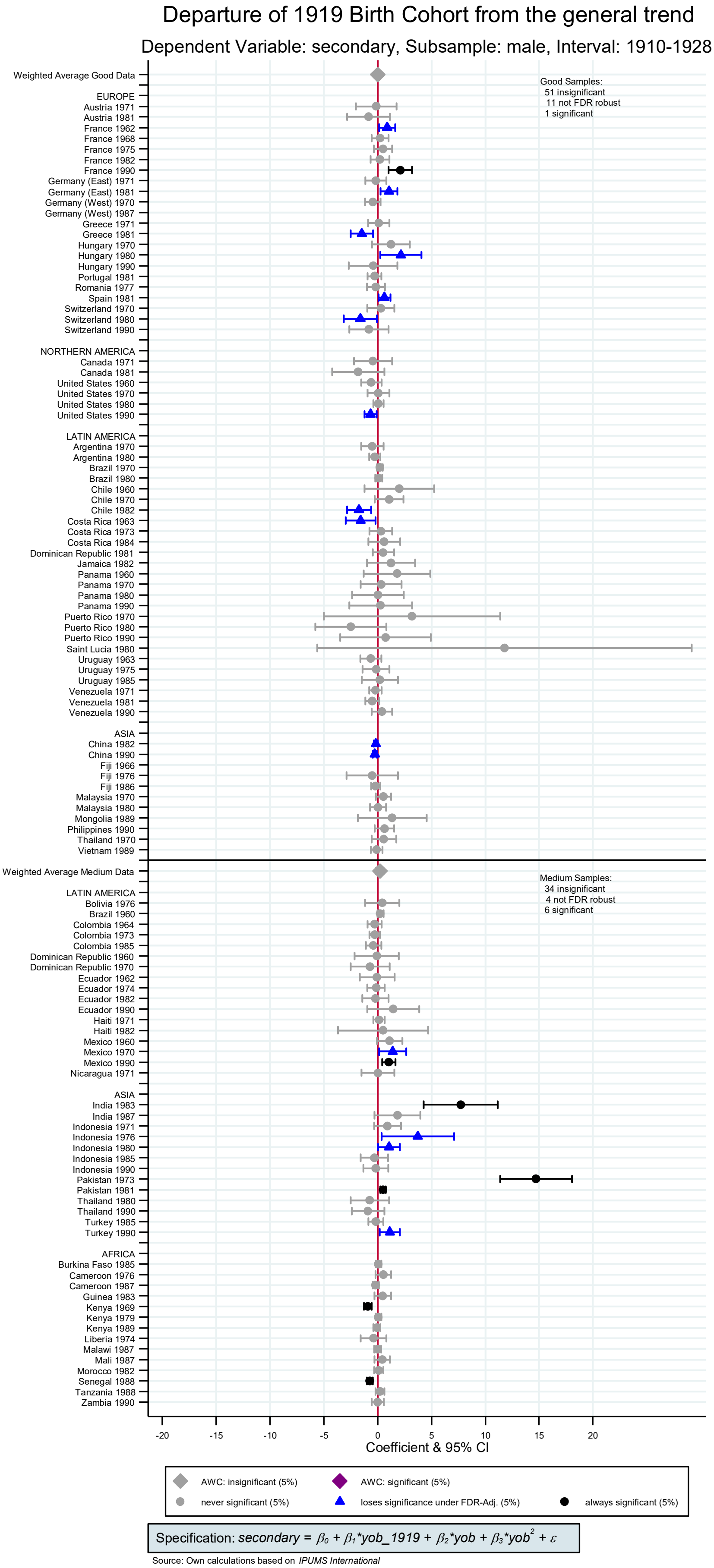

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: secondary, Subsample: male, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
51 insignificant
11 not FDR robust
1 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
34 insignificant
4 not FDR robust
6 significant
-20
-15
-10
-5
0
5
10
15
20
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: secondary = β0 + β1*yob_1919 + β2*yob + β3*yob2 + ε
Source: Own calculations based on IPUMS International

Figure 5e

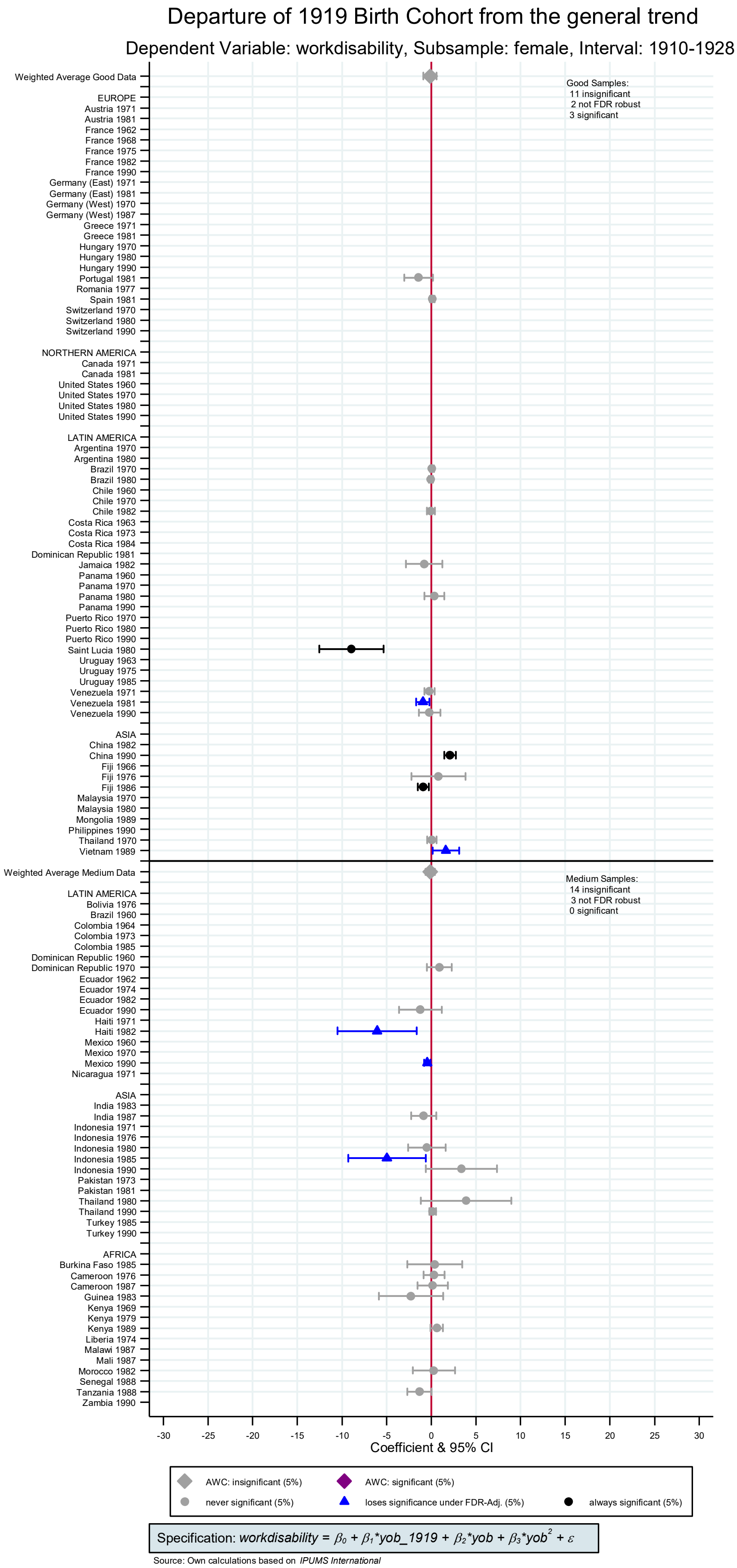
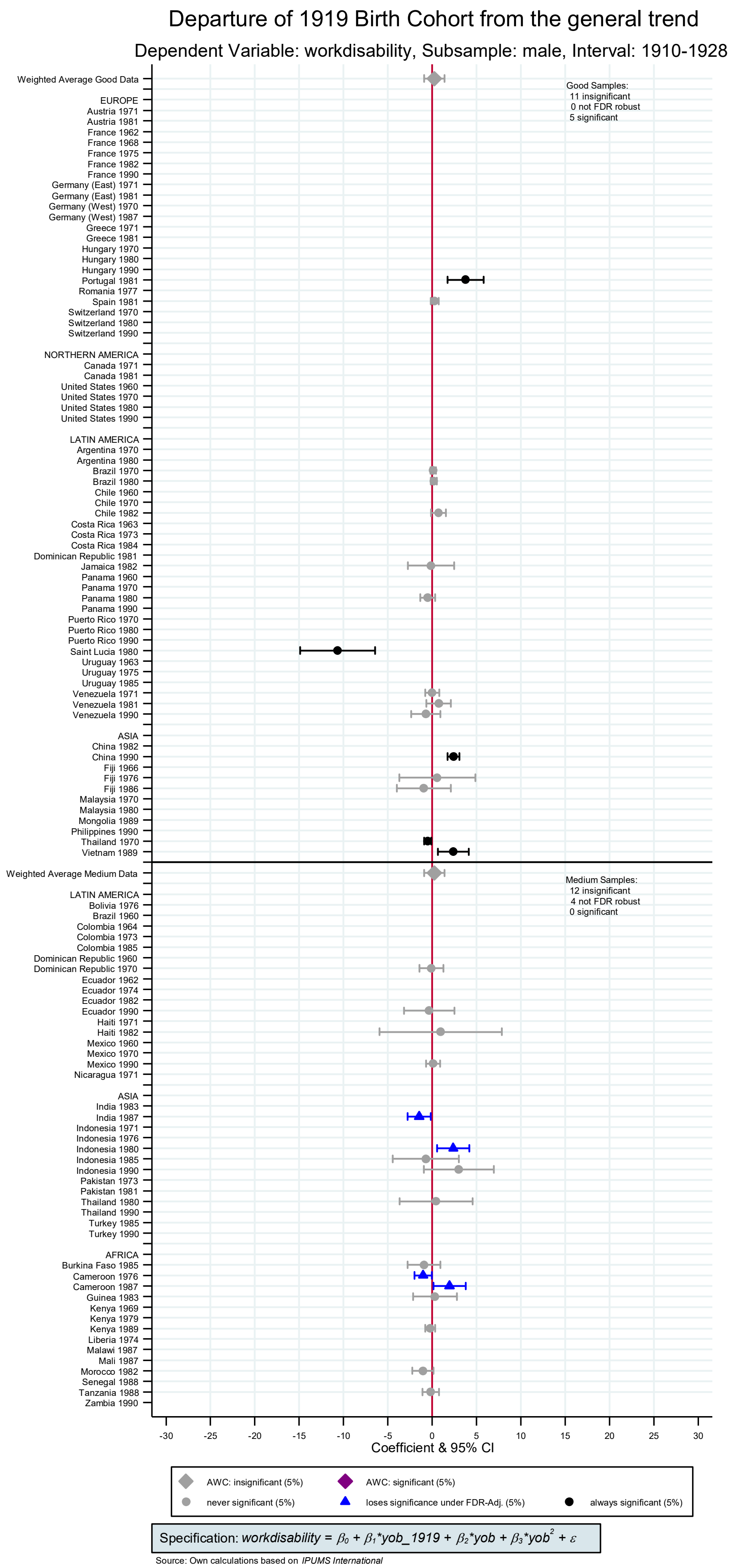

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: female, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
11 insignificant
2 not FDR robust
3 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
14 insignificant
3 not FDR robust
0 significant
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: workdisability = β0 + β1*yob_1919 + β2*yob + β3*yob2 + ε
Source: Own calculations based on IPUMS International

Figure 5f



Departure of 1919 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: male, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
11 insignificant
0 not FDR robust
5 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
12 insignificant
4 not FDR robust
0 significant
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: workdisability = β0 + β1*yob_1919 + β2*yob + β3*yob^2 + ε
Source: Own calculations based on IPUMS International

Figure 5g

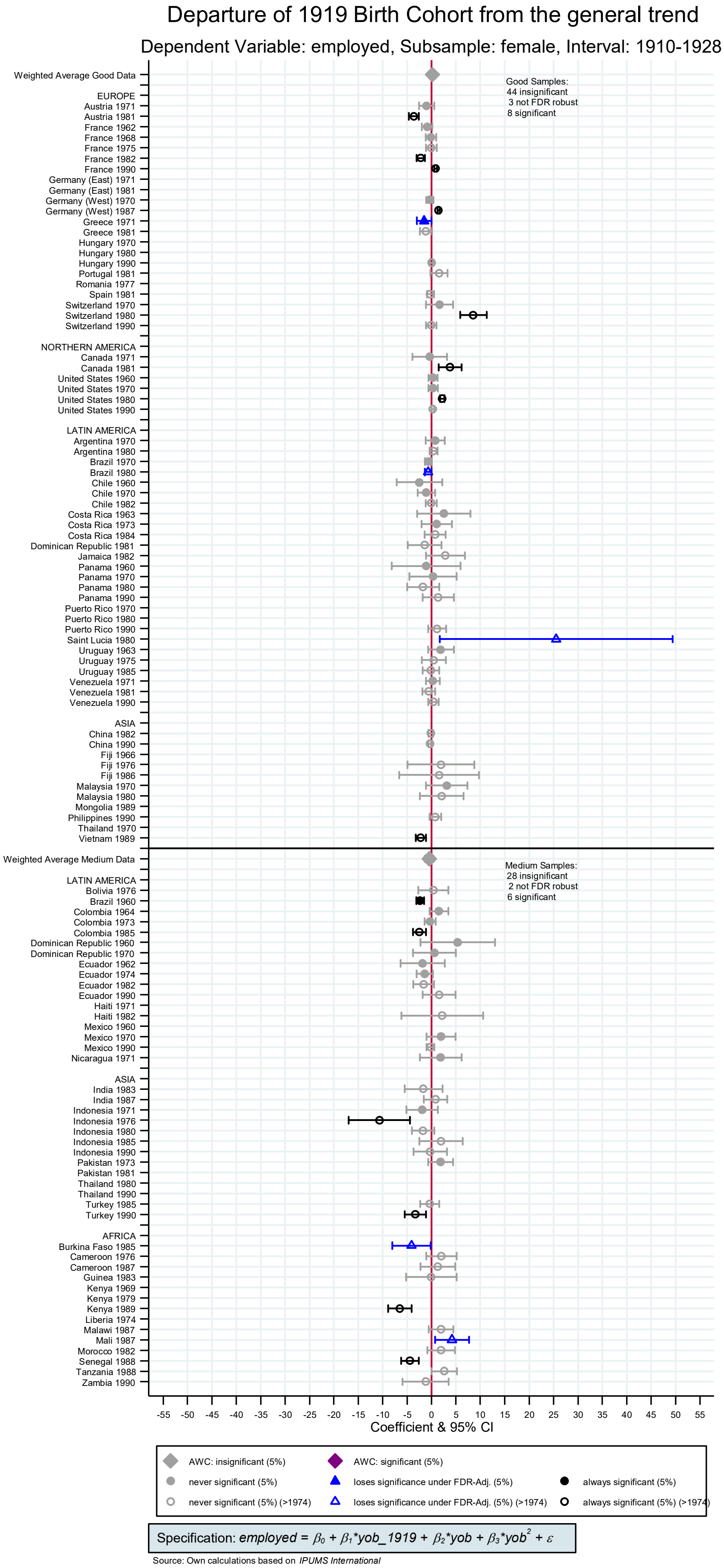
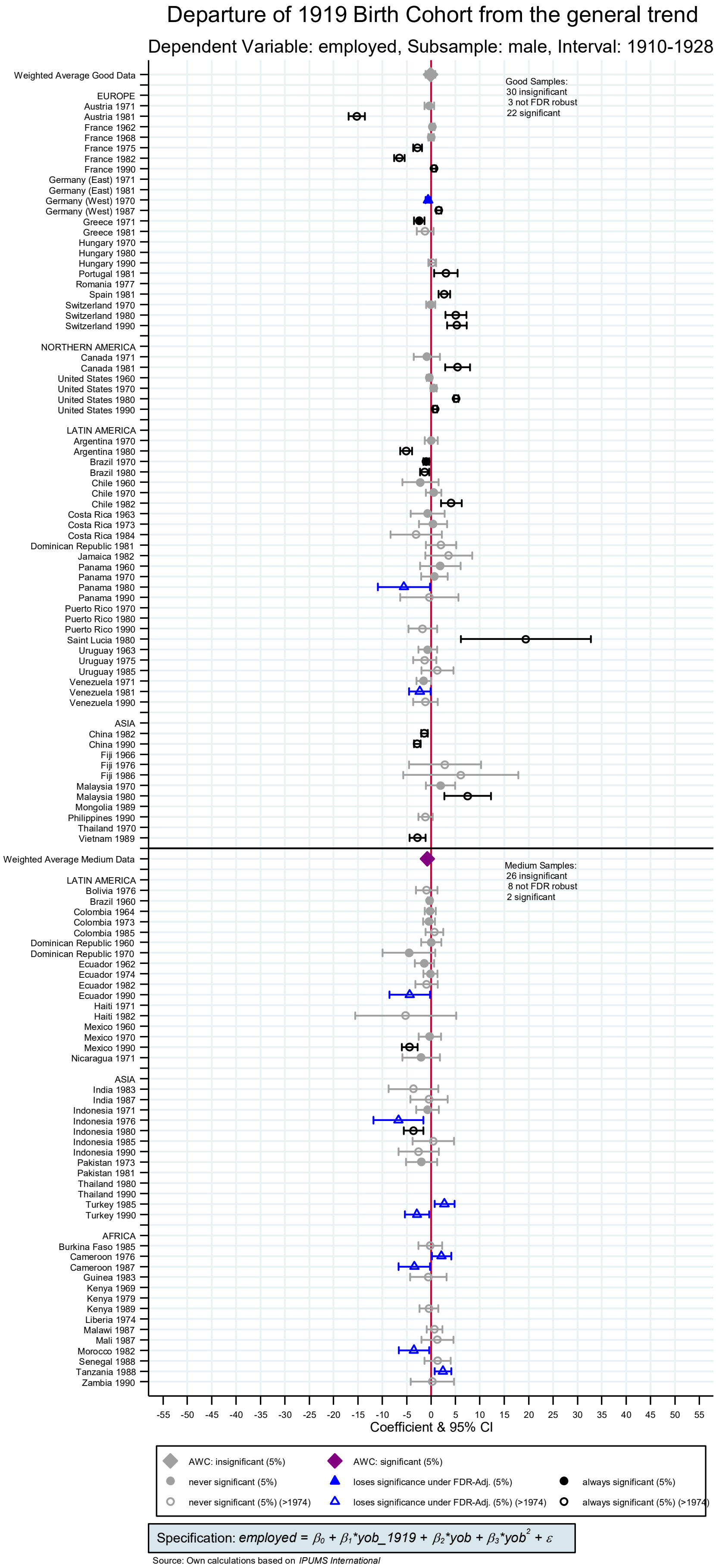
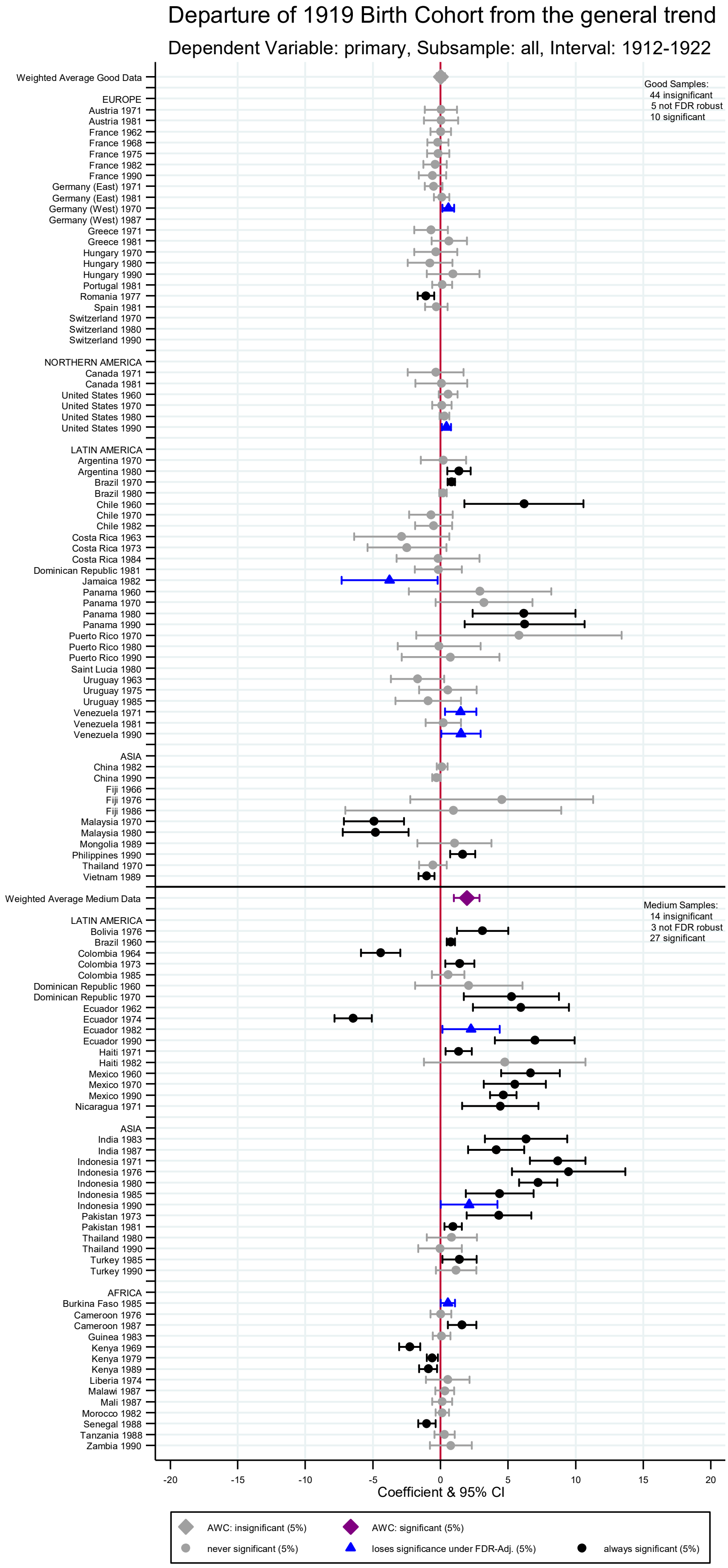

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: employed, Subsample: female, Interval: 1910-1928
Good Samples:
44 insignificant
3 not FDR robust
8 significant
Medium Samples:
28 insignificant
2 not FDR robust
6 significant
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
never significant (5%) (>1974)
loses significance under FDR-Adj. (5%) (>1974)
always significant (5%) (>1974)
Specification: employed = $\beta_0 + \beta_1$*yob_1919 + β_2*yob + β_3*yob^2 + ε
Source: Own calculations based on IPUMS International

Figure 5h



Departure of 1919 Birth Cohort from the general trend
Dependent Variable: employed, Subsample: male, Interval: 1910-1928
Good Samples:
30 insignificant
3 not FDR robust
22 significant
Medium Samples:
26 insignificant
8 not FDR robust
2 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
never significant (5%) (>1974)
loses significance under FDR-Adj. (5%) (>1974)
always significant (5%) (>1974)
Specification: employed = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + ε
Source: Own calculations based on IPUMS International

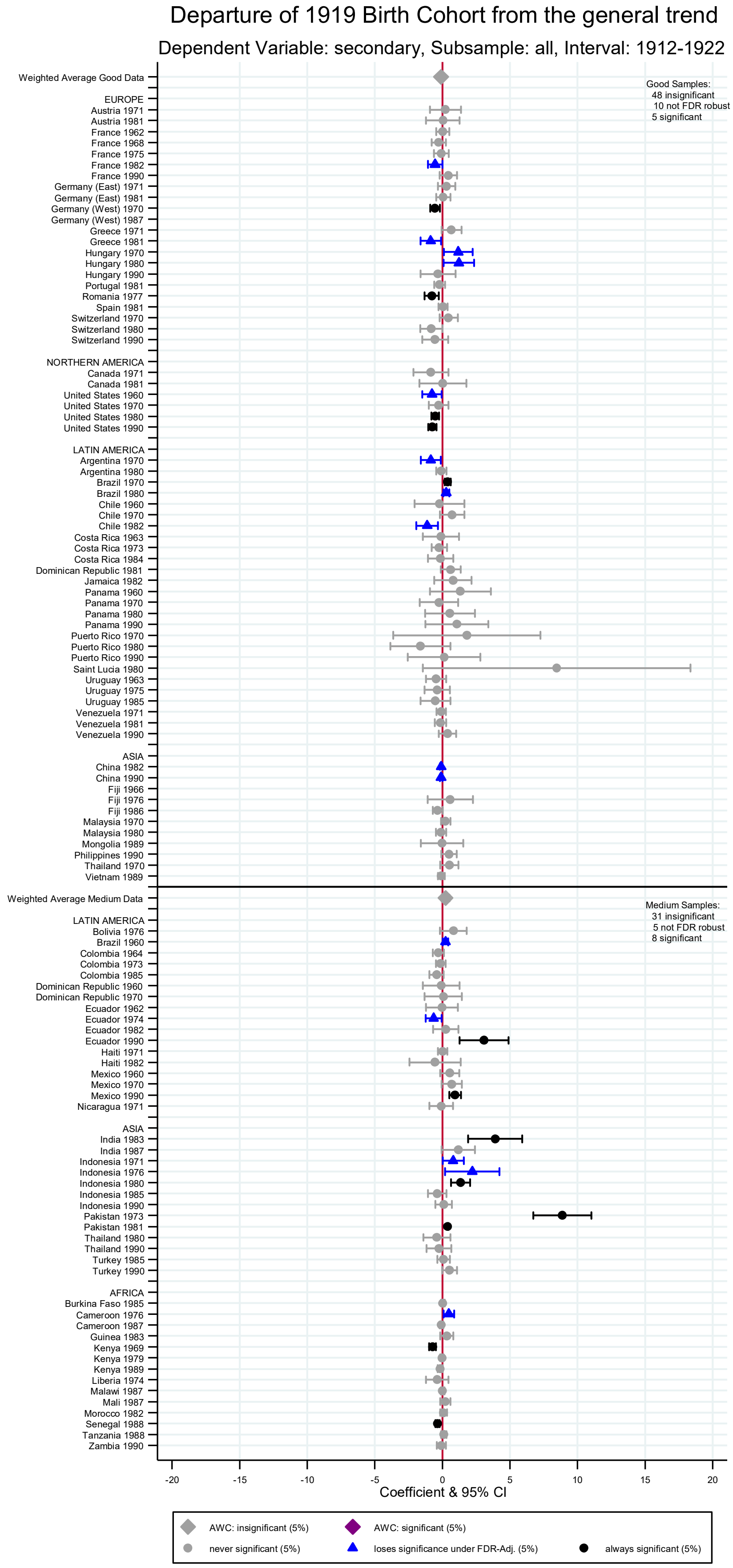
Figure 6a



Specification: *primary* = $\beta_0 + \beta_1$*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε

Source: Own calculations based on *IPUMS International*

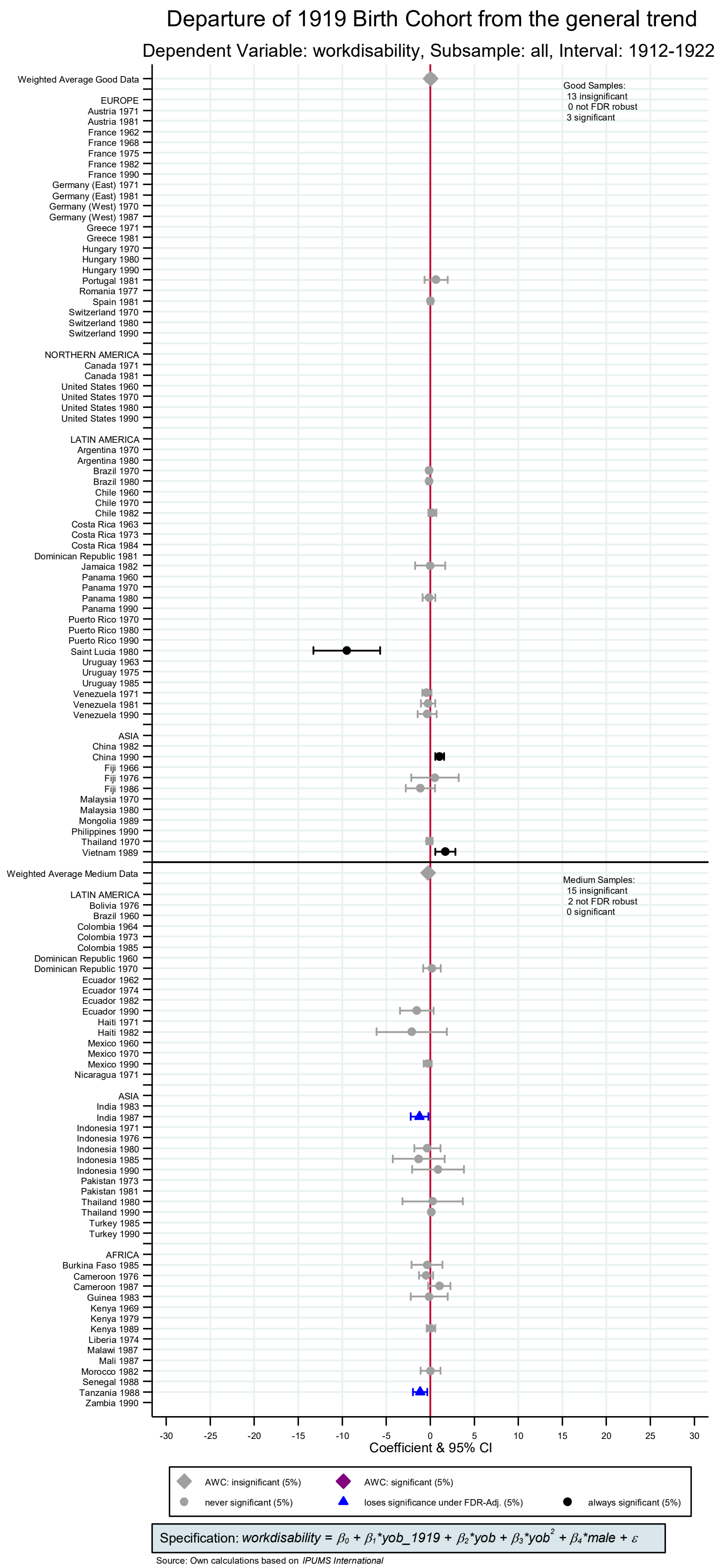
Figure 6b



Specification: *secondary* = $\beta_0 + \beta_1$*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε

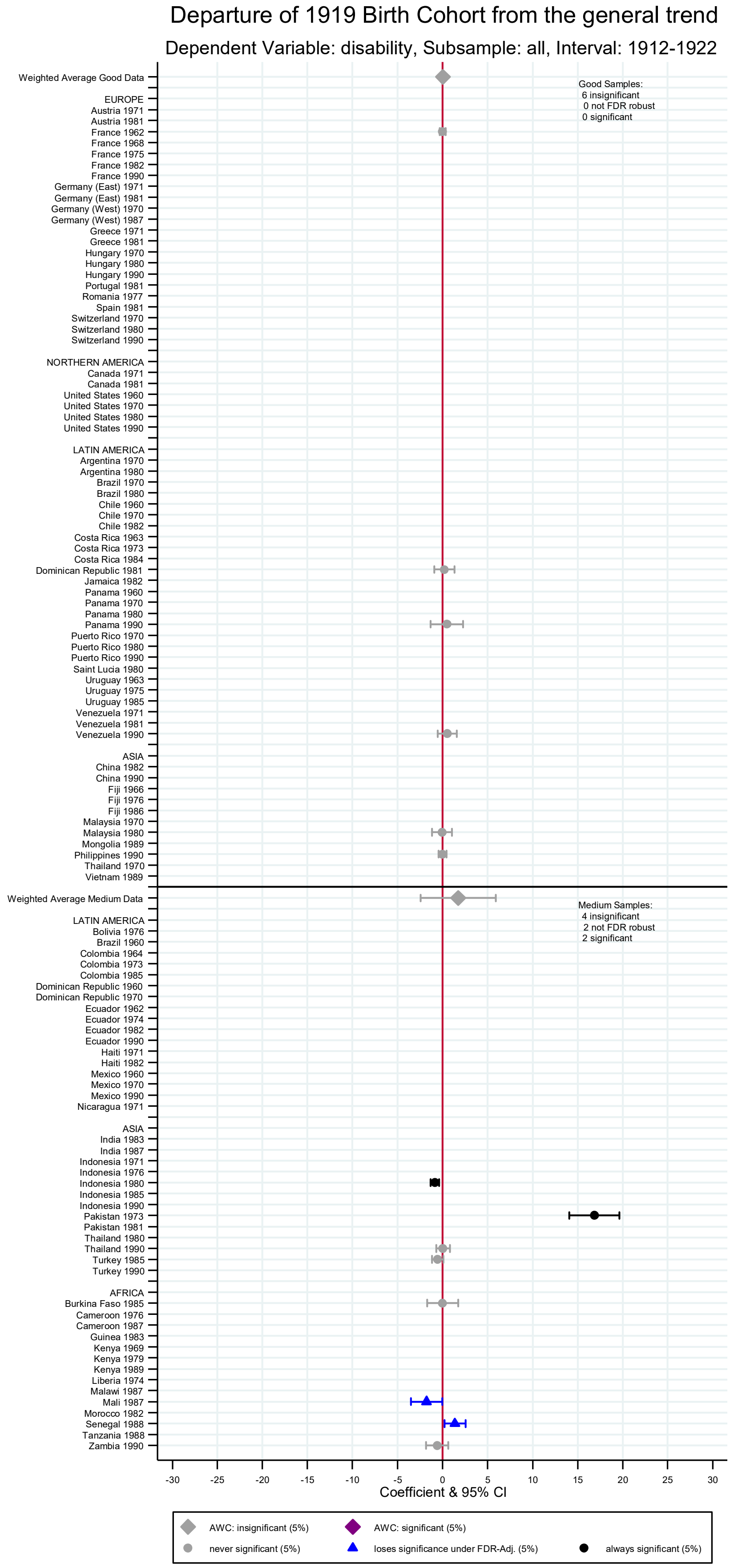
Source: Own calculations based on *IPUMS International*

Figure 6c



Departure of 1919 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: all, Interval: 1912-1922
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
13 insignificant
0 not FDR robust
3 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
15 insignificant
2 not FDR robust
0 significant
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: workdisability = β0 + β1*yob_1919 + β2*yob + β3*yob2 + β4*male + ε
Source: Own calculations based on IPUMS International

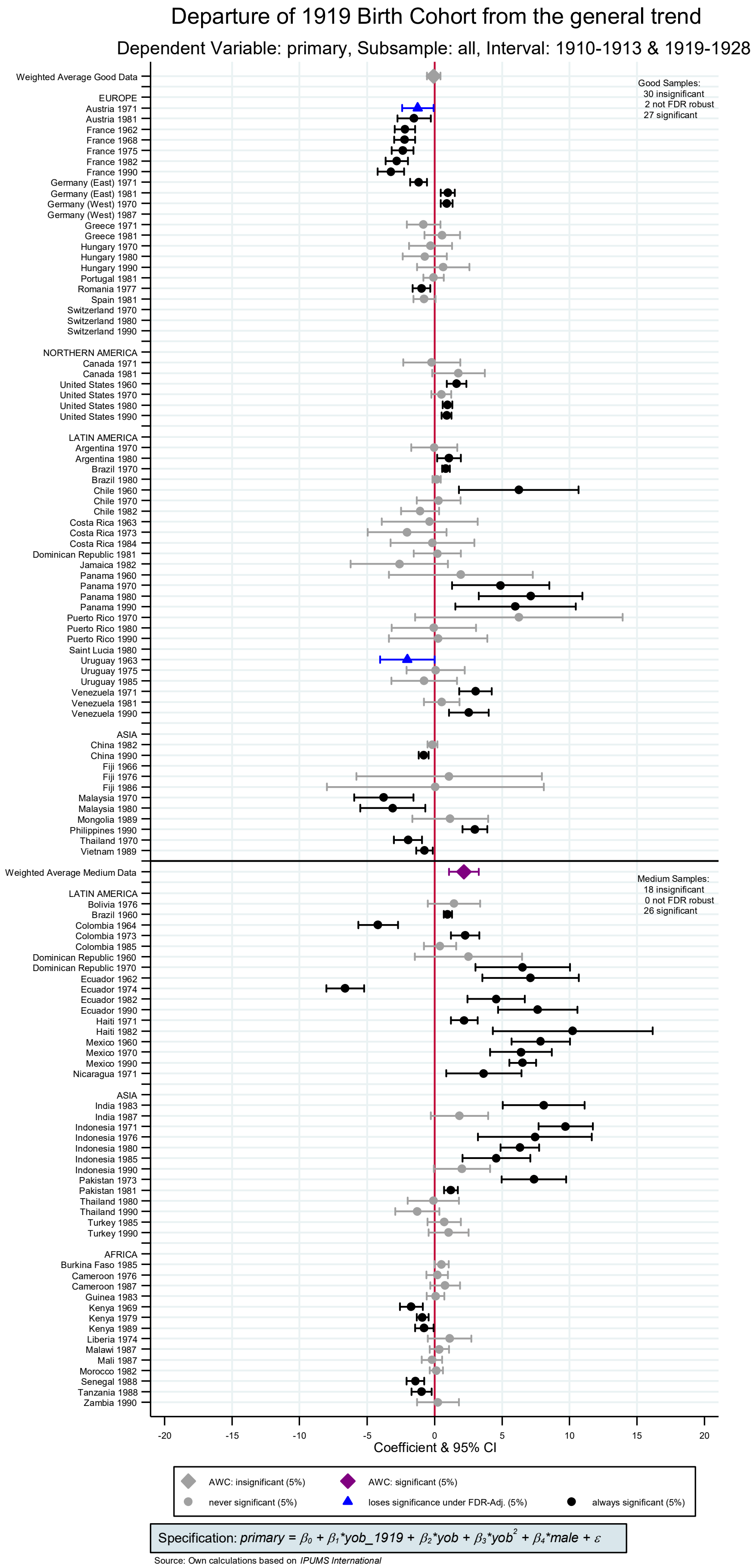
Figure 6d



Specification: *disability* = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε

Source: Own calculations based on *IPUMS International*

Figure 7a



Departure of 1919 Birth Cohort from the general trend
Dependent Variable: primary, Subsample: all, Interval: 1910-1913 & 1919-1928
Good Samples: 30 insignificant 2 not FDR robust 27 significant
Medium Samples: 18 insignificant 0 not FDR robust 26 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: primary = β0 + β1*yob_1919 + β2*yob + β3*yob² + β4*male + ε
Source: Own calculations based on IPUMS International

Figure 7b

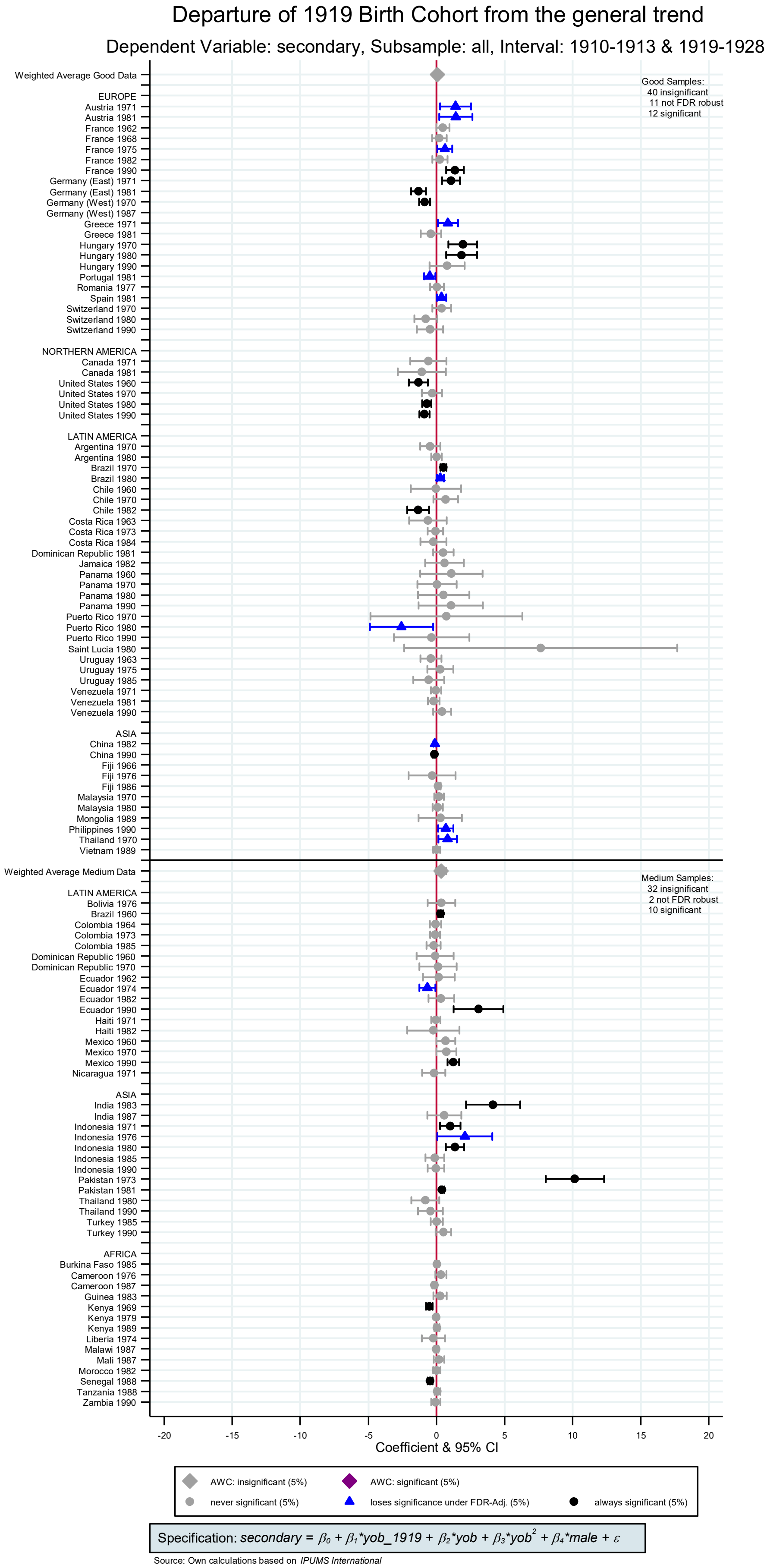

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: secondary, Subsample: all, Interval: 1910-1913 & 1919-1928
Good Samples: 40 insignificant 11 not FDR robust 12 significant
Medium Samples: 32 insignificant 2 not FDR robust 10 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: secondary = $\beta_0 + \beta_1$*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on IPUMS International

Figure 7c

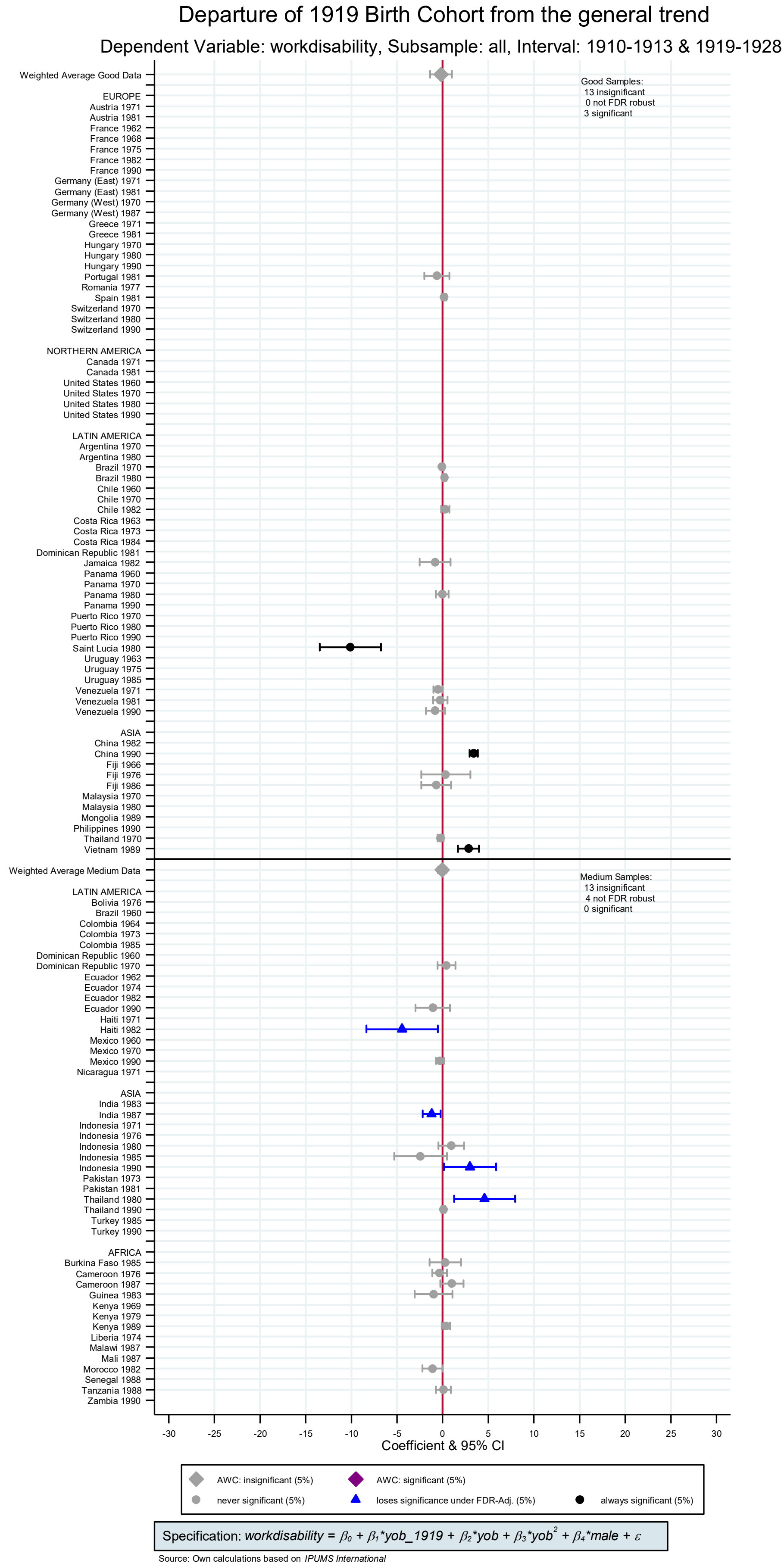
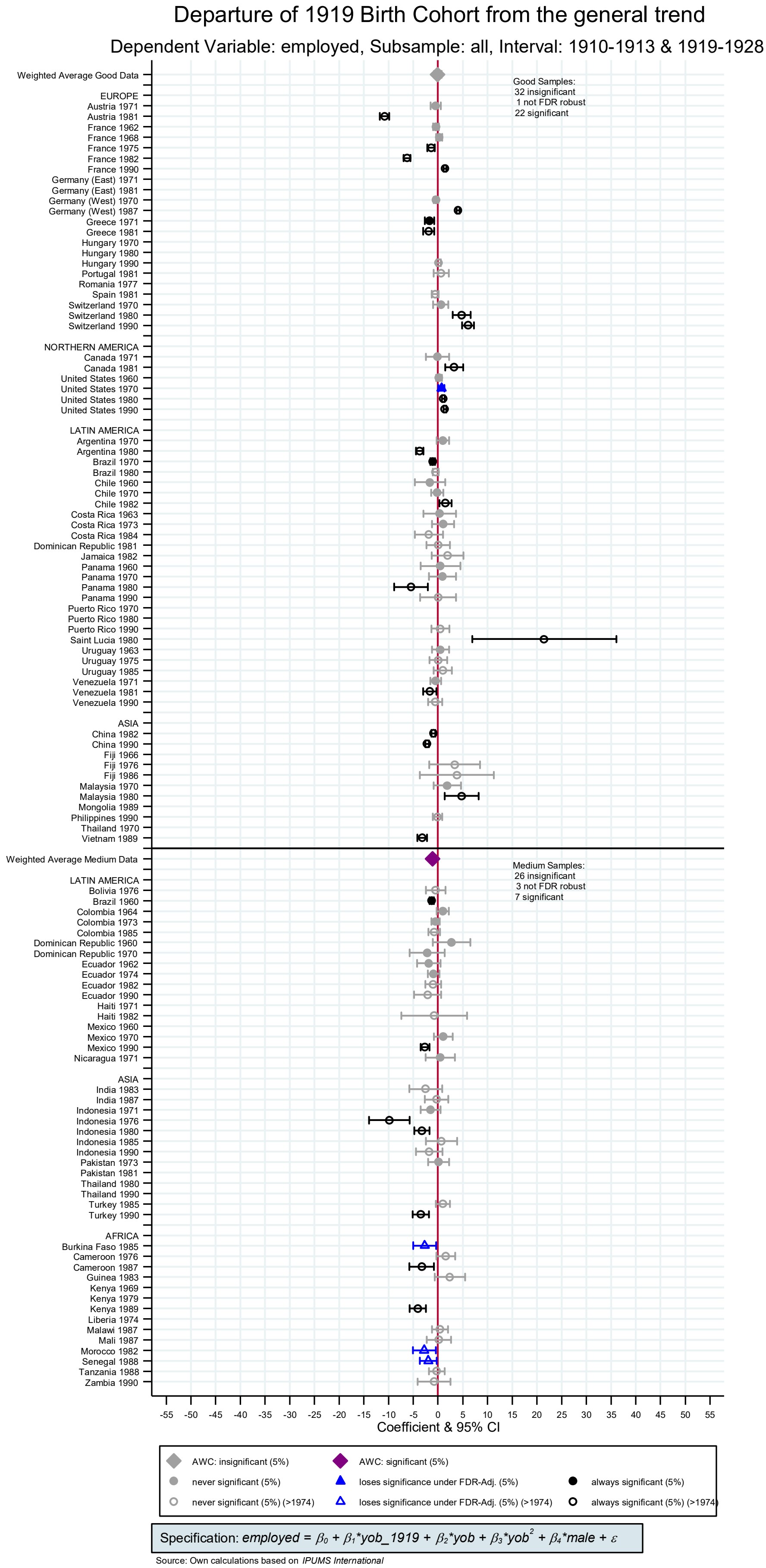
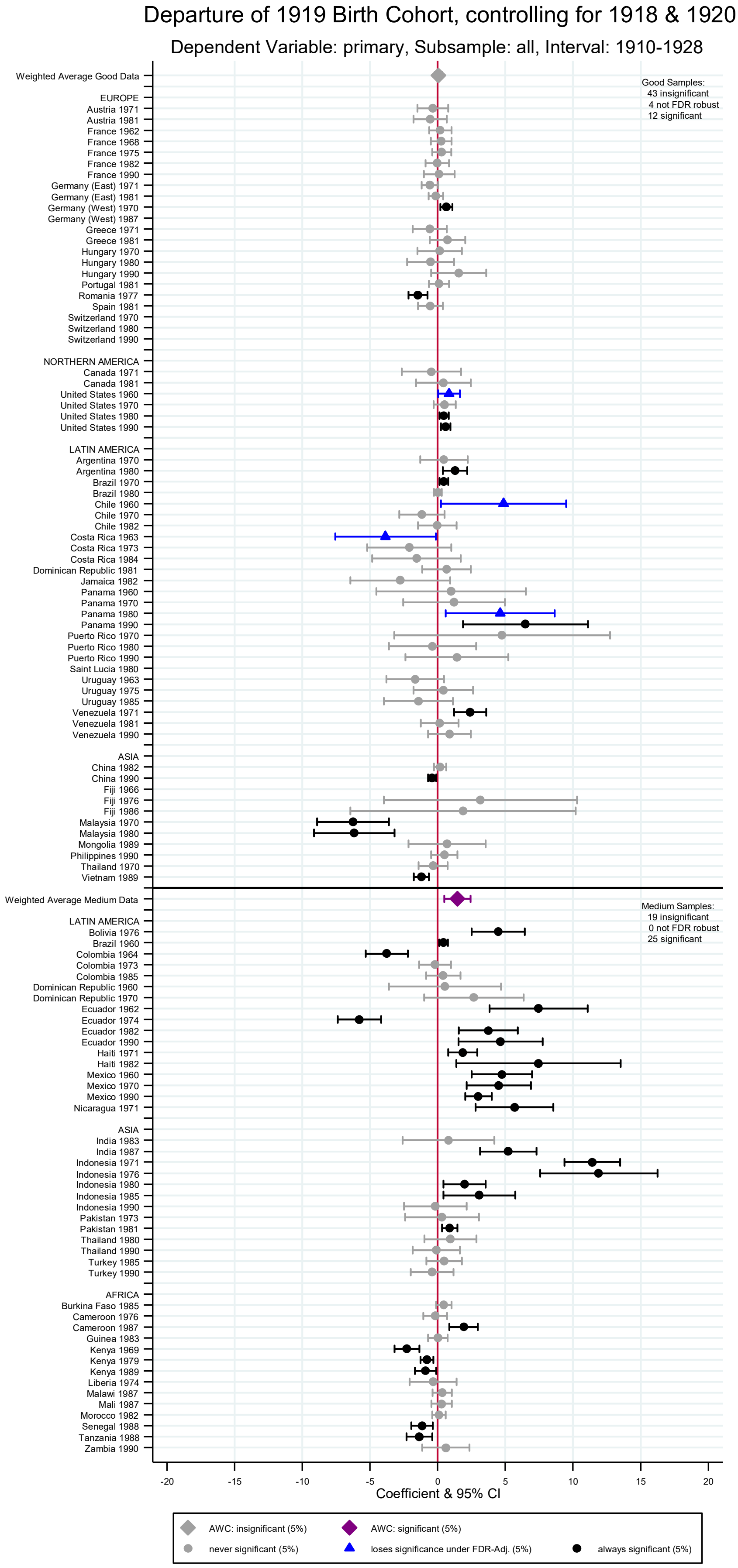

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: all, Interval: 1910-1913 & 1919-1928
Good Samples:
13 insignificant
0 not FDR robust
3 significant
Medium Samples:
13 insignificant
4 not FDR robust
0 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: workdisability = β0 + β1*yob_1919 + β2*yob + β3*yob² + β4*male + ε
Source: Own calculations based on IPUMS International

Figure 7d



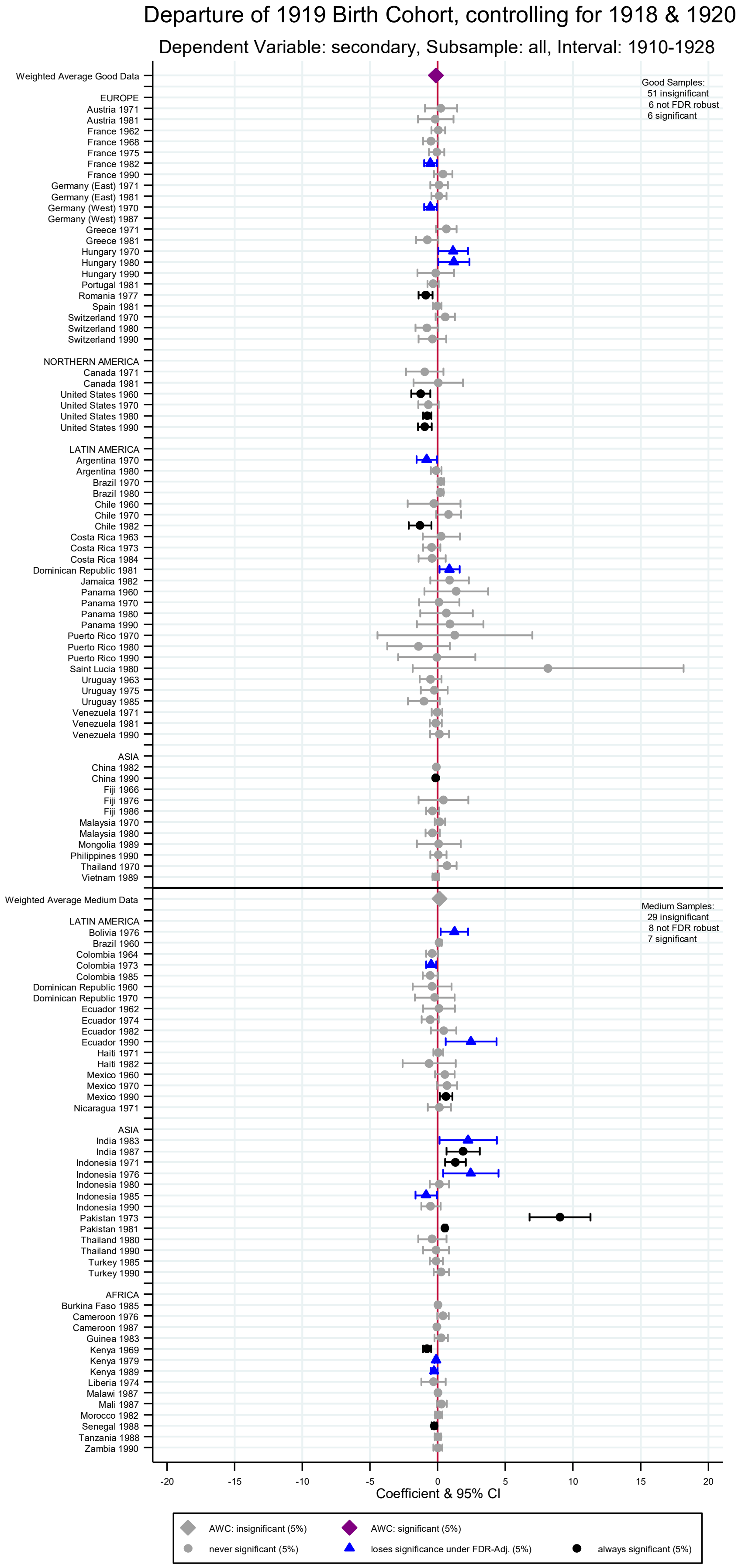
Departure of 1919 Birth Cohort from the general trend
Dependent Variable: employed, Subsample: all, Interval: 1910-1913 & 1919-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Good Samples:
32 insignificant
1 not FDR robust
22 significant
Medium Samples:
26 insignificant
3 not FDR robust
7 significant
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
never significant (5%) (>1974)
loses significance under FDR-Adj. (5%) (>1974)
always significant (5%) (>1974)
Specification: employed = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on *IPUMS International*

Figure 8a



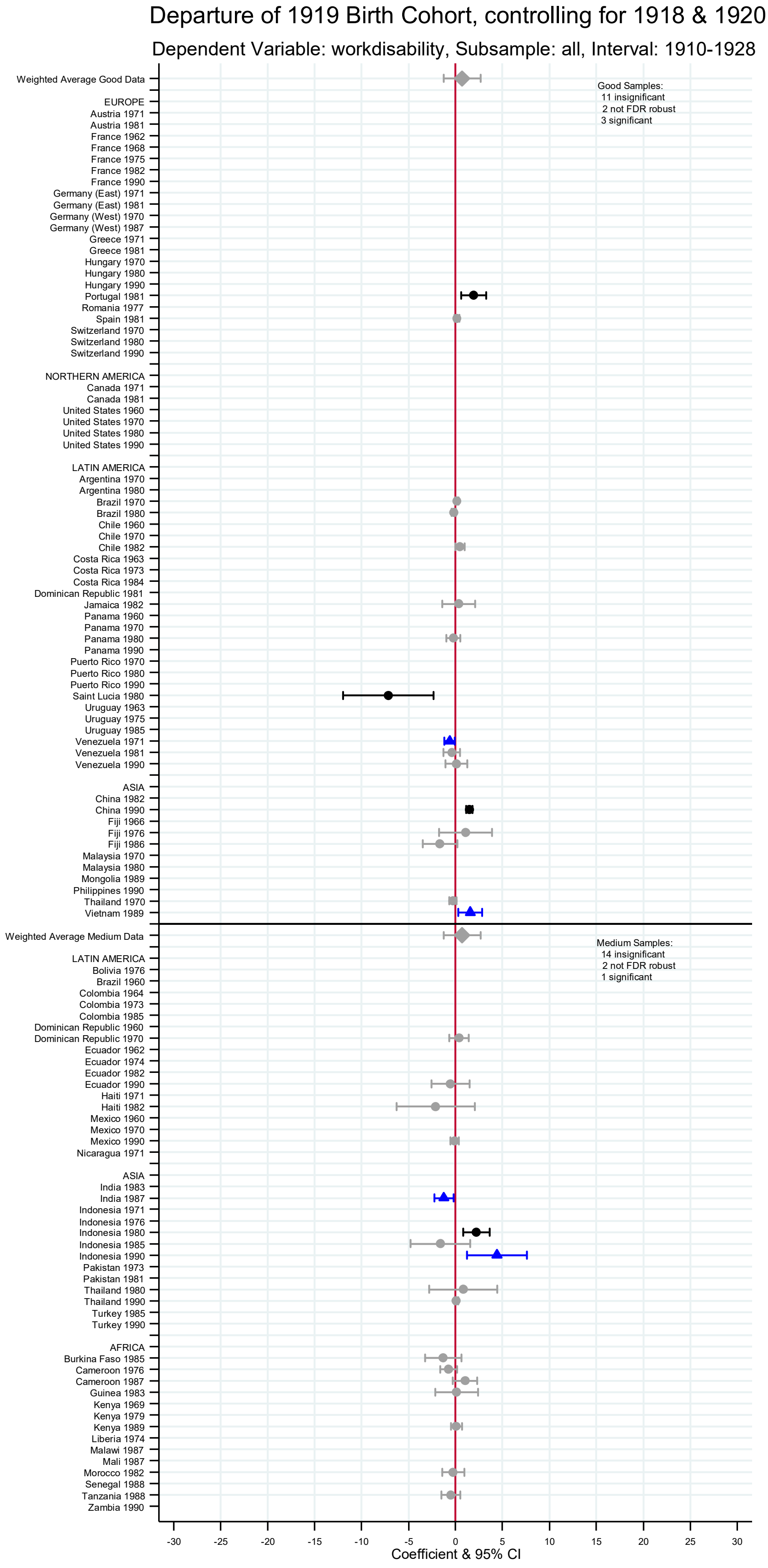
Source: Own calculations based on *IPUMS International*

Figure 8b



Source: Own calculations based on *IPUMS International*

Figure 8c



Source: Own calculations based on *IPUMS International*

Figure 8d

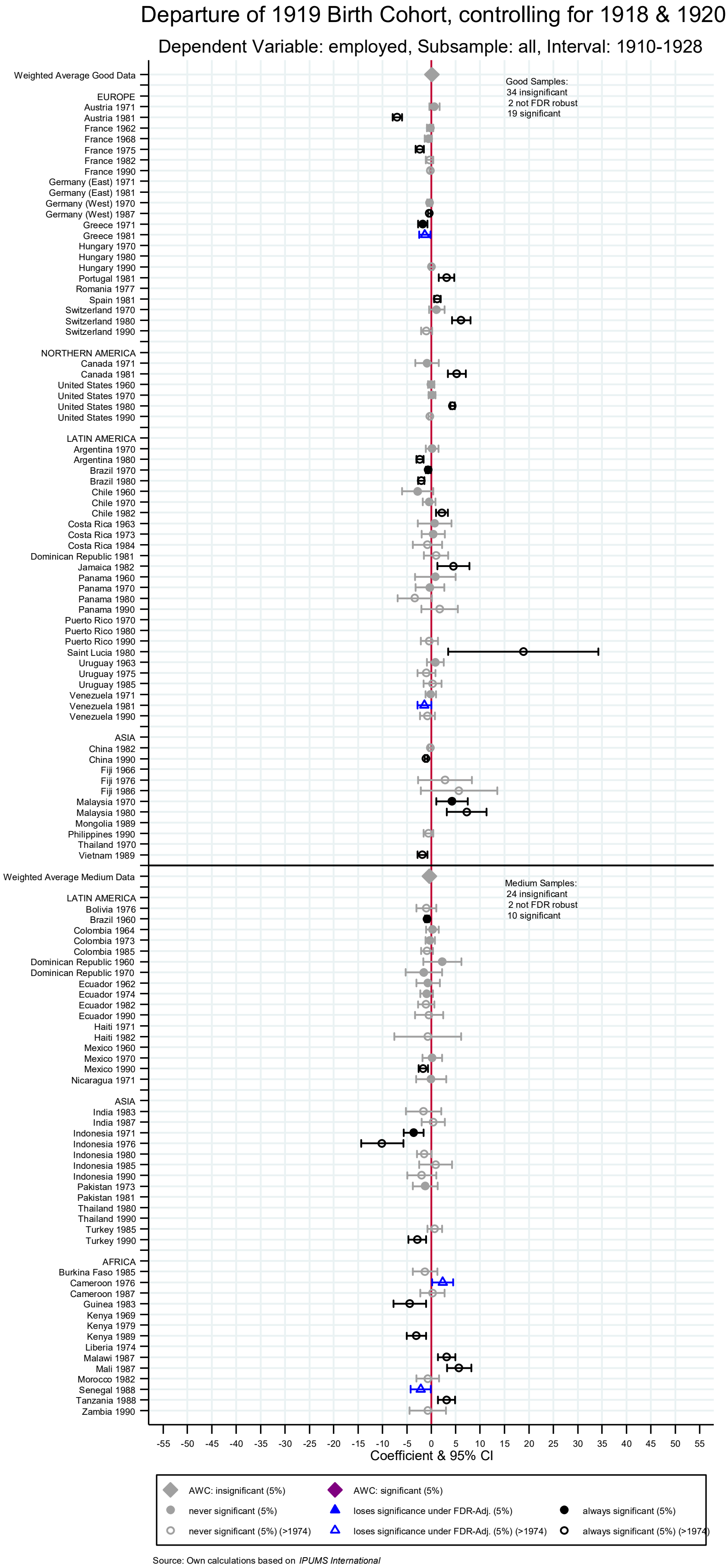

Departure of 1919 Birth Cohort, controlling for 1918 & 1920
Dependent Variable: employed, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
34 insignificant
2 not FDR robust
19 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
24 insignificant
2 not FDR robust
10 significant
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
never significant (5%) (>1974)
loses significance under FDR-Adj. (5%) (>1974)
always significant (5%) (>1974)
Source: Own calculations based on IPUMS International

Figure 9a

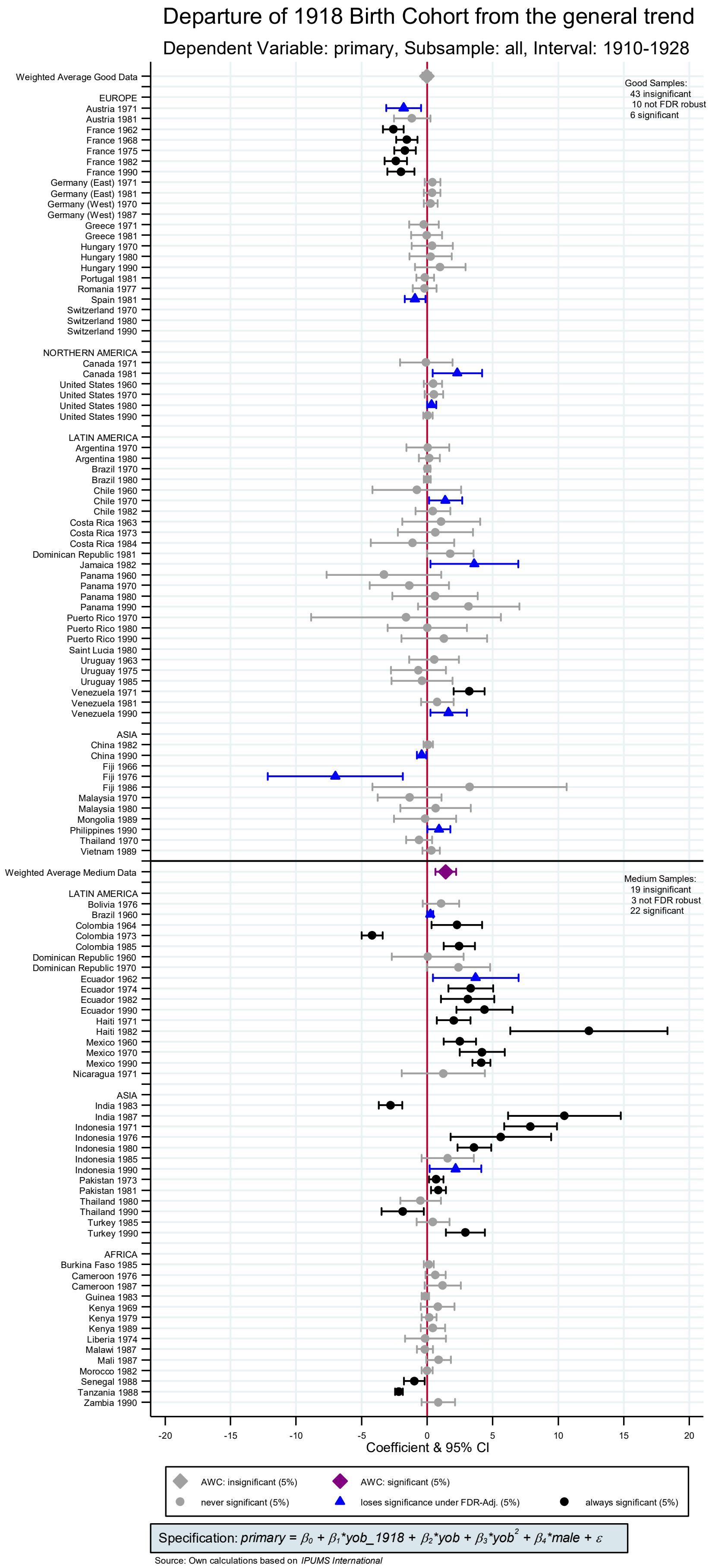

Departure of 1918 Birth Cohort from the general trend
Dependent Variable: primary, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
43 insignificant
10 not FDR robust
6 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
19 insignificant
3 not FDR robust
22 significant
-20
-15
-10
-5
0
5
10
15
20
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: primary = β₀ + β₁*yob_1918 + β₂*yob + β₃*yob² + β₄*male + ε
Source: Own calculations based on IPUMS International

Figure 9b

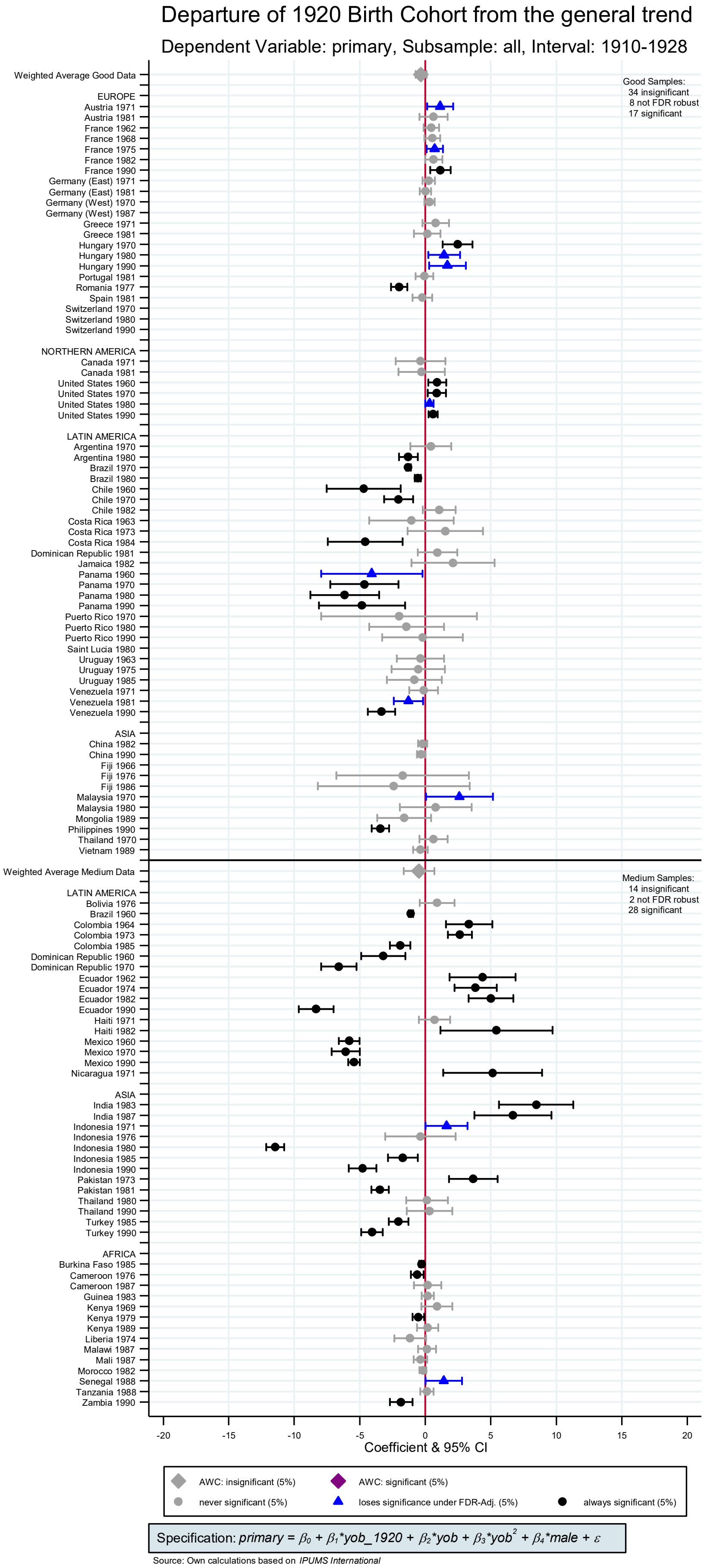
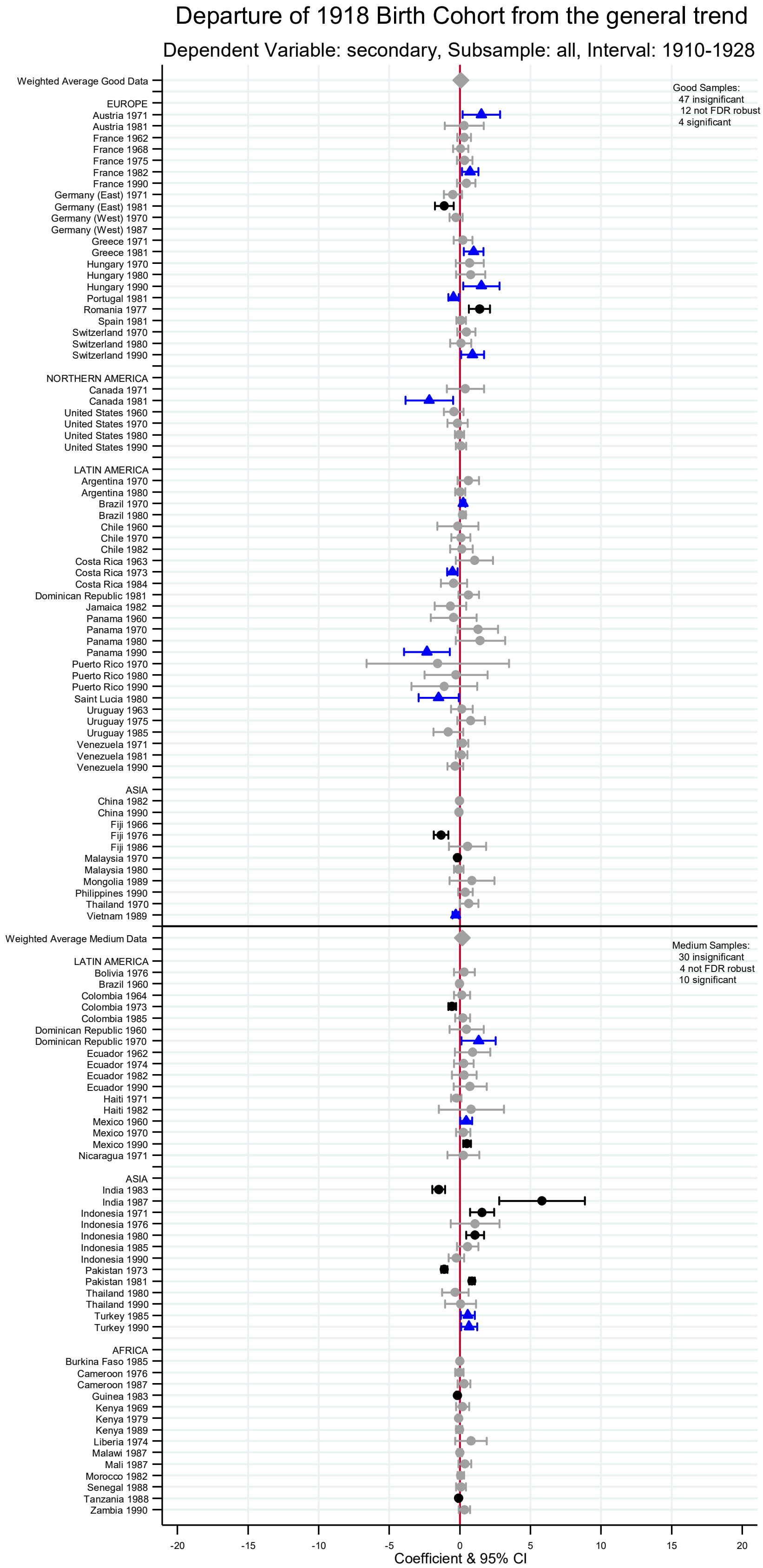

Departure of 1920 Birth Cohort from the general trend
Dependent Variable: primary, Subsample: all, Interval: 1910-1928
Good Samples: 34 insignificant 8 not FDR robust 17 significant
Medium Samples: 14 insignificant 2 not FDR robust 28 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: primary = β_0 + β_1*yob_1920 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on IPUMS International

Figure 9c



Specification: *secondary* = $\beta_0 + \beta_1$*yob_1918 + β_2*yob + β_3*yob^2 + β_4*male + ε

Source: Own calculations based on *IPUMS International*

Figure 9d

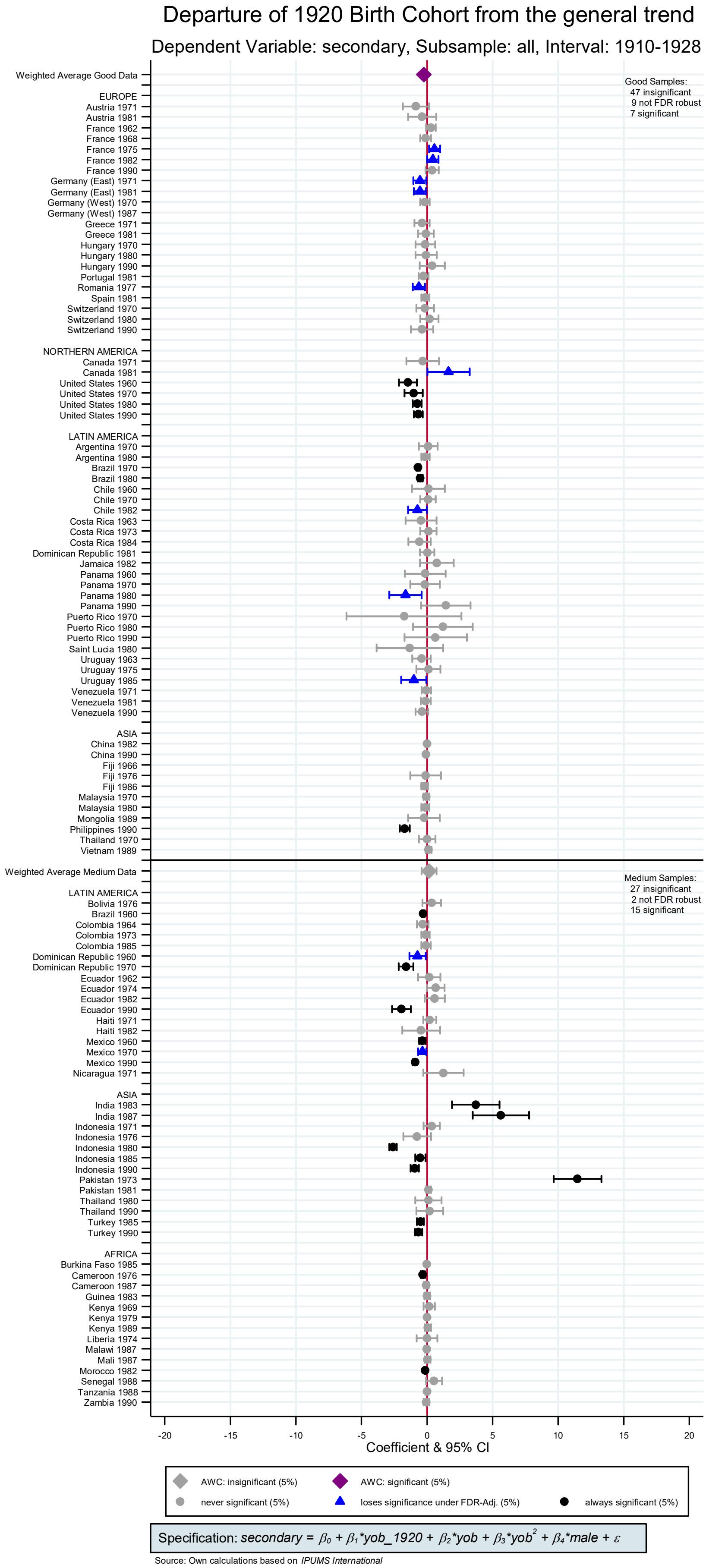

Departure of 1920 Birth Cohort from the general trend
Dependent Variable: secondary, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Good Samples:
47 insignificant
9 not FDR robust
7 significant
Medium Samples:
27 insignificant
2 not FDR robust
15 significant
-20
-15
-10
-5
0
5
10
15
20
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: *secondary* = β_0 + β_1*yob_1920 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on *IPUMS International*

Figure 9e

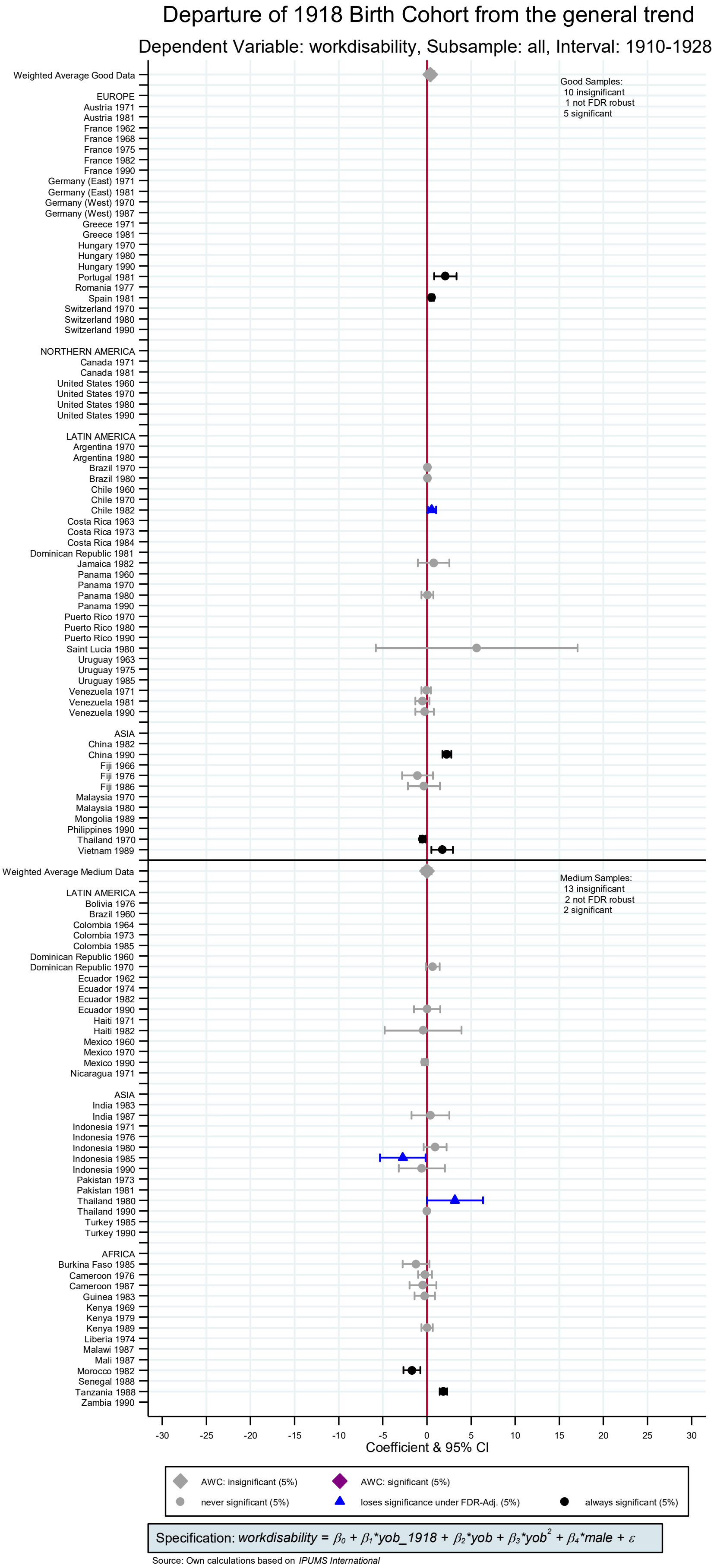
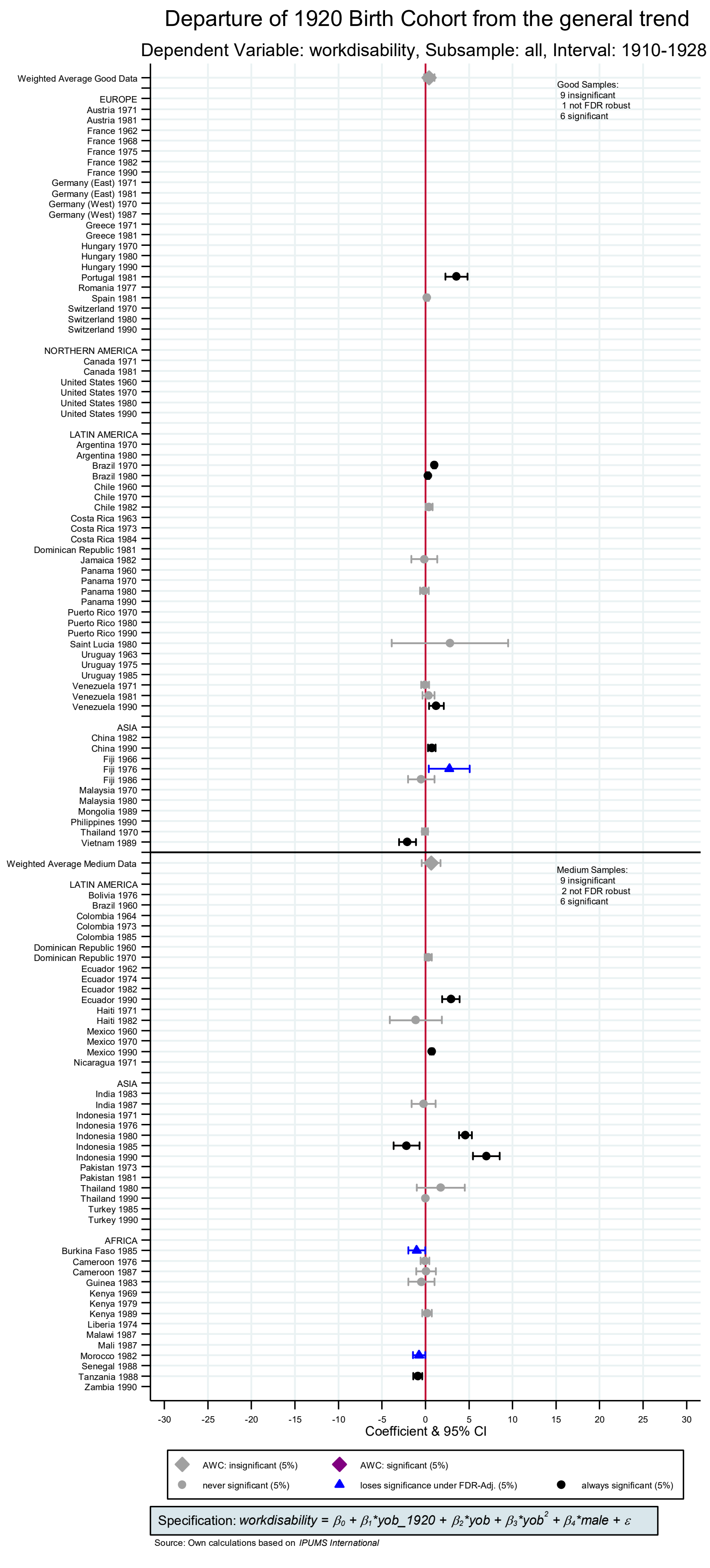

Departure of 1918 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
10 insignificant
1 not FDR robust
5 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
13 insignificant
2 not FDR robust
2 significant
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: *workdisability* = β_0 + β_1*yob_1918 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on *IPUMS International*

Figure 9f



Departure of 1920 Birth Cohort from the general trend
Dependent Variable: workdisability, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
9 insignificant
1 not FDR robust
6 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
9 insignificant
2 not FDR robust
6 significant
-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: workdisability = β0 + β1*yob_1920 + β2*yob + β3*yob² + β4*male + ε
Source: Own calculations based on IPUMS International

Figure 9g

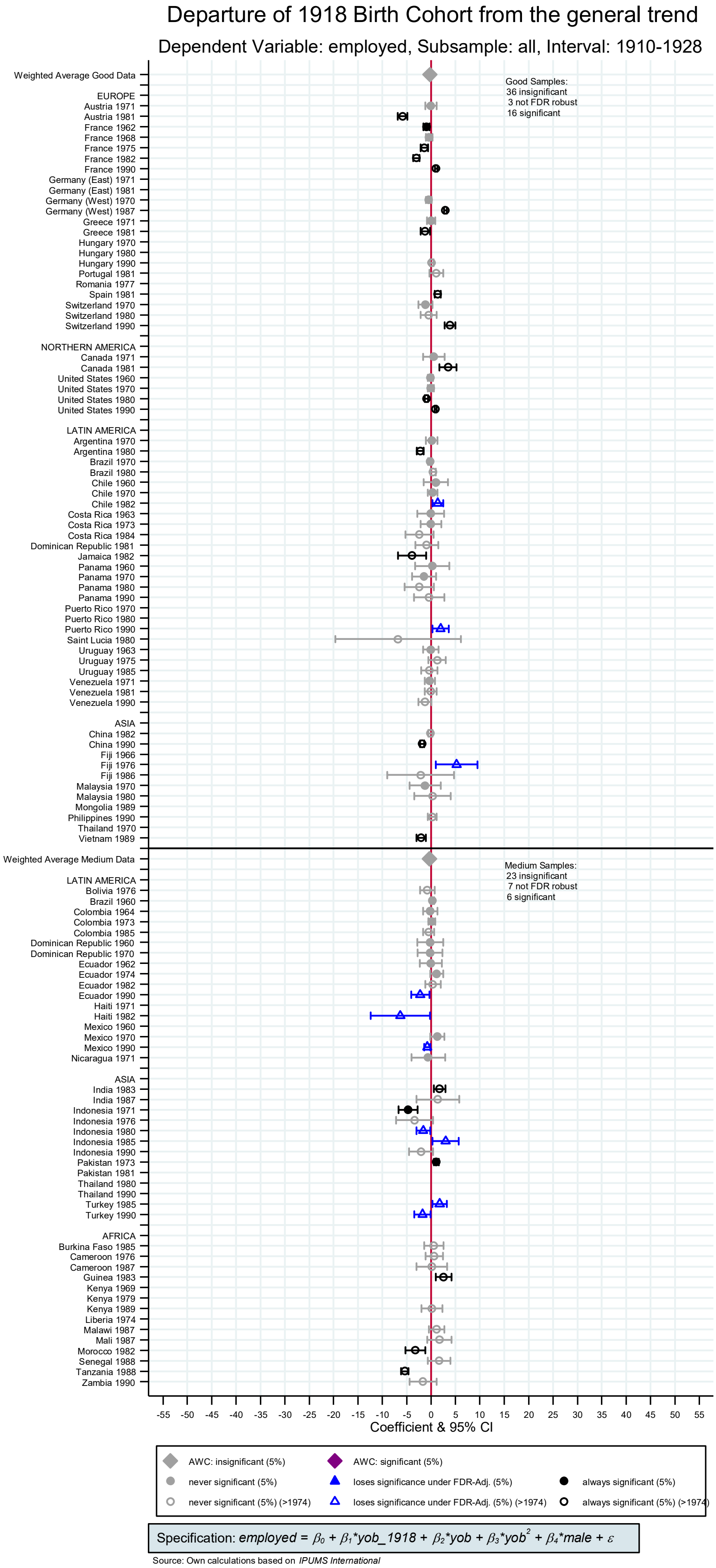
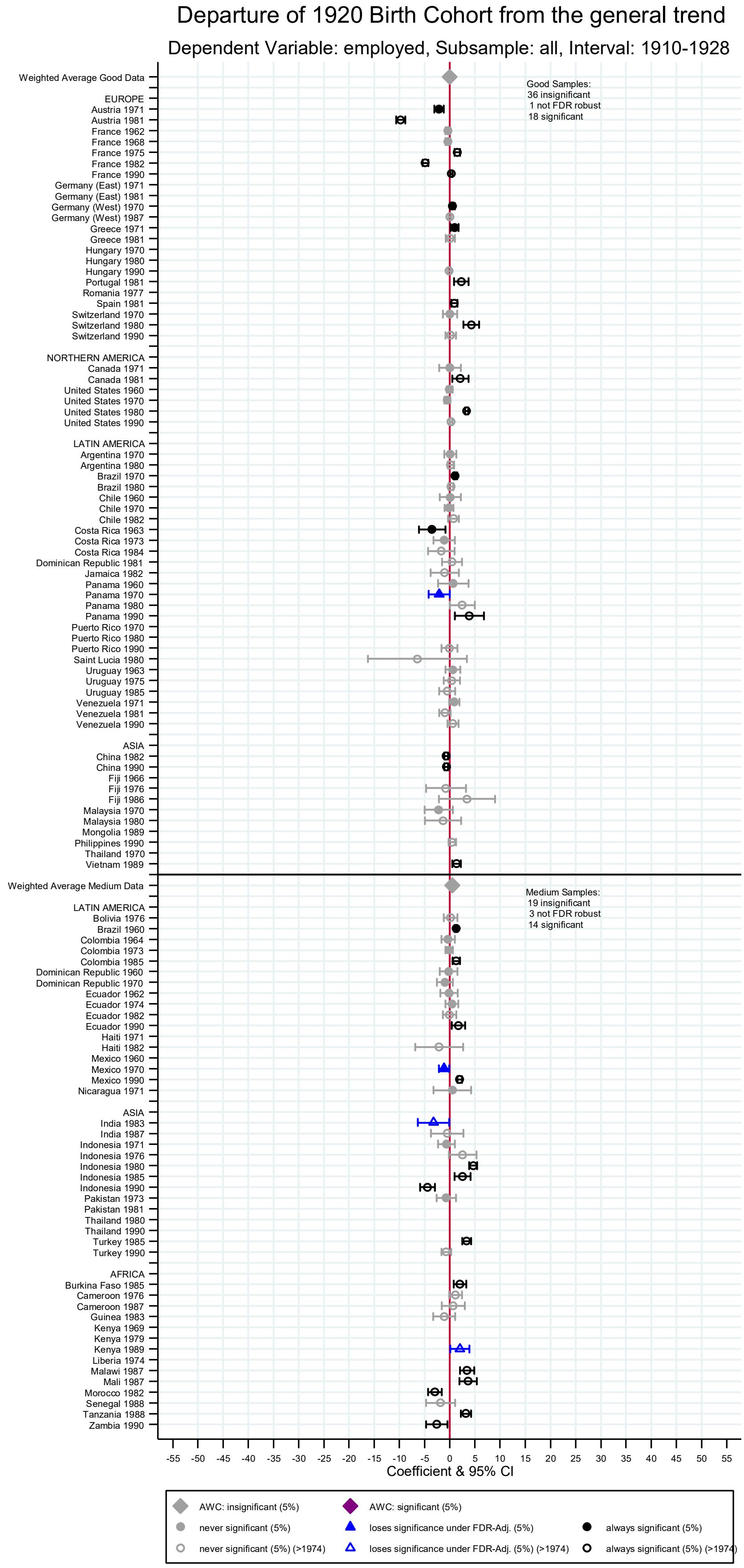

Departure of 1918 Birth Cohort from the general trend
Dependent Variable: employed, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
36 insignificant
3 not FDR robust
16 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
23 insignificant
7 not FDR robust
6 significant
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
never significant (5%) (>1974)
loses significance under FDR-Adj. (5%) (>1974)
always significant (5%) (>1974)
Specification: employed = β_0 + β_1*yob_1918 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on IPUMS International

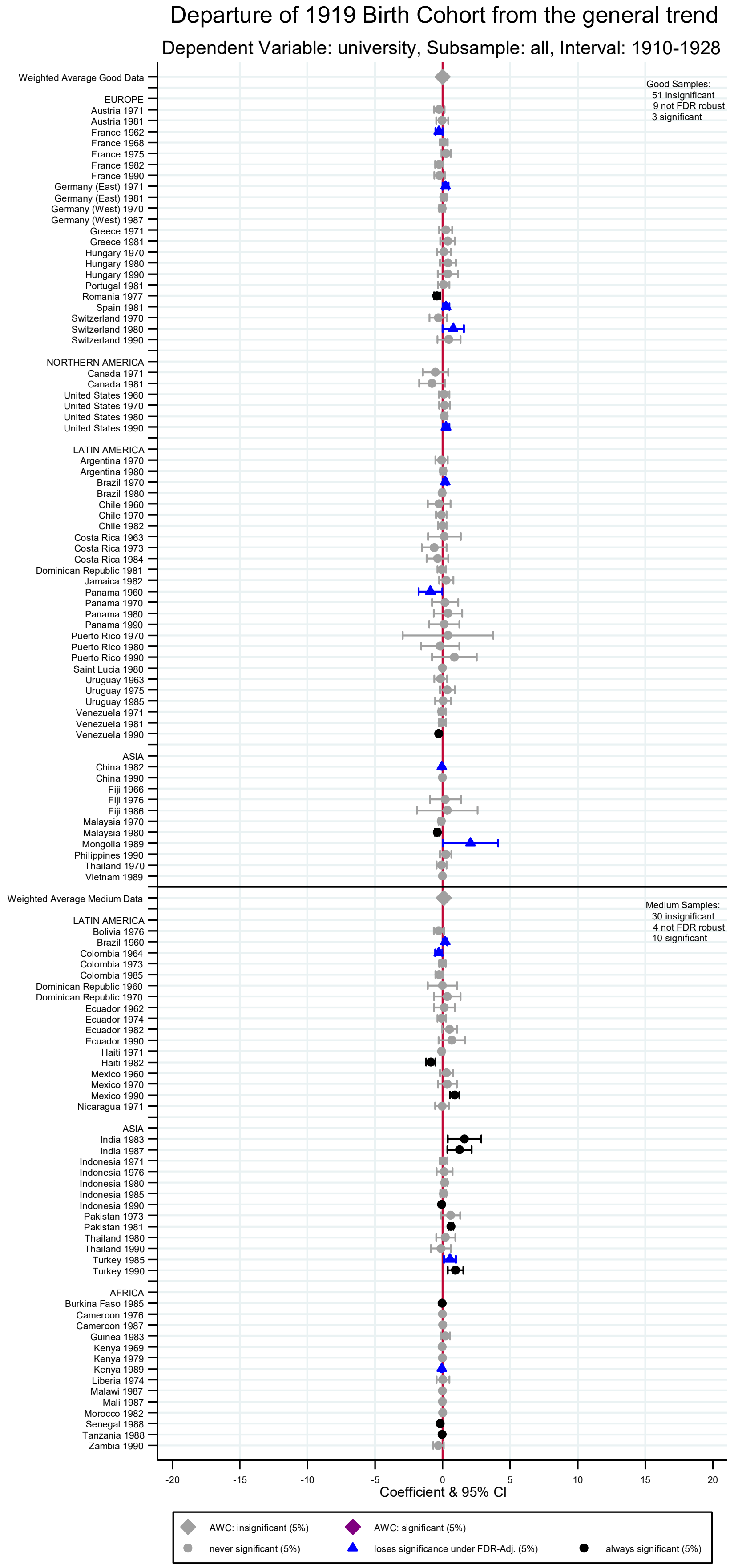
Figure 9h



Specification: *employed* = $\beta_0 + \beta_1$*yob_1920 + β_2*yob + β_3*yob^2 + β_4*male + ε

Source: Own calculations based on *IPUMS International*

Figure 10a



Specification: *university* = $\beta_0 + \beta_1$*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε

Source: Own calculations based on *IPUMS International*

Figure 10b

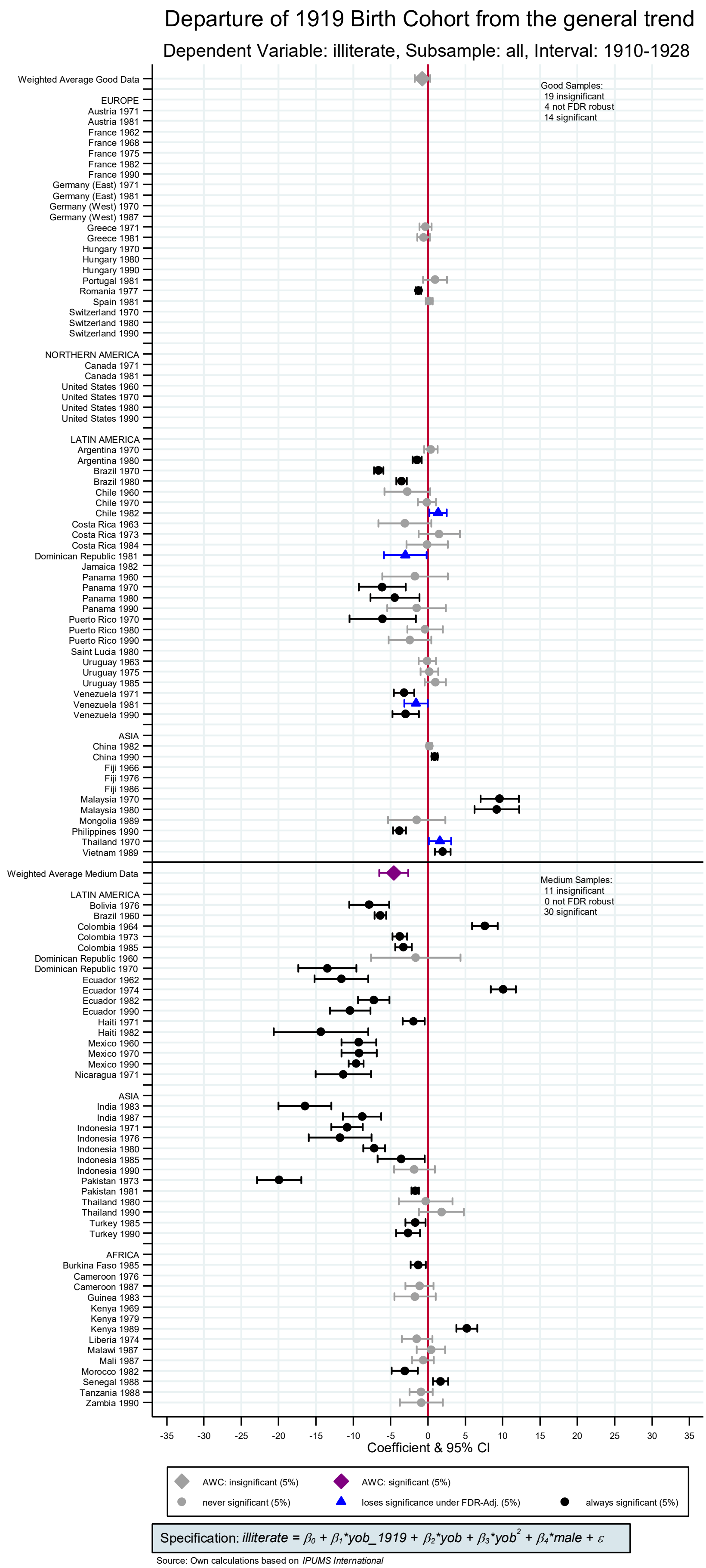
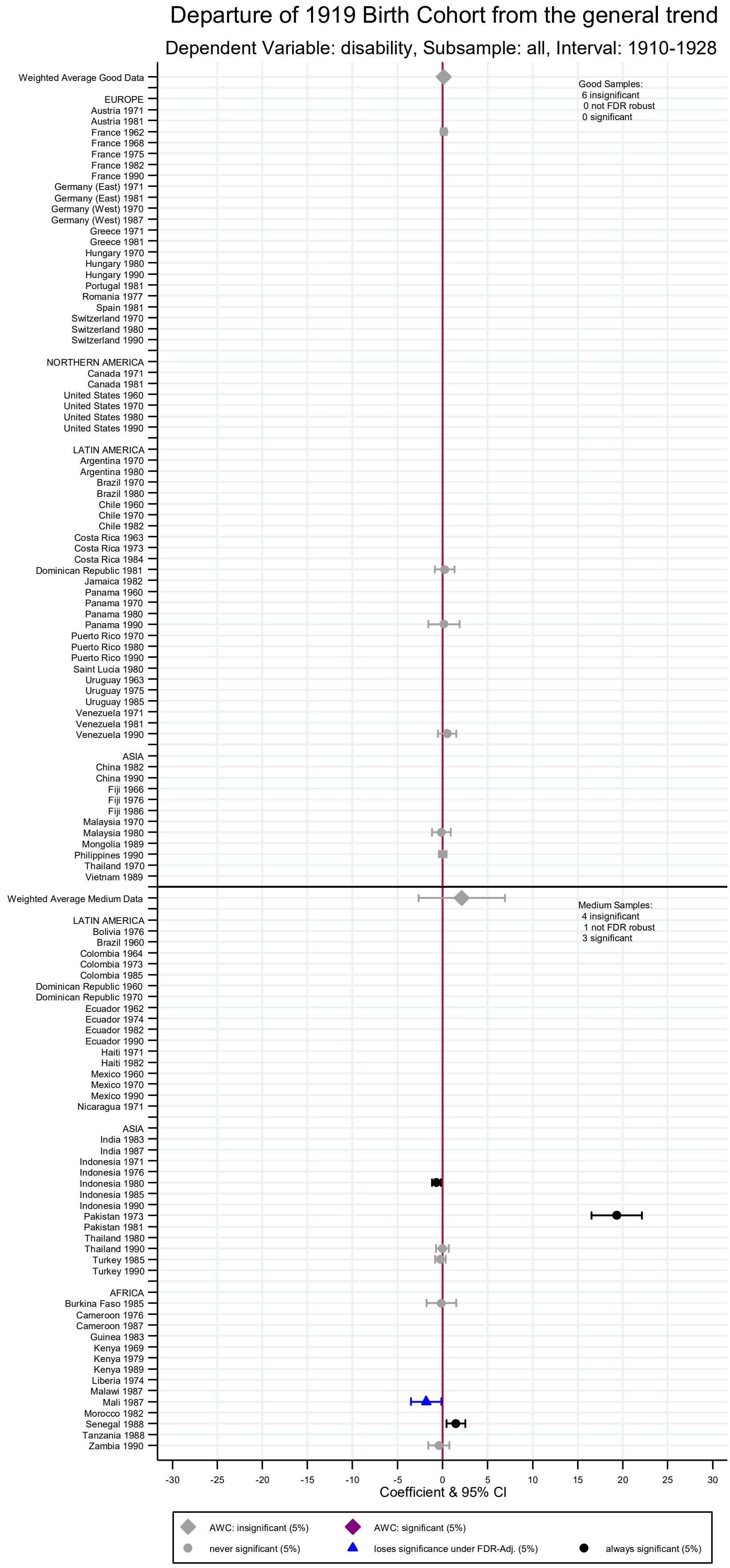

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: illiterate, Subsample: all, Interval: 1910-1928
Good Samples:
19 insignificant
4 not FDR robust
14 significant
Medium Samples:
11 insignificant
0 not FDR robust
30 significant
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
Specification: illiterate = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on IPUMS International

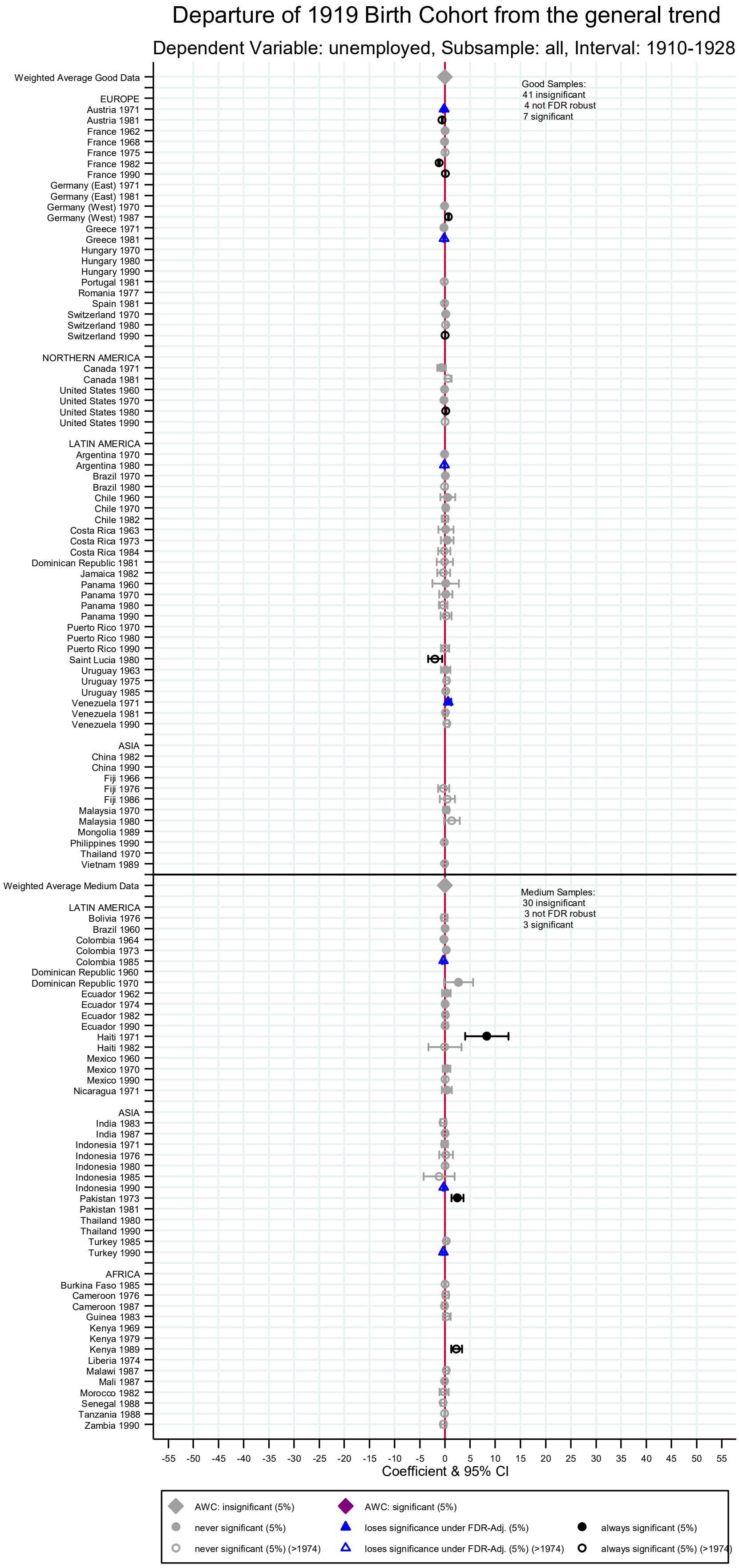
Figure 10c



Specification: *disability* = $\beta_0 + \beta_1$**yob_1919* + β_2**yob* + β_3**yob*^{2} + β_4**male* + ε

Source: Own calculations based on *IPUMS International*

Figure 10d



Specification: *unemployed* = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε

Source: Own calculations based on *IPUMS International*

Figure 10e

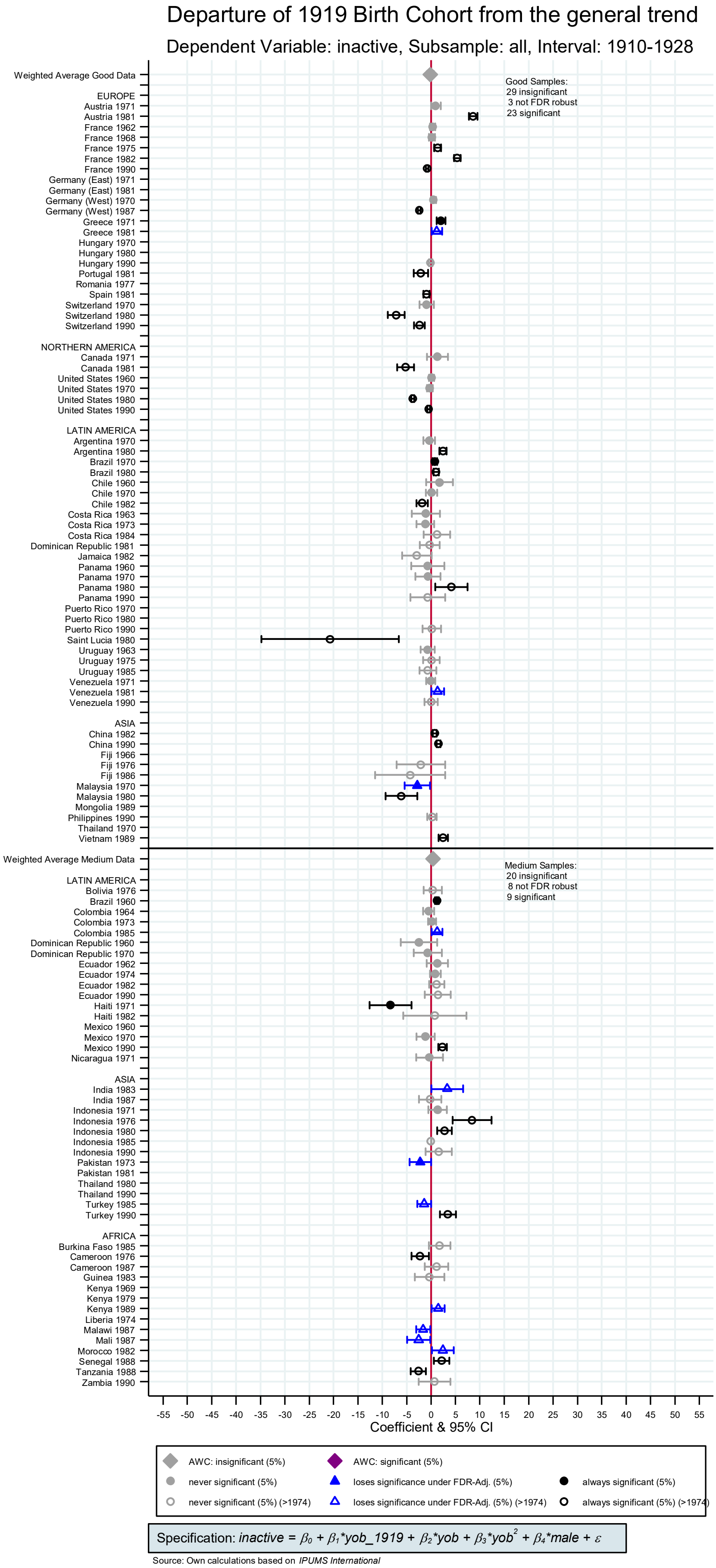

Departure of 1919 Birth Cohort from the general trend
Dependent Variable: inactive, Subsample: all, Interval: 1910-1928
Weighted Average Good Data
EUROPE
Austria 1971
Austria 1981
France 1962
France 1968
France 1975
France 1982
France 1990
Germany (East) 1971
Germany (East) 1981
Germany (West) 1970
Germany (West) 1987
Greece 1971
Greece 1981
Hungary 1970
Hungary 1980
Hungary 1990
Portugal 1981
Romania 1977
Spain 1981
Switzerland 1970
Switzerland 1980
Switzerland 1990
NORTHERN AMERICA
Canada 1971
Canada 1981
United States 1960
United States 1970
United States 1980
United States 1990
LATIN AMERICA
Argentina 1970
Argentina 1980
Brazil 1970
Brazil 1980
Chile 1960
Chile 1970
Chile 1982
Costa Rica 1963
Costa Rica 1973
Costa Rica 1984
Dominican Republic 1981
Jamaica 1982
Panama 1960
Panama 1970
Panama 1980
Panama 1990
Puerto Rico 1970
Puerto Rico 1980
Puerto Rico 1990
Saint Lucia 1980
Uruguay 1963
Uruguay 1975
Uruguay 1985
Venezuela 1971
Venezuela 1981
Venezuela 1990
ASIA
China 1982
China 1990
Fiji 1966
Fiji 1976
Fiji 1986
Malaysia 1970
Malaysia 1980
Mongolia 1989
Philippines 1990
Thailand 1970
Vietnam 1989
Good Samples:
29 insignificant
3 not FDR robust
23 significant
Weighted Average Medium Data
LATIN AMERICA
Bolivia 1976
Brazil 1960
Colombia 1964
Colombia 1973
Colombia 1985
Dominican Republic 1960
Dominican Republic 1970
Ecuador 1962
Ecuador 1974
Ecuador 1982
Ecuador 1990
Haiti 1971
Haiti 1982
Mexico 1960
Mexico 1970
Mexico 1990
Nicaragua 1971
ASIA
India 1983
India 1987
Indonesia 1971
Indonesia 1976
Indonesia 1980
Indonesia 1985
Indonesia 1990
Pakistan 1973
Pakistan 1981
Thailand 1980
Thailand 1990
Turkey 1985
Turkey 1990
AFRICA
Burkina Faso 1985
Cameroon 1976
Cameroon 1987
Guinea 1983
Kenya 1969
Kenya 1979
Kenya 1989
Liberia 1974
Malawi 1987
Mali 1987
Morocco 1982
Senegal 1988
Tanzania 1988
Zambia 1990
Medium Samples:
20 insignificant
8 not FDR robust
9 significant
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
Coefficient & 95% CI
AWC: insignificant (5%)
AWC: significant (5%)
never significant (5%)
loses significance under FDR-Adj. (5%)
always significant (5%)
never significant (5%) (>1974)
loses significance under FDR-Adj. (5%) (>1974)
always significant (5%) (>1974)
Specification: *inactive* = β_0 + β_1*yob_1919 + β_2*yob + β_3*yob^2 + β_4*male + ε
Source: Own calculations based on *IPUMS International*

Table 4a

Table 4a: Meta-Analysis for primary

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef
CensusYear			-0.0001									
			[0.0003]									
good_data				-0.0003								
				[0.0031]								
medium_data				0.0172***				0.0257*	0.0159**			0.0277**
				[0.0035]				[0.0111]	[0.0052]			[0.0082]
Europe					-0.0047	-0.0048						
					[0.0054]	[0.0047]						
N_America					0.0040	0.0041						
					[0.0093]	[0.0082]						
L_America					0.0137***	0.0053						
					[0.0040]	[0.0047]						
Asia					0.0156**	-0.0071						
					[0.0052]	[0.0071]						
Africa					-0.0013	-0.0014						
					[0.0060]	[0.0053]						
L_America_medium						0.0187*						
						[0.0072]						
Asia_medium						0.0385***						
						[0.0094]						
myers_year							0.0008***					
							[0.0002]					
p_miss_year							0.0005					
							[0.0003]					
computed_year								0.0103				
								[0.0066]				
medium_computed								-0.0119				
								[0.0123]				
nativity_unavailable									-0.0000			
									[0.0072]			
medium_no_nativity									0.0154			
									[0.0138]			
bothdates										0.0079*		
										[0.0035]		
startdate										0.0084*		
										[0.0041]		
nodate										0.0037		
										[0.0076]		
belligerent											0.0021	-0.0051
											[0.0028]	[0.0070]
non_belligerent											0.0197***	
											[0.0043]	
medium_belligerent												-0.0186
												[0.0098]
Constant	**0.0076****	**0.0023**	**0.1465**				**-0.0041**	**-0.0071**	**-0.0002**			**0.0035**
	[0.0025]	**[0.0195]**	**[0.5709]**				**[0.0035]**	**[0.0053]**	**[0.0036]**			**[0.0062]**
Observations	103	103	103	103	103	103	103	103	103	103	103	103
Country FE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F-Test				13.73	3.10			2.71	0.00	0.15	11.60	0.75
p-value				0.00	0.02			0.10	0.97	0.86	0.00	0.39

*** p<0.001, ** p<0.01, * p<0.05

Table 4b

Table 4b: Meta-Analysis for secondary												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef
CensusYear			-0.0000									
			[0.0001]									
good_data				-0.0004								
				[0.0010]								
medium_data				0.0017				0.0015	0.0021			0.0062*
				[0.0011]				[0.0037]	[0.0016]			[0.0026]
Europe					0.0008	0.0008						
					[0.0016]	[0.0016]						
N_America					-0.0063*	-0.0063*						
					[0.0030]	[0.0030]						
L_America					0.0005	-0.0006						
					[0.0012]	[0.0016]						
Asia					0.0028	0.0006						
					[0.0015]	[0.0020]						
Africa					-0.0004	-0.0004						
					[0.0016]	[0.0016]						
L_America_medium						0.0022						
						[0.0024]						
Asia_medium						0.0046						
						[0.0030]						
myers_year							0.0003***					
							[0.0001]					
p_miss_year							0.0001					
							[0.0001]					
computed_year								-0.0011				
								[0.0021]				
medium_computed								0.0009				
								[0.0041]				
nativity_unavailable									0.0014			
									[0.0024]			
medium_no_nativity									0.0025			
									[0.0045]			
bothdates										0.0004		
										[0.0010]		
startdate										0.0015		
										[0.0012]		
nodate										-0.0021		
										[0.0025]		
belligerent											0.0002	0.0021
											[0.0009]	[0.0022]
non_belligerent											0.0013	
											[0.0013]	
medium_belligerent												-0.0062
												[0.0031]
Constant	**0.0005**	**-0.0007**	**0.0063**				**-0.0027***	**0.0003**	**-0.0007**			**-0.0020**
	[0.0007]	**[0.0084]**	**[0.1677]**				**[0.0011]**	**[0.0017]**	**[0.0011]**			**[0.0019]**
Observations	107	107	107	107	107	107	107	107	107	107	107	107
Country FE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F-Test				1.96	1.94			0.00	0.01	0.84	0.52	2.85
p-value				0.16	0.11			0.94	0.93	0.43	0.47	0.09

*** p<0.001, ** p<0.01, * p<0.05

Table 4c

Table 4c: Meta-Analysis for workdisability												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef
CensusYear			0.0002									
			[0.0004]									
good_data				-0.0003								
				[0.0040]								
medium_data				-0.0013				-0.0018	-0.0001			0.0015
				[0.0042]				[0.0102]	[0.0016]			[0.0114]
Europe					0.0055	0.0056						
					[0.0110]	[0.0116]						
L_America					-0.0057	-0.0064						
					[0.0045]	[0.0055]						
Asia					0.0054	0.0081						
					[0.0053]	[0.0077]						
Africa					-0.0022	-0.0022						
					[0.0062]	[0.0065]						
L_America_medium						0.0016						
						[0.0108]						
Asia_medium						-0.0056						
						[0.0110]						
myers_year							-0.0003					
							[0.0002]					
p_miss_year							0.0003					
							[0.0003]					
computed_year								-0.0132				
								[0.0082]				
medium_computed								0.0010				
								[0.0120]				
nativity_unavailable									0.0215***			
									[0.0038]			
medium_no_nativity									-0.0329***			
									[0.0083]			
bothdates										0.0029		
										[0.0034]		
startdate										-0.0033		
										[0.0046]		
nodate										-0.0289*		
										[0.0118]		
belligerent											-0.0013	-0.0006
											[0.0035]	[0.0090]
non_belligerent											0.0004	
											[0.0053]	
medium_belligerent												-0.0030
												[0.0136]
Constant	**-0.0007**	**0.0194***	**-0.4444**				**0.0026**	**0.0093**	**0.0005**			**-0.0003**
	[0.0028]	**[0.0082]**	**[0.8852]**				**[0.0041]**	**[0.0069]**	**[0.0009]**			**[0.0073]**
Observations	33	33	33	33	33	33	33	33	33	33	33	33
Country FE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F-Test				0.03	0.97			0.02	14.10	3.58	0.07	0.01
p-value				0.87	0.42			0.90	0.00	0.04	0.79	0.91
*** p<0.001, ** p<0.01, * p<0.05												

Table 4d

Table 4d: Meta-Analysis for employed

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef	coef
CensusYear			-0.0001									
			[0.0003]									
good_data				0.0009								
				[0.0030]								
medium_data				-0.0075				-0.0140	-0.0119*			-0.0158
				[0.0039]				[0.0131]	[0.0052]			[0.0081]
Europe					-0.0019	-0.0019						
					[0.0051]	[0.0051]						
N_America					0.0142	0.0142						
					[0.0088]	[0.0087]						
L_America					-0.0034	-0.0014						
					[0.0038]	[0.0048]						
Asia					-0.0073	0.0029						
					[0.0057]	[0.0086]						
Africa					-0.0020	-0.0020						
					[0.0071]	[0.0071]						
L_America_medium						-0.0051						
						[0.0077]						
Asia_medium						-0.0182						
						[0.0115]						
myers_year							-0.0002					
							[0.0002]					
p_miss_year							-0.0005					
							[0.0004]					
computed_year								0.0103				
								[0.0063]				
medium_computed								0.0037				
								[0.0142]				
nativity_unavailable									-0.0196**			
									[0.0071]			
medium_no_nativity									0.0132			
									[0.0154]			
bothdates										-0.0025		
										[0.0033]		
startdate										-0.0033		
										[0.0041]		
nodate										0.0040		
										[0.0087]		
belligerent											-0.0018	-0.0054
											[0.0030]	[0.0067]
non_belligerent											-0.0031	
											[0.0041]	
medium_belligerent												0.0123
												[0.0104]
Constant	**-0.0023**	**-0.0039**	**0.1278**				**0.0011**	**-0.0060**	**0.0050**			**0.0047**
	[0.0024]	**[0.0248]**	**[0.5354]**				**[0.0036]**	**[0.0051]**	**[0.0033]**			**[0.0057]**
Observations	91	91	91	91	91	91	91	91	91	91	91	91
Country FE	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F-Test				2.81	1.10			0.44	1.98	0.29	0.07	1.30
p-value				0.10	0.36			0.51	0.16	0.75	0.79	0.26

*** p<0.001, ** p<0.01, * p<0.05

All data were provided by:

Minnesota Population Center. ***Integrated Public Use Microdata Series, International: Version 6.3*** **[Machine-readable database]. Minneapolis: University of Minnesota, 2014.**

The authors wish to acknowledge the statistical offices that provided the underlying data making this research possible:

Argentina	National Institute of Statistics and Censuses
Austria	National Bureau of Statistics
Bolivia	National Institute of Statistics
Brazil	Institute of Geography and Statistics
Burkina Faso	National Institute of Statistics and Demography
Cameroon	Central Bureau of Census and Population Studies
Canada	Statistics Canada
Chile	National Institute of Statistics
China	National Bureau of Statistics
Colombia	National Administrative Department of Statistics
Costa Rica	National Institute of Statistics and Censuses
Dominican Republic	National Statistics Office
Ecuador	National Institute of Statistics and Censuses
Fiji Islands	Bureau of Statistics
France	National Institute of Statistics and Economic Studies
Germany	Federal Statistical Office
Ghana	Ghana Statistical Services
Greece	National Statistical Office
Guinea	National Statistics Directorate
Haiti	Institute of Statistics and Informatics
Hungary	Central Statistical Office
India	Ministry of Statistics and Programme Implementation
Indonesia	Statistics Indonesia
Ireland	Central Statistics Office
Israel	Central Bureau of Statistics
Jamaica	Statistical Institute
Kenya	National Bureau of Statistics
Liberia	Institute of Statistics and Geo-Information Systems
Malawi	National Statistical Office
Malaysia	Department of Statistics
Mali	National Directorate of Statistics and Informatics
Mexico	National Institute of Statistics, Geography, and Informatics
Mongolia	National Statistical Office
Morocco	High Commission of Planning
Netherlands	Statistics Netherlands
Nicaragua	National Institute of Statistics and Censuses
Pakistan	Statistics Division
Panama	Census and Statistics Directorate
Philippines	National Statistics Office
Portugal	National Institute of Statistics
Puerto Rico	U.S. Bureau of the Census
Romania	National Institute of Statistics
Saint Lucia	Government Statistics Department
Senegal	National Agency of Statistics and Demography
Spain	National Institute of Statistics
Switzerland	Federal Statistical Office
Tanzania	National Bureau of Statistics
Thailand	National Statistical Office
Turkey	Turkish Statistical Institute
United States	Bureau of the Census
Uruguay	National Institute of Statistics
Venezuela	National Institute of Statistics
Vietnam	General Statistics Office
Zambia	Central Statistical Office