Why do young females delay labor market participation in rural Indonesia? A cohort analysis using maximum entropy approach

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Abstract

Rural females born in the late 80s and younger in Indonesia were less likely to participate in the labor market relative to their older counterparts who were born three decades earlier. The opposite trend however emerges for urban women. The interaction between two opposing trends is arguably the main culprit to the decades-long stagnation in female labor force participation in Indonesia. I construct a synthetic panel of cohorts using 30 years-long of repeated cross-sectional household survey data, namely SAKERNAS and SUSENAS. Focusing on the multi-generation of rural women, I employ the age-period-cohort model (Browning et al., 2012) to shed light on key factors that drive the negative cohort effect of labor force participation. The results suggest at least two important insights. Firstly, albeit more young women opt out the unpaid family job, I do not find evidence that improved education drives women out of the labor market as indicated by previous findings (Schaner and Das, 2016). Secondly, the negative cohort effect is largely driven by the married women with kids group. This suggests that childbearing cost is an important issue over generations in rural areas, despite a significant drop in fertility, as found in other countries (Klasen et al., 2020). My results challenge the adequacy of the current campaign on lifting female labor force participation by only focusing on improving access to education in rural areas and providing access to childcare in urban areas.

Keywords: female labor force participation, cohort analysis, gender economics.

JEL Classification: J16

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1 Introduction

In the last two decades, female labor force participation (FLFP) in Indonesia stalled at around 55%. The stagnation is apparent in both rural and urban areas. However, comparing participation across birth cohorts reveals that younger females in rural areas participate less than their older counterparts. In particular, young women who were born in 1980-1984 have lower labor force participation by about 10% in their 20s (around the age they are to finish their education and enter the labor market) compared to those who were born three decades earlier. In contrast, in urban areas, women born in 1980-1984 were 10% more likely to participate in the labor market than women born in 1960-1964 in their mid 20's. This pattern is consistent as I compared younger cohorts with their older counterparts. Considering male groups, in rural areas, men born in 1980-1984 participate at a slightly lower rate compared to older counterparts born in 1960-1964. This indicates that there are gender-specific components that shape such trends. The participation drops of young females in the rural areas pose an intriguing puzzle since in the last two decades, younger women attain more education and have fewer children both in rural and urban areas (Schaner and Das, 2016). The striking contrast between young women's FLFP in urban and rural is suspected to contribute to the long-lasting stagnation trends of FLFP (Cameron et al., 2019).

This paper aims to shed light on the reasons for dropping in FLFP of young women in rural areas. Several main drivers of female labor force participation suggest that there should be an improvement rather than a decline for young females in rural areas. First, the younger generation of rural females had better educational achievement. Secondly, this group also has fewer kids compared to older cohorts of the same age. Thirdly, norms have hardly changed over time and shift towards promoting gender equality rather than otherwise. Fourth, the share of employment in agriculture declines over time, the females are no exception. However, it still needs to investigate whether these facts are driven by better-educated women pulled to more paid work which is mainly available in non-farm work. If that is the case. Younger females may be discouraged from entering the labor market if such jobs are limited. To support this hypothesis, one should observe a declining share of casual workers, as opposed to paid workers, in family workers' supply. Observing some of these stylized facts at the surface, I tend to expect that there will be a rising female labor force participation rate for younger cohorts compared to the older cohorts in rural areas.

Extending literature on female labor supply highlights several traditional key determi-

nants that drive female labor force participation, which include: education, fertility, and norms. First, education, in general, increases the opportunity cost of not joining the labor market (Killingsworth and Heckman, 1986). However, education may also correlate negatively with participation if it improves female bargaining in the household which leads to (Blundell and MaCurdy, 1999). At an aggregate level, this constitutes a feminization of the U-shaped curve of female labor force participation (Goldin, 1995). Within the country, this U-shaped relationship is usually observed between female labor force participation and economic or education status (Klasen and Pieters, 2012; Klasen, 2019). However, as shown empirically by Heath and Jayachandran (2016), there is evidence that this U-curve shifts upward over time, where lower-income countries experience higher female participation than the trajectory path predicted by the U-shaped curve. Many pieces of evidence show that in developing countries, fertility has minimal impact on the labor supply decisions of married women (Klasen and Pieters, 2012). Fourthly, sticky traditional norms (women only belong to household work), have been seen as a glass ceiling of female labor force participation even in developed countries (Fernández, 2013). Lastly, recent literature also discusses external labor market shock affects young women's participation and last for the long-run (Oreopoulos et al., 2012; Von Wachter, 2020).

Previous studies in Indonesia mainly focus on the long-lasting stagnation of female labor force participation but have limited discussion on urban and rural differences. Cameron et al. (2019) find that larger increases in young women's labor force participation in urban areas than in rural areas are consistent with changing cultural norms and women beginning to be accepted into non-agricultural employment in urban areas. However, as also shown in their graph, the increase in female labor force participation in urban areas is starting to stagnate and decline for those who were born in 1975 and later years. In addition to supply-side factors, Schaner and Das (2016) hypothesize that women are well represented in jobs that require soft skills, while they are underrepresented in leadership-oriented jobs and blue-collar jobs. They argue this is evidence of a "glass ceiling" constraint in which norms may constrain highly skilled women's careers. The author hypothesized that many discouraged workers because of a lack of social networks in the labor market. From Sakernas, only a few of them felt discouraged as a consequence of job searching. Using an individual longitudinal dataset, Halim et al. (2019) find that availability of preschool could increase female labor force participation by 0.14%. A cross-country study using micro labor market data by Klasen (2019), points out

several key important features of female labor force participation in Indonesia that differ from the rest of the countries of study. First, education does not strongly positively correlate with high labor force participation. Second, higher household income and household education have a negative association with female labor force participation. They argue that leaving the labor market becomes an affordable choice for Indonesian women once household income increases. Kis-Katos et al. (2018) find that trade liberalization increases female labor force participation by encouraging more female-friendly sectors such as the manufacturing sector to grow. Lack of investment in rural areas explains why female labor force participation is rising in urban areas, especially for young women with low-secondary education.

I used the samples from a large national labor representative of the National Labor Market Survey (SAKERNAS) and the National Socio-economic Survey (SUSENAS) to examine the underlying reasons for the decline of the rural FLFP rate for the younger cohorts. Using the dataset from 1990 to 2019, these two datasets provide detailed information on labor market outcomes of repeated cross-section samples that span over 30 years. The SAKERNAS, managed by Indonesia's statistics bureau, is nationally representative and is the main source of Indonesia's annual labor force statistics. The SAKERNAS records demographic and labor supply information for all individuals age 10 and older living in sampled households. The SUSENAS is a nationally representative household socio-economic survey that has been the primary dataset to derive official socio-economic indicators such as poverty rate. In regards to Sakernas, the SUSENAS complements the dataset as it contains detailed information on the fertility information and childbearing cost of the household member. The two datasets suit my purpose to provide a comprehensive analysis of female labor force participation in Indonesia.

In this paper, I use the maximum entropy approach (Browning et al., 2012) as my main APC model. To understand the change in the cohort's behavior towards labor market participation one should consider three dimensions: the age, cohort and period effect. The first dimension covers factors that affect life-cycle decisions such as timing education, having children and retirement. The second dimension covers the business cycle or policy changes such as the Asian Financial Crisis or minimum wage policy. The third dimension relates to the fact that over generations education might improve as well as fertility decisions and finally changing social norms. Thus, incorporating those three dimensions motivates me to use the age-period-cohort model Deaton and Paxson (1994); Browning et al. (2012) to isolate the age and period

effect and tease out the true cohort effect.

This paper contributes to the literature in two ways. First, this paper provides the first systematic analysis to explain why female labor force participation drops for young women living in rural areas using the age-period-cohort model approach. In comparison to the closest previous studies on female labor force participation, this study complement in the following ways. Schaner and Das (2016) only provides the life cycle profile by cohort analysis which neglects the age and period effect. Cameron et al. (2019) fail to isolate the period effects, which contaminate the age and cohort effect results. Second, it offers new insight into factors that contribute to persistent female labor force stagnation in Indonesia. Previous studies (Cameron et al., 2019; Schaner and Das, 2016) acknowledge young women in Indonesia hold back female labor force participation in rural areas. However, they provide a little discussion on the mechanism behind the large drop in FLFP in rural areas. (Schaner and Das, 2016) argue that young women's decision to decline to work as unpaid family workers is the main driver of the labor market participation drop in rural areas. While the drop in employment as a family worker is evident for young women in rural areas, this might not fully explain the drop in terms of labor market participation. Cameron et al. (2019), on the other hand, only focuses on improved participation in urban areas in which she argues that FLFP stagnation would soon disappear once the older generation is out of the labor market. In addition, unlike previous efforts that use either SUSENAS (Cameron et al., 2019) or SAKERNAS (Schaner and Das, 2016), I use both household datasets and the first to confirm that both datasets agree on the negative cohort effect in rural areas.

I find several key findings from the cohort analysis. The life cycle profiles analysis reveals that, firstly, young women in rural areas tend to be employed in the services sector as opposed to agriculture compared to their older counterparts. The drop in the agriculture employment rate is consistent with a large drop in unpaid work or family worker status. However, the drop might not necessarily be translated to a drop in labor market participation. Secondly, there is no significant difference between the drop in labor market participation between low and high-educated women, as many found in other countries. The life cycle analysis also fails to find evidence of the childbearing cost as an explanatory factor as both younger cohorts of women with and without younger kids experience a drop in labor market participation compared to their older counterparts. Finally, I employ the APC decomposition method Deaton and Paxson (1994) to purge the year and age effect out of the cohort effect. Using the APC

method, I find two important insights. Firstly, negative cohort effects are mainly driven by young women who are married and have kids. Hence, this implies that such negative cohort effects are suggestively related to childbearing costs as found in other countries (Klasen et al., 2020; Kuziemko et al., 2018). However, further investigation reveals that those who have access to informal childcare (e.g: having elder female household members) experience a similar drop as those who have no elder female household members. Secondly, education level does not directly affect labor force participation. While I find earlier that more women are less employed in low-paying jobs in agriculture, which may be related to improved education, I also observe a large drop in participation for those who only attained primary education.

The rest of the paper is organized as follows. The second section narrates the labor market development in Indonesia from the early 1990s. I focus on what factors may have affected FLFP transformation. In the second section, I also present descriptive figures of trends in female labor force participation. I focus on the level of participation by cohort over time and their interaction with several individual traits such as marital status and education level. The third section presents the descriptive statistics of key determinants of female labor force participation and how they evolve. This section would serve as a baseline understanding of how these key factors supposedly affect the FLFP level. In the fourth section, I discuss the data and identification framework. The fifth section focuses on presenting and discussing the results from the cohort analysis. The last section concludes my investigation, discusses the policy relevance and provides direction for further research.

2 Indonesia's Context

2.1 Trends in the labor market 1990-2018

Pre-crisis: 1990-1998

Since the late 1980s, the Indonesian economy has been accelerating mainly due to the commodities price boom (i:e oil and gas). Alongside high economic growth, better access to education leads to rising urban employment and a more educated workforce profile (Bank, 2010). This period was also marked by significant shifting in terms of labor absorption from the agriculture sector to the industrial and service sectors (Manning, 1993). At the same time, wage inequality between rural and urban narrows as more people migrate to urban areas (Bank,

2010). From a welfare perspective, a growing economy leads to a significant reduction in the poverty rate, falling about 5 percentage points between 1990 to 1996 (Suryahadi et al., 2012). These achievements appear to be short-lasted due to the Asian Financial Crisis (AFC) and major political turmoil in the following years.

In terms of labor policy, this period was marked by a significant minimum wages increase between 1993-1995 (Manning and Junankar, 1998). One of the main causes of such a significant increase in the minimum wage was a long-lasting stagnation in real wages, which led to multiple labor unrest. On the other hand, while a large portion of economic growth is fueled by oil-related sector growth, starting in the mid-1980s, non-oil manufacturing sectors began to grow which created more demand for skilled workers.

In terms of the unemployment rate, a steady increase occurred between 1991 to 1997, averaging 0.1 percentage points per annum. However, in terms of overall employment trends, Indonesia experienced significant employment expansion in urban areas (Bank, 2010). For both men and women, the percentage of working adults (to the total adult age population) increases by about 0.5 percentage points every year. Meanwhile, there was significant growth in terms of the number of rural women in the workforce. As part of its consequences, the share of non-agricultural employment increased from 45% to about 60% in 1997. Similarly, the share of formal sector employment increased by 10% during the same period. The median of hourly wages for employees also improved by 7.1%, after adjusting for inflation, between 1990 and 1997 (Sakernas). This indicates that during that period, shifting to more formal jobs was followed by an increase in wages. Bank (2010) estimate that 40% of the increase in median wage can be attributed to changes in worker's characteristics (i.e: education level).

During this period, we also observed the formalization of rural workers. In terms of share of formality, from Sakernas data, it is revealed that during the 1990-1997 period, the share of formal employment increased by about 1.2 percentage points per year for rural workers compared to 0.4 percentage points for urban workers. Bank (2010) also observed that the farm-to-nonfarm occupation transition may also improve household incomes.

The Asian Financial Crisis: 1997-1999

The Asian Financial Crisis (AFC) marked a 15% drop in economic growth between 1997-1998, taunted as the worst recession since the 1960s. The unemployment rate, continuing previous trends, increased by about 0.1 percentage points per year during the period. In terms

of employment, as documented by Manning and Junankar (1998) and Strauss et al. (2004), a relatively large drop in household incomes was anticipated by increasing the labor supply of female household members. As a response to husband's job losses and earning losses, married women opt to join the labor market, broadly discussed as added worker effect Posadas and Sinha (2010). Not only in urban areas, but poor women in rural areas also noticeably joined the labor force. Rural areas during this period provide job availability to keep the unemployment rate in check. Interestingly, the increase in the unemployment rate was accounted for by a huge increase in unemployment among youth by 4.4 percentage points, from 15.5% to 19.8% (Bank, 2010).

This crisis also temporarily reverses the structural transformation trend as many formal workers who lost their jobs return to farm activities as well as informal sectors. Sakernas data recorded the share of workers in formal sectors fell at a rate of 3.2 percentage points per year between 1998 to 1999. This decline was almost similarly shared among serviced and manufacturing sectors. However, manufacturing sectors recovered to pre-crisis employment rates earlier than service sectors. Declining formal sectors are also reflected by real wage drop, around 31 percent between 1997 and 1999 (Bank, 2010). Regarding poverty, this crisis ends positive trends of poverty reduction, as the poverty rate increased by 12% during the 1997-1999 period. It is also worth noting that Indonesia also suffers from drought.[1]

From the female employment perspective, the increased labor force participation among women, especially from low-income families, was motivated by sustaining the household level of income. Female labor force participation who live in poor families increased by 7 percent between 1997 to 1999 In both urban and rural areas, most of these women worked as unpaid family workers and were mostly driven by low-educated women (Smith et al., 2002). They also pointed out the significant impact of AFC on wage cuts and employment rates for the younger female group, especially in urban areas with low education. Added worker effect, as more women join the labor force, may also partly explain that declines in real family incomes are about half of the individual hourly earnings (Smith et al., 2002).

[1]El Nina brings a long period of rain which significantly affects agricultural production. As consequence, food crops retail price increases which slightly benefits farmers, but overall there are no winners in this period given the share of net producers of rice in rural areas was smaller than net consumer

Jobless growth period: 1999-2003

There are two important labor market policy changes after the Indonesian economy returns to positive growth. The two were the Trade Union Law (No. 21/2000) and the Manpower Law (No. 13/2003). Paid workers in urban areas enjoyed a relatively large increase in wages as the minimum wage increased as well as an increase in legislated severance pay. However, this comes with consequences of declining formal jobs availability as the cost of hiring and firing increases. There is an indication that this push uneducated and low-skilled workers back to farms and agricultural jobs.

As summarized by (Bank, 2010), during this period share in agricultural employment increased by 0.8 percentage points per annum. Moreover, by 2003, the share of people working in agriculture was around the same level as in 1994. Given the fact productivity also fell, at the same time serviced and manufacturing workers enjoyed increased productivity, these workers were pushed back into farm activities. Real wages for paid workers increased about 9% (adjusted inflation) per year between 2000-2008. At the same time, there is no significant change in terms of workers' education profiles.

Recovery and GFC: 2003-2007

Three significant labor laws were issued during this period: the Industrial Disputes Settlement Law 4/2004, the Social Security Law 41/2004 and the Migrant Worker Law 39/2004. The first two laws added to investor concerns about increasing hiring and firing costs. The Industrial Disputes Settlement Law introduced labor courts in all provinces as the new mechanisms to settle labor disputes. The new Social Security Law 41/2004 mandates the merging of existing social insurance schemes under a new national social security agency (Dewan Jaminan Sosial Nasional, DJSN). In addition, it aims to extend mandatory social insurance to informal sector workers. The law is not specific on the governance and financing aspects of the new system, raising concerns regarding fiscal sustainability and the potential additional employment costs to the firms.

Total employment stagnated during this period, despite some encouraging signs. The employment ratio fell slightly by 0.1 percentage points per year. The core unemployment rate held steady, and the increased availability of formal jobs led to a decrease in the number of discouraged workers. In contrast to the previous period, employment declined for men and increased for women. Employment declines were greatest for rural men and increases

were greatest for urban women. This reflects the fact that women re-entered the workforce, in response to expanded job opportunities off the farm and, perhaps, also because of falling household incomes due to lower wages.

Under-employment (the percentage of workers working less than 35 hours per week who would be willing to accept another job if it were offered), which was relatively constant in the previous period, climbed from 14.6 percent to 17.4 percent. The rate increased not because more workers worked fewer than 35 hours, but rather because more already under-employed workers were willing to accept another job. This might be explained by the increase in opportunities in the formal sector, together with stagnating wages.

Formal and off-farm employment expanded rapidly during this period. Formality grew at an impressive rate of 1.2 percentage points per year — only slightly lower than the strong pre-crisis growth rate of 1.5 percentage points per year. Using the more accurate new definition, formality still grew strongly, at 0.8 of a percentage point per year. 32 This increase in formality, however, did not extend to the lowest-quality jobs. The percentage of workers who were casual daily laborers rose, from 8.5 percent in 2003 to 10.4 percent in 2007.

For the first time since the crisis, median real wages fell. Employee wages during the period fell by 14.2 percent — an average of 3.8 percent per year. This wage decline is entirely explained by the drop in wages from August 2004 to November 2005, when median wages declined by 14 percent. All types of workers experienced sharp real wage declines in 2005, but high-wage workers had fully recovered by 2007. Wages at the 90th percentile grew slightly between 2003 and 2007, while wages at the 10th and 50th percentile declined by over 3.5 percent per year, possibly because of the entrance of less educated workers.

2.2 Female labor force participation

In this paper, female labor force participation is defined as the proportion of working-age females, aged 20 to 65 years old, who actively engage in the labor market, these include those who were currently working at least 1 hour per week and looking for work, those who are seeking a job and those who are starting to set up a business. The definition follows Indonesia's national statistics office definition who has conducted the annual labor market survey since 1986. Notice that under this definition, I rule out those who are still at school or temporarily out of the labor market. In addition, samples are restricted to women age. Over time, BPS occasionally improves its questionnaire to add more detailed questions on employment.

As a consequence, labor force participation was also redefined following more information. However as seen in Figure 1 Panel B differences between labor force participation using the prior-to-1997 definition (solid line) and contemporaneous definitions (dashed) are relatively small.

[Figure 1 about here.]

If I take into account education level, as shown in Figure 2 Panel A and Panel B, I can see that for highly educated females, stagnation trends emerge in both rural and urban areas. Compared with the lower educated females, the trends are similar except for a large drop in the recent 2 years in both urban and rural areas. Panels C and D illustrate relative female labor force participation (ratio between female and male) parallel to Panel A and Panel B. Both graphs show very similar trends which indicates the trends were not affected by a particular change in labor market dynamics for females.

[Figure 2 about here.]

We also observe that younger cohorts start to move to urban areas. A lesser proportion of young cohort females live in rural areas compared to their old cohort counterparts emerges from the graph. A similar trend is also observed in male groups. Further, if I look at education profiles, I find that most females with lower education live in rural areas and the proportion is stagnant over time. The proportion of females with secondary and tertiary education that live in rural areas slightly increases over time, this possibly reflects slow improving education access. Education however improves as I can see fewer females with low education reside in rural areas. There is no clear supportive evidence of sorting by education that potentially explains lower labor force participation.

[Figure 3 about here.]

Figure 3 presents the main motivation of this paper. From Panel A, it emerges that at age 30 years old, females in younger cohorts have lower labor force participation compared to their older cohorts counterparts. Notice that by age 30, most females in Indonesia have finished their education (the average year of schooling is 19 years old). As shown in Panel B, similar patterns also arise for male groups. Figure 11 suggests that the male group also experiences similar trends. However, as shown in Figure 1 Panel A and Figure 2 Panel B, the size of the

participation gap, between old and younger cohorts, is larger for females compared to male groups.

The FLFP rate across different birth cohorts exhibits the same differential trend between rural and urban women even if I focus only on the married women group. When I take into account education, the opposite trend of urban and rural females remains the same given the same educational level. Figure 4 compares labor force participation of low-educated women in urban areas and rural areas. It emerges that low-educated young females in rural areas have lower participation than their older counterparts while low-educated younger females participate more in the labor market.

[Figure 4 about here.]

Schaner and Das (2016) discusses these two opposite trends between urban and rural areas as consequences of several factors: changes in norms and/or income effects or more formal jobs available in urban areas. They argue that such opposite trends may also cause rural-urban gaps in labor force participation to disappear, in which female labor force participation, in general, would start to rise. A similar argument is also discussed by Cameron et al. (2019). However, it is unclear why I see a drop in female labor force participation in rural areas. If it is caused by more formal job availability in urban areas, one must look at the migration patterns over time. If it is a story of migration to urban areas, rural young females must self-select themselves into less educated and productive families. In the next section, I will discuss the trends of key determinants of female labor force participation in Indonesia.

3 Trends of key determinants of FLFP in Indonesia

3.1 Fertility and education

Hull (2016) documents a comprehensive picture of fertility dynamics in Indonesia. As discussed by some authors (McDonald, 2014; Qibthiyyah and Utomo, 2016) In terms of TFR, in 1990 Indonesian TFR, calculated using own child technique, was recorded as 3.3 and then reduce to 2.3 in 2000. One decade later, TFR barely changed to 2.4 in 2010. It is highly contested whether fertility should be reduced to the replacement level of 2.1 births per woman as soon as possible for Indonesia. When using Rele regression, from 2000 to 2010, TFR declined by

0.2 points. The contraceptive prevalence rate has been increasing from 50 to 62% between 1990-2012 (Hull, 2016). [2].

Age of marriage Singulate Mean Age at Marriage (SMAM) national female SMAM rose between 1990 and 2005. It then fell between 2005 and 2010 returning to the 2000 level. Despite data issues and measurement problems, the trends are suggestive that there has been an important social change at work in the last decade that is encouraging young people to marry earlier than was the case for their older siblings. Overall, the mean age of marriage of rural male and females are much lower than their urban counterparts. Since 2007, the trend in the age of marriage in rural areas has declined steeper than the urban areas. The average difference between rural and urban females' age of marriage is about 7 years old. Looking at regional variations,

Fertility in Indonesia has been declining over generations in rural areas. It emerges that the younger cohort, for instance, the 1970s-1980s, has almost 1.5 kids fewer than 1950's-1960[3]. Of course, one should treat this figure with caution as fertility is reported as the total number of live births. Figure A1 in Appendix A illustrates the trend in live birth using SUSENAS data. It does not include unborn children. As discussed by Hull (2016), TFR in Indonesia has been decreasing significantly since the 1960s. However, worth to note that the decline has been somewhat stagnant, especially in, the post-Soeharto era. Many authors attribute this stagnation to the weakening role of the national family planning board (BKBBN), following a more decentralized Indonesia.[4]

Related to fertility issues, success in fertility reduction could not be separated from the improvement of education access for females and rural areas. Duflo (2001) has discussed that massive school construction in the 1960s focused in the rural areas has increased female education and some of the employment outcomes significantly.[5] Figure A2 and Panel A and Figure A3 in Appendix A confirm that years of schooling improve over a generation. It also shows that the years of schooling gap between urban and rural has been significantly narrowed across generations.

[2]We need to read the statistic with caution since Indonesia's national family planning program explicitly excludes unmarried women (and men), therefore these women receive little attention from any surveys. The number may underestimate or overestimate the contraception prevalence

[3]Author estimation using SUSENAS

[4]As one of the major consequences of Soeharto's step down in 1998 was big-bang decentralization. Most authorities were delegated at the district level. Family planning, once a championing policy of Soeharto's regime, is no longer a priority in local government policies.

[5]Cubas (2016) find that this school construction policy has a non-significant effect on female labor force participation

3.2 Norms

Many authors argue that Indonesia, like any other developing country in the region, except for the Philippines, adopts traditional norms towards women's participation in work. In 2019, World Value Survey (WVS)[6] collects information about what society thinks about women and work. When asked "do you think men should be prioritized to get a job over women in a time of crisis?", more than 60% of male respondents agree with the statement, while for female respondents about 40% of respondents agree on this statement (see Figure A4 in Appendix A). It is unsurprising to see this gap in gender attitudes between females and males, but what is surprising is how this belief across age groups is shared at almost the same acceptance rate. Within women, for instance, the youngest surveyed group, aged 15-25 agree to the previous statement of about 40% while the elder group is only slightly above 40%. Albeit small differences, I observe that younger females do not share a more pro-equality gender perspective.

One might relate norms with certain religious beliefs. Indonesia is the largest Muslim country in the world. While Muslim countries, tied closely with middle-east culture, are often seen as very traditional on gender equality (Kuziemko et al., 2018), Indonesia relatively has high female labor force participation. I estimate labor market participation and types of religion to see whether different religions might affect different probabilities of participation in the labor market. My results suggest that Muslim and non-Muslim status does not significantly affect the likelihood of a woman to be participation in the labor market (see Appendix).

3.3 Education and labor market mismatch

An increased supply of more educated women might not be matched with the availability of relevant jobs that cause women to opt out of the labor market (Afridi et al., 2018). Hence, I should observe a negative correlation between school attainment and labor force participation in rural areas[7]. Alternatively, I should also observe the share of casual workers over time declines. Figure 10 suggests that there is no strong evidence of a declining share of casual workers in rural areas. The trends are similar for both urban and rural areas. This does not support the idea that there is a significant drop in labor force participation because women

[6]WVS surveys around 60 countries. Survey design preserves national representative statistics.

[7]Simple regression of labor force participation and years of schooling do not confirm this, using pooled SAKERNAS dataset from 1990-2019

are discouraged given the availability of jobs.

Observing the adjusted national-yearly deflator (see Figure A4, in Appendix), the wage hourly rate is consistently higher for younger females compared to older females at any given age. The trend evidence for urban and rural areas. Younger females accept higher wages compared to older females. This indicates that regardless of the higher wage rate offered to younger females, they still participate less than their older counterparts.

4 Data and methodology

4.1 SAKERNAS

I use the Indonesia labor market survey, SAKERNAS as the main source of the dataset. SAKERNAS was first conducted in 1976 and has been conducted every year since 1986 (except in 1995), with varying frequency within a given year. The SAKERNAS, managed by Indonesia's statistics bureau, is nationally representative and is the main source of Indonesia's annual labor force statistics. The SAKERNAS records demographic and labor supply information for all individuals age 10 and older living in sampled households.

I draw the main sample from pooled individual observations from SAKERNAS from 1990 to 2019[8]. Our sample is restricted to those who were born between 1975 to 2000. This sample includes those who were entering the labor market before rising unemployment and cohorts that were arguably most affected by high unemployment during Asian Financial Crisis and jobless growth periods in Indonesia. I also restrict samples to be between 15 to 65 in each survey year.

From SAKERNAS I collect information on an individual's labor force participation indicator, education profile, income profile, and basic demographic information such as age and marital status. One limitation of the SAKERNAS dataset is the lack of information on other socio-economic characteristics at both individual and household levels. As SAKERNAS purposely focus on labor market information such as job status and income, SAKERNAS does not provide, for instance, information on household consumption and detailed household demographic characteristics which may affect labor market decision.

[8]In 1995 there was no SAKERNAS survey in which I replaced the sample with Intercensal Survey (SUPAS)

4.2 SUSENAS

The SUSENAS is a nationally representative survey conducted annually and typically covers about 200,000 households. Each survey contains a core questionnaire which consists of a household roster listing the sex, age, marital status, and educational attainment of all household members. 4 It also includes questions on labor market activity, health, fertility, and other household characteristics.

One of the advantages of the SUSENAS data set (over the more widely used National labor Force Survey, Sakernas) is that it collects information on all household members. Using the household roster, I can identify the number of children present in the household and their ages, which allows us to explore the role of child-raising and the availability of alternative child-carers in the household (primarily grandparents and other women who could act as babysitters) in the decision to participate.

4.3 Age-Period-Cohort (APC) Model

The APC model has a long lineage that can be traced to work by epidemiologists in the late 30s. The task appears simple: Use a pooled cross-section of individuals to decompose the variation in the outcome of interest to components that can be captured by indicators of age, period (marked by survey year) and cohort (marked by birth year). This method is used recently by economists to investigate various research questions such as earnings and income life cycle behavior (Hanoch and Honig, 1985), savings growth and aging (Deaton and Paxson, 1994), and, recently growing, labor force participation (Browning et al., 2012; Goldin, 1995; Tunalı et al., 2021; Lassassi and Tansel, 2022). This analysis consists of following the same representative cohort over time. The model captures age, period and cohort effects as indicators of (unobserved) determinants of participation behavior. I use these effects and observed determinants to construct trends in labor supply. Different age groups are at different stages relating to education, work and retirement. Different cohorts are exposed to different events such as a recession. Birth cohorts born in different periods that encounter different historical and social conditions as they age would conceivably have diverse developmental paths. The major challenge of estimating separate age, period, and cohort effects is the "identification problem" induced by the linear dependency among age, period, and cohort indicators.

One solution to the linear dependency problem is by imposing an arbitrary restriction to

achieve identification. In economics, the concept was first introduced by Hanoch and Honig (1985) and was further modified and popularised by Deaton and Paxson (1994). The basic idea of the Hanoch-Honig/Deaton-Paxson normalization is to impose one extra parametric restriction so that the APC model becomes just identified. First, the variables are de-trended, and then the restriction that time effect dummies are orthogonal to a trend and the sum to zero is imposed. The coefficients for age, period, and cohort can then be estimated by using OLS. For the rest of the paper, I refer to the Hanoch-Honig/Deaton-Paxson normalization as the DP approach.

The alternative, using the maximum entropy approach, does not impose an arbitrary restriction to achieve identification and is not an OLS estimator. It was first used to solve the APC model by Browning et al. (2012). This is an information-based approach where the maximum entropy is used as a principle to address the identification problem. It is based on the belief that there is not enough information in the data to provide one unique solution. Instead of finding one unique solution, the maximum entropy principle provides a framework that can formalize the uncertainty in the model and estimate the most likely solution. The maximum entropy principle tells us to seek the probability density function such that certain constraints and use the density satisfying the constraints with the largest entropy (Conrad (2004)). I refer to the entropy strategy as the ME approach in this paper.

Using the UK female labor force participation data from 1974 to 2007, Browning et al. (2012) presents the difference between DP and ME approaches. They show that the DP approach produces a noisy cycle in the period effects compared to the ME approach. Thus, the DP approach suggests a flatter cohort effect, while the ME approach suggests a steeper positive cohort effect.

4.4 Sample construction

For the main analysis, I construct my synthetic-panel dataset by aggregating repeated cross-section individual observations to their age and survey year identifiers. First, I restrict our sample to females between 20 to 65 years old who live in rural areas in each cross-sectional dataset each year. The age restriction ensures the female sample has finished their education in their lifetime.[9] Next, I pool the series of cross-sectional SAKERNAS (SUSENAS). Further, I

[9]At the same time, it also ensures the marital status to be stable after 20. The average age of marriage in Indonesia is around 18 years old.

restrict the birth cohort to between 1940 to 1990. I then gather the aggregate mean of labor force participation of each cell of age and year of surveys. Lastly, I generate the birth cohort variable by subtracting year and age variables. The sample construction yields an unbalanced panel of unique 51 birth cohort observations of 1,251 total observations over a lifetime. In the additional analysis, the number of observations varies over required data dimensions (e.g: by marital status, education level, etc.)

Given that I have only 30 years of data, I cannot cover the full span of an individual's potential working life (say, 20-65) for each cohort. This could lead to bias in estimating the life cycle effect of labor force participation, especially at the lower tail (age 20s) and upper tail (age 60s) of the observation. At both tails, the number of observations would be much smaller compared to the other point of age profile. This could lead to an overestimation of labor force participation for the oldest cohort and an underestimate for the youngest cohort. The coverage problem can also create problems in nailing down time trends (Deaton, 1985). This issue is especially related to the retirement age in the sample of the study. Bias could be more significant if the sample coverage could not cover the relevant age profile of lifetime working behavior. Regarding this, fortunately, the average Indonesian woman retired in their 50s. Thus, 29 years of observation should give enough observations to represent a lifetime profile of labor force participation in Indonesia.

5 Cohort analysis

5.1 Life cycle profiles by cohorts

I start with examining the life cycle profiles of female labor force participation by cohorts in Indonesia. Previous studies from Indonesia (Schaner and Das, 2016) and other countries (Afridi et al., 2018; Klasen, 2019) suggest at least three possible hypotheses on how young cohorts have relatively lower participation in the labor market in comparison to their older counterparts. First, as education access improves, young females value more homework and the importance of investment to children (Afridi et al., 2018). Thus, more young mothers lower their participation to allocate more time at home. Second, as young cohorts became more educated, their reservation wage increased Schaner and Das (2016). Meanwhile, in rural areas, waged job opportunities remain limited as most jobs were unpaid family workers. This discourages young women from participating in the labor market and may choose to stay out

of the labor market. Closely related, the third hypothesis claims that as agriculture, which has largely unpaid workers, remains the largest occupational sector in rural areas, this does not attract younger cohorts to participate in the labor market Cameron et al. (2019). In this section, using life cycle descriptive, I test those hypotheses as follows.

The first hypothesis argues that the younger cohort values more housework as they are more educated. It argues that young women invest more in children. Figure 5 does not support the argument. Comparing Panel A and B, I learn that regardless of marital status, labor force participation of younger cohorts was lower than the older cohorts. If the hypothesis holds, I should observe a larger drop in labor force participation for married women.

[Figure 5 about here.]

Using SUSENAS, I can use the information of having own kids aged 0-5 years old at the time of the survey as a better proxy of childbearing. From Figure 6, it emerges that there is no strong evidence that childbearing affects the likelihood to participate in the labor market. In either case, in women with young children and women without young children, the less participating young cohorts phenomena remain evident.

[Figure 6 about here.]

The second hypothesis claim that young women are discouraged to participate in the labor market due to limited waged job opportunities. Figure 7 supports such a claim. From Panel A, I learn that for unpaid family worker jobs, the employment rate for younger cohorts is significantly lower than their older counterparts. The opposite trends are apparent for waged workers.

[Figure 7 about here.]

The last hypothesis is highly correlated with the fact that agriculture remains the main occupation sector in rural areas. Figure 9 illustrates such a pattern. It emerges that the employment rate for the agriculture sector, as presented in Panel A, is much lower for younger cohorts compared to the older cohorts. Mirroring Panel A, from Panel B I observe exactly the opposite trends as younger cohorts take up service sector jobs compared to those older cohorts.

[Figure 8 about here.]

Does education directly define the level of labor force participation? To put it to a test, I simply plot the life cycle graph by education level. Surprisingly, in Figure 8, in each level of education younger cohorts have lower participation than their older counterparts.

[Figure 9 about here.]

Reflecting on what I have investigated so far, there is compelling evidence that shows that young women in rural areas may opt out of the labor market due to a lack of high-paying jobs that match their education level. However, a graphical investigation using a life cycle plot may not be sufficient to determine whether I do have a negative cohort effect due to job market mismatch. One limitation of using life cycle plots is I could not determine if there is any specific year effect that corroborates with the cohort effect. For instance, a lower employment rate in agriculture might also be driven by some year-specific policy that masks the cohort effect. To isolate and expose the cohort effect, in the next section, I employ the age-period-cohort model using the ME approach (Browning et al., 2012). In section 4.3, I have discussed the caveats, strengths and alternatives to the (Browning et al., 2012) approach in detail. I present the results using the DP approach in Appendix A.

5.2 APC results

Firstly, I turn to Figure 10 to compare decomposition effects between urban and rural. As expected, the age profile for both urban and rural women presents an inverted U-shape relationship using SAKERNAS data.[10] Both in urban and rural areas, women start to retire at a similar age. The only difference in terms of the life cycle effect is women in the urban area pull out from the labor market in the mid-20s before returning to the labor market in their 30s. This pattern is evidenced in many countries which indicates the behavior of married women in urban areas that delayed their participation due to childbearing.

Comparing Figure 10 Panel A and Panel B confirms that there is a cohort-specific effect that drives trends depicted in Figure 3. Isolating the year effect and life cycle effect, young women in rural areas participate less than their older counterparts, while the opposite trend emerges in urban areas. The younger cohort in the urban area becomes more likely to participate in the labor market over time compared to their older counterparts.

[10] I produce the APC graphs in this section using my own modified version of the `apc` package (O'Dea, 2012) running on STATA version 16. Please contact me to gain access to the modified `ado` file

In regards to the DP approach, as illustrated in Figure A7 in Appendix A, I discuss the following features. First, the age profiles of both urban and rural areas are virtually the same with the DP approach. Secondly, the ME approach suggests a less noisy period effect on both rural and urban areas. Thirdly, the negative cohort effect is more pronounced compared to the mild negative cohort effect from the DP approach. Lastly, the estimates for younger cohorts, using the ME approach, are less affected by coverage problems. This is indicated by rather stable coefficients at the end of the right tail of the plotted cohort effect. Overall, the DP approach results confirm findings from the ME approach except for the year effects.

Figure 11 depicts the decomposition of age, year and cohort effects for both SUSENAS and SAKERNAS estimation. Overall, the age effect shows an expected inverted U-shape relationship regardless of the choice of dataset. However, a major significant difference is the trend of year effect. A negative trend between the period 1990 to 2007 was observed, however, in 1997 SAKERNAS picked up a large negative dip as a result of the AFC, followed by a recovery trend until the year 2000. However, this negative dip is likely to be related to the major change in labor market participation definition following the crisis. Given the differences between SAKERNAS and SUSENAS, I mainly refer to SAKERNAS as benchmark results for further heterogeneity results, except when looking at fertility effects.

On the cohort effects, I can confirm that younger women in rural areas show negative trends compared to their older counterparts. However, using SAKERNAS data, the negative trends of cohorts started in earlier cohorts (the 1970s) compared to the results from the SUSENAS (the 1980s). This result confirms that there are indeed such cohort effects in the decline of labor market participation for young women in the rural areas after isolating period effects.

[Figure 10 about here.]

[Figure 11 about here.]

5.2.1 Education

Previous literature (Schaner and Das, 2016; Afridi et al., 2018) argues that the lower participation of young women in rural areas is driven by more educated women being discouraged to participate due to limited opportunities in the job market that match their skills. Following that argument, I should observe a negative cohort effect for more educated women relative to those who have low education.

Figure 12 summarize the decomposition analysis of the APC model comparing low-educated and high-educated women. Low-educated women finish their education up to primary education while high-educated women are those who have at least a secondary degree. Surprisingly, consistent negative cohort effects emerge for the low-educated women. More young women with low education decide to participate less in the labor market compared to those who have higher education. These results do not support the previous hypothesis on labor market mismatch.

[Figure 12 about here.]

5.2.2 Marital

Marital status may affect labor force participation over generations in several ways. First, marital status is closely related to childbearing. Over time, we observe, as it is evident in Indonesia, presented in Section 3.1. Secondly, in Indonesia, marital status is a key determinant of migration decisions. In the last decades, more young women in rural areas migrates to urban areas as their new household migrates for better job opportunities (Marta et al., 2020; Pardede et al., 2020). Thirdly, as discussed by Fernández et al. (2004), the marriage market is a mechanism behind the evolution of labor market participation through the role of gender norms. She argues that through the marriage market, sons from working mothers are likely to be matched to women who will participate in the labor market upon marriage.

From Figure 13, it emerges that both married and not-married women participate less in the labor market as they are born into younger cohorts. However, married women, compared to their non-married counterparts, show larger negative cohort effects over time. This may suggest that married women may contribute the most to the negative cohort effect. More married young women in rural areas participate less in the labor market given the same life cycle period compared to their older counterparts.

[Figure 13 about here.]

5.2.3 Childbearing

In previous sections, I show that the fertility rate and the number of livebirth have been declining over a generation. The declines are evident in both urban and rural areas. This trend is very important as a previous study (Halim et al., 2017) show that having a child responsible

for about a 20% drop in the likelihood to work in Indonesia. However, a decline in fertility does not implies lower childbearing costs.

Childbearing costs could relate to the actual monetary cost to raise a child as well as more intangible factors such as the availability of childcare and norms (Kuziemko et al., 2018). Firstly, the actual cost to raise a child includes monetary costs of consumption as well as allocated time to provide care. Studies show that such costs are non-linear to the number of children. Having younger children between 0 to 5 years old is thought to be the most costly. Secondly, in rural area context in Indonesia, where formal childcare virtually does not exist, the availability of elder female household members in the household provides informal childcare. In rural Indonesia, a household is accustomed to living with extended family which provides an opportunity to supply informal childcare. Lastly, how the community perceives a mother who works could also create social norms cost.

To understand the childbearing effect on the participation rate, I turn to the SUSENAS dataset as it provides two important pieces of information, which are the number of children and the availability of elder household members. Figure 14 summarizes the results. It emerges that women with kids aged 0 to 5 years old possess an overall similar cohort effects trend compared to those with younger children. In contrast, those without younger kids experience a positive cohort effect up to the 1980s cohorts. Further, from Figure 15, it emerges that a sharper decline is also experienced by those without kids.

In comparison to previous results, as depicted in Figure 11, the negative cohort effect at the aggregate level resembles the negative cohort effect of those without any elderly females and who have younger kids. This suggests that this group of women might drive the negative cohort effect trend in Indonesia. However, to point out what component of childbearing costs that have been rising across generations requires more detailed information at the household level. The unavailability of formal childcare, where at the same time lesser engagement of elder household members in informal care, could be one factor that might push childbearing costs up. Social norms might also create penalties for mothers who want to participate in the labor market. Stronger traditional norms in the community would put a negative stigma on young women who want to participate in the labor market. I argue that a high rate of rural-to-urban migration presumably leads to selection problems. Those who chose to stay in rural areas were those who were likely to have more conservative views on gender attitudes. This study, unfortunately, is limited to disentangling the component of possibly rising childbearing

costs.

[Figure 14 about here.]

[Figure 15 about here.]

6 Conclusion

From 1990 to 2019, the female labor force participation rate in Indonesia has been plateauing at around 55%. Further investigation reveals an intriguing difference across cohorts between rural and urban areas. I observe that the female younger cohorts in rural areas experience about 10 percent lower participation rate compared to their older cohorts counterparts at the same age (see Figure 3. The opposite trend emerges for urban women. In comparison, the male group also experiences a similar pattern but with less than an average 5% gap across cohorts. This is intriguing for several factors: (1) fertility rates have been declining, (2) access to education has been greatly improved as reflected by a significant gap of years of schooling between younger and older cohorts, (3) income gap between agriculture and non-agriculture employment has been narrowing, (4) less female employed in agriculture compared to non-agriculture, while agriculture sector contribution to the economy has been shrinking and (5) social norms are likely to be rigid. None of these stylized facts supposedly predict a lower labor market takeup of young females in rural areas if not the opposite.

I begin my investigation by plotting the life cycle of labor force participation for different cohorts. Cross-examining the labor force participation trends across different aspects I find several key findings. Firstly, young women in rural areas tend to be employed in the services sector as opposed to agriculture compared to their older counterparts. The drop in the agriculture employment rate is consistent with a large drop in unpaid work or family worker status. Secondly, the life cycle analysis suggests that the differences between younger cohorts' participation and their older counterparts are similar across levels of education and childbearing status.

As a further investigation, I employ the APC decomposition method (Browning et al., 2012) to tease the year and age effect out of the cohort effect. Using the ME approach, I find two important insights. Firstly, the aggregate negative cohort effect resembles the negative cohort effect of the young women group who were married and have kids. Hence, this implies

that such negative cohort effects might be related to the childbearing cost as found in other countries (Klasen et al., 2020; Kuziemko et al., 2018). These findings contradict the earlier investigation using the life cycle profiles analysis. In addition, the non-married women and no kids group experience a positive cohort effect for those born before the 1980s. More conservative views of the community also presumably affect childbearing costs upward. One possible channel is the rural-to-urban migration pattern that might lead to selection issues. Those who decided to migrate to the urban areas were likely to be those who had more progressive outlets and views on gender roles and those who were staying otherwise.

Secondly, education level does not directly affect labor force participation. While I find earlier that more women are less employed in low-paying jobs in agriculture, which may be related to improved education, I also observe a large drop in participation for those who only attained primary education.

My findings have several policy implications. First, current policies focusing on improving labor force participation by improving access to education (Schaner and Das, 2016) may not be fruitful in the short-run as neither policy targeted issues are factors that hold labor force participation in rural areas. Secondly, the government should also improve access to childcare not only in urban areas but also in rural areas despite the conservative belief that rural areas provide more informal childcare services. Lastly, it advocates the importance of a rural development strategy to incentivize non-farm activities in rural areas and provide information dispersion on belief on gender attitudes.

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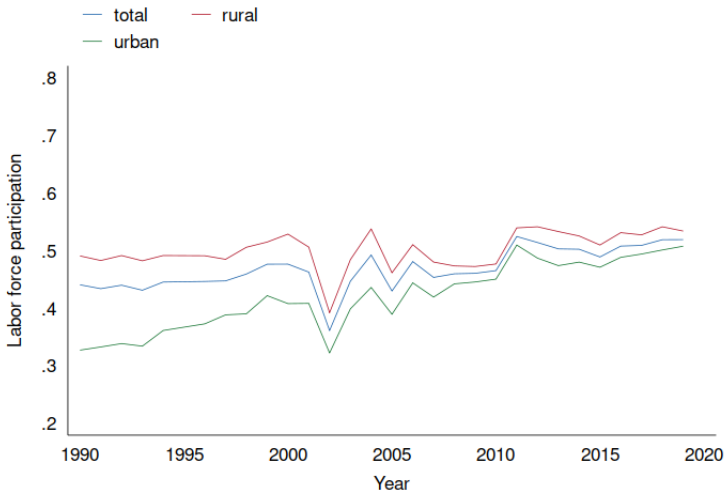
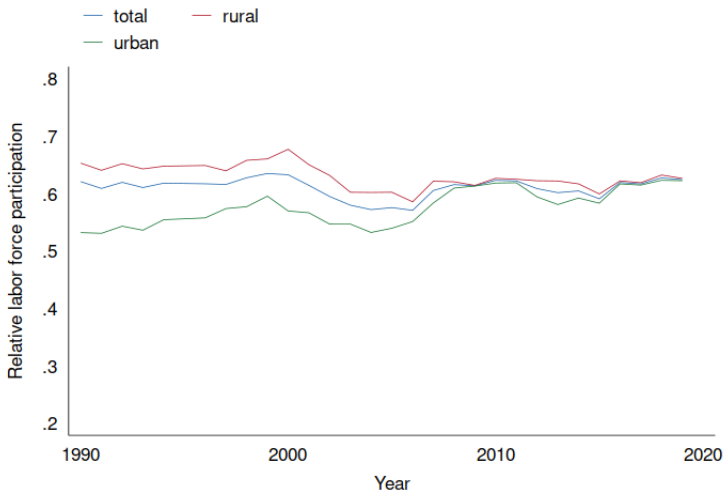
Figure 1: Female labor force participation trends in Indonesia, 1990-2019

Panel A. FLFP



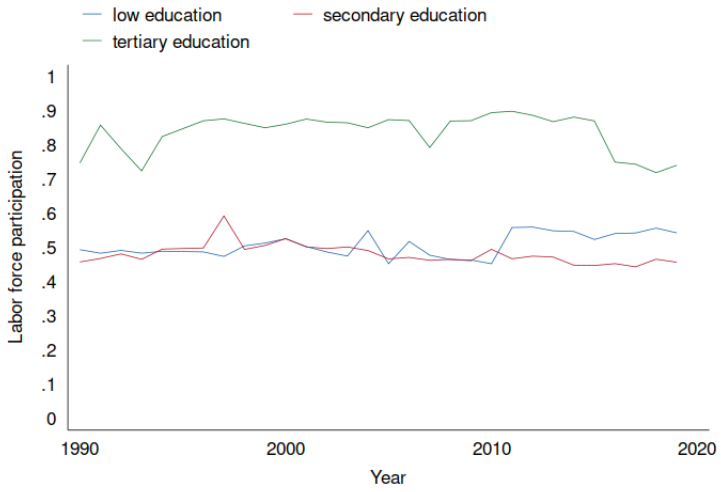
Panel B. Weighted FLFP



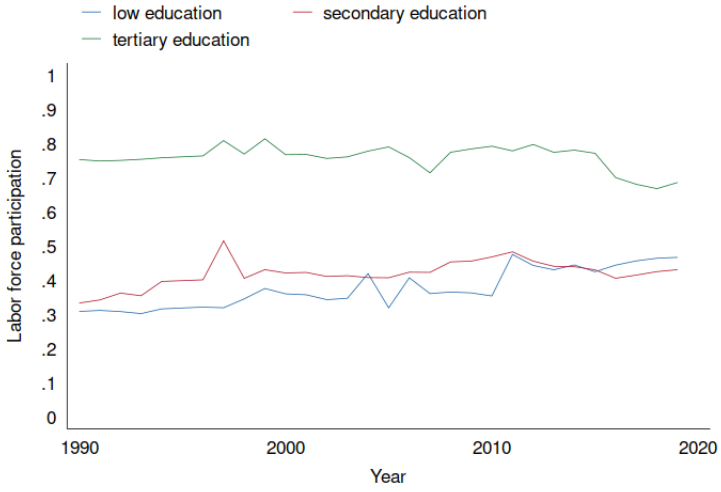
Notes: Author's calculation using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I apply individuals' weight provided by the survey. Figure in Panel B represents the ratio of female labor force participation and male labor force participation in corresponding years.

Figure 2: Female labor force participation status trends and education

Panel A. Rural



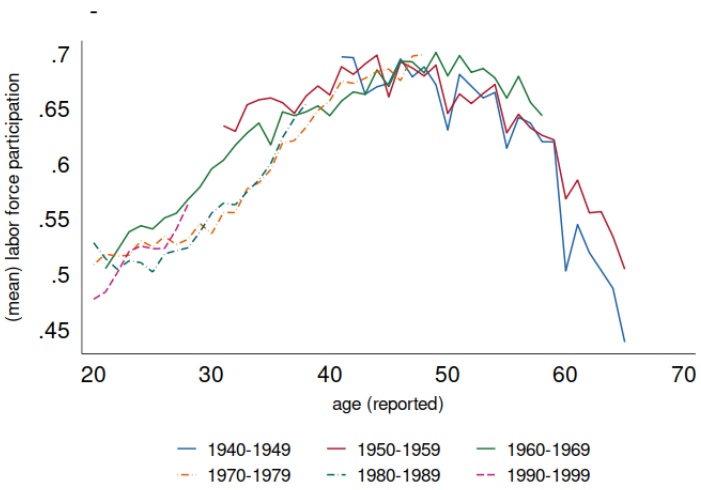
Panel B. Urban



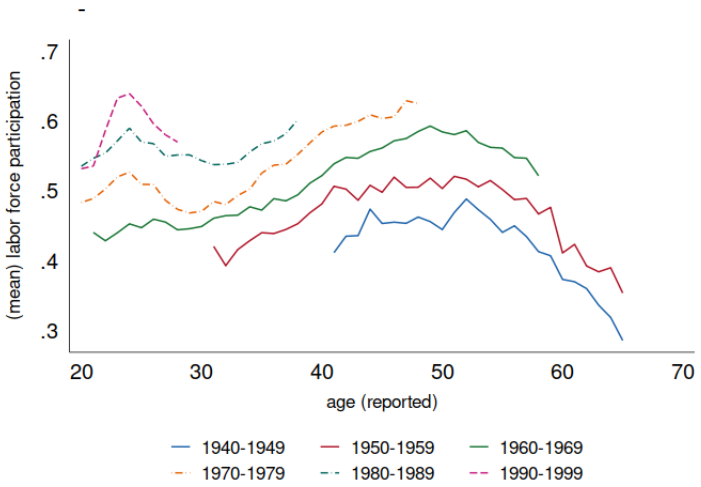
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 3: Female labor force participation status trends and education

Panel A. Rural



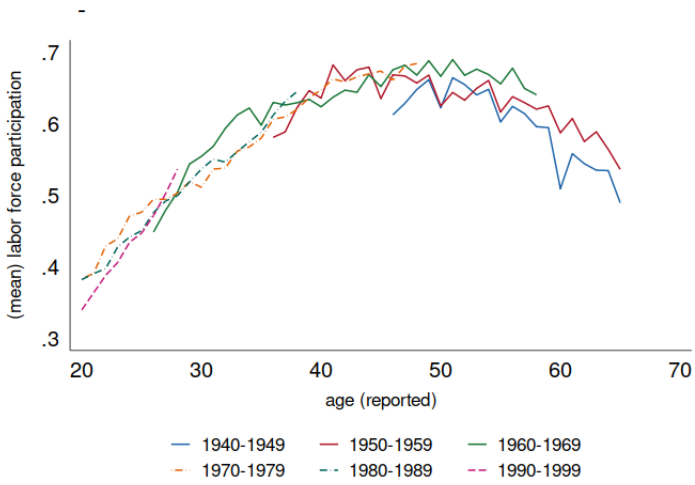
Panel B. Urban



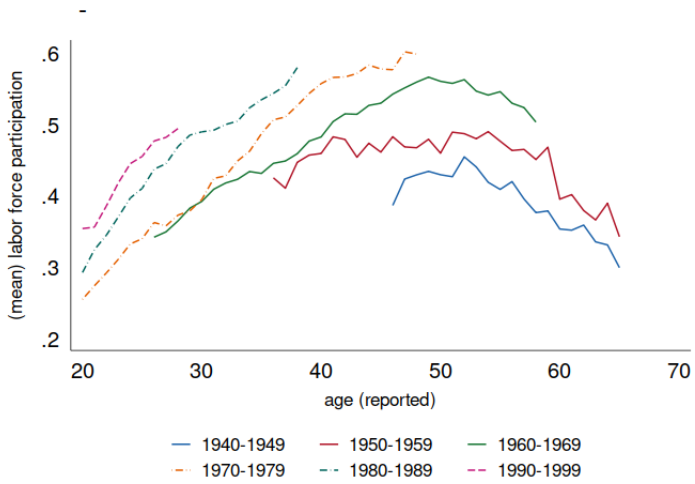
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 4: Female labor force participation status trends and marital status

Panel A. Rural



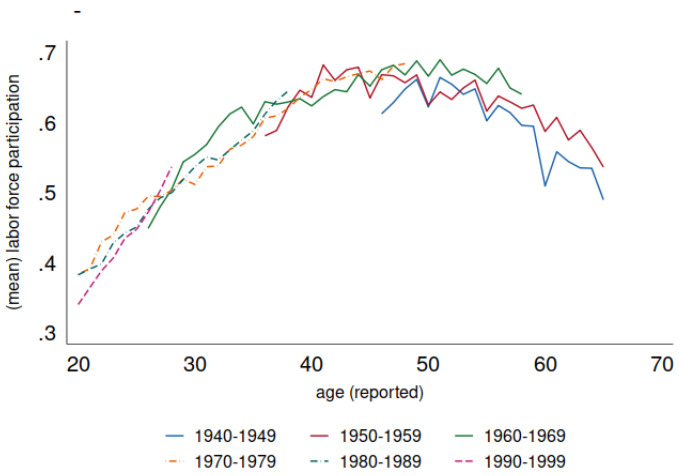
Panel B. Urban



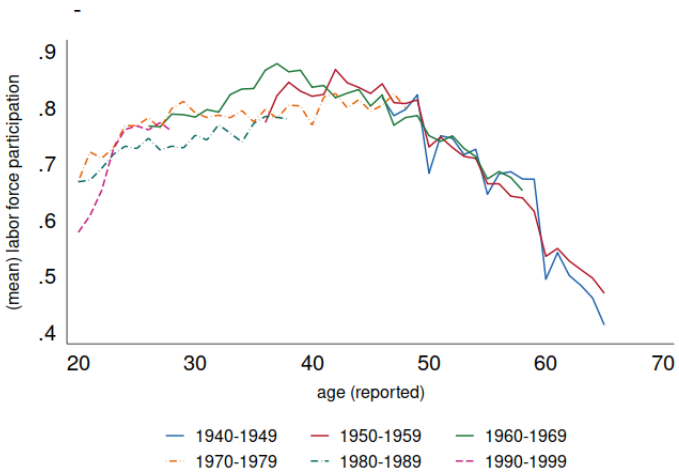
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 5: Female labor force participation status by birth cohorts and marital status, SAKERNAS 1990-2019, Author's calculation

Panel A. Married



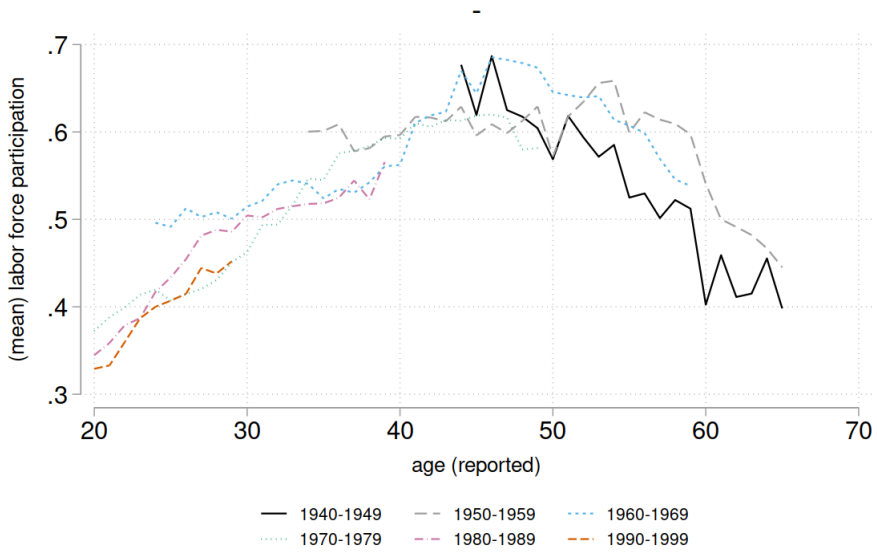
Panel B. Not married



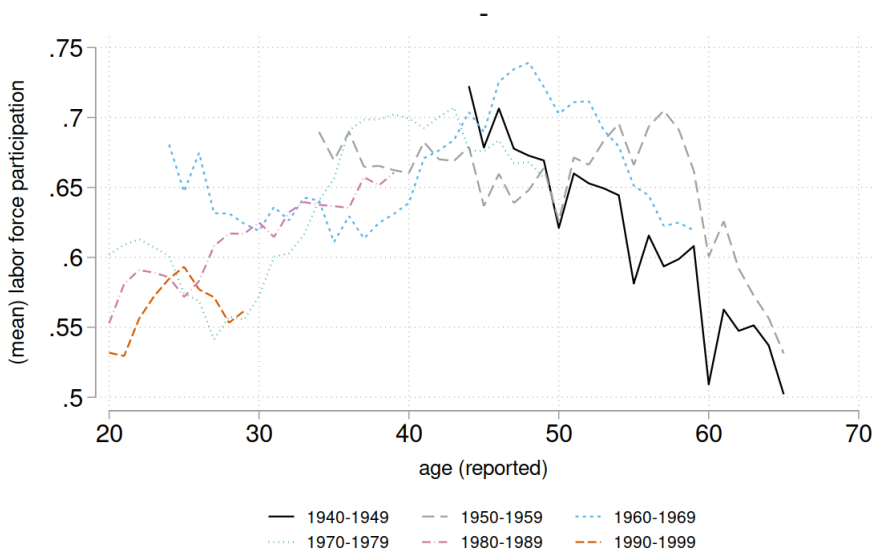
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 6: Female labor force participation status by birth cohorts and childbearing status, SUSENAS 1990-2019, Author's calculation

Panel A. Have children aged 0-5 years old



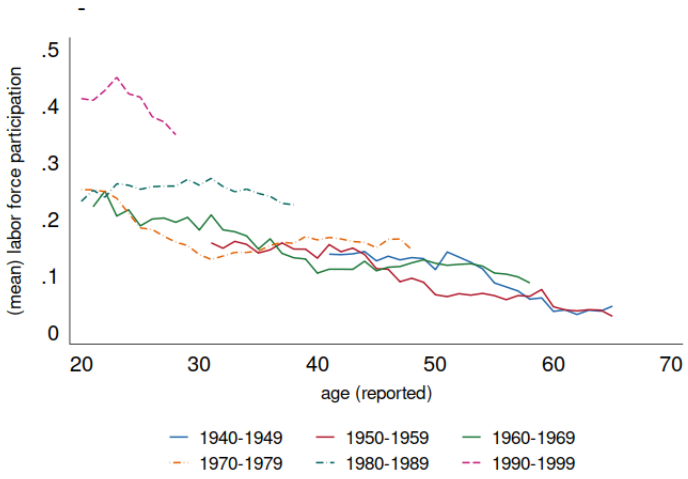
Panel B. No children aged 0-5 years old



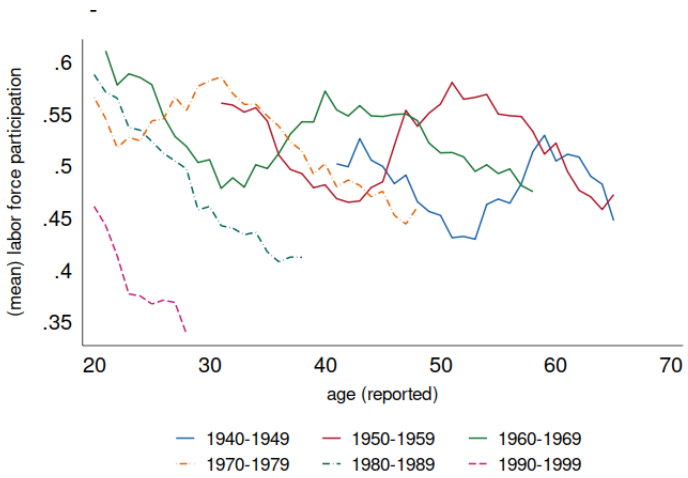
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 7: Employment status by birth cohorts and work status, SAKERNAS 1990-2019, Author's calculation

Panel A. Family worker



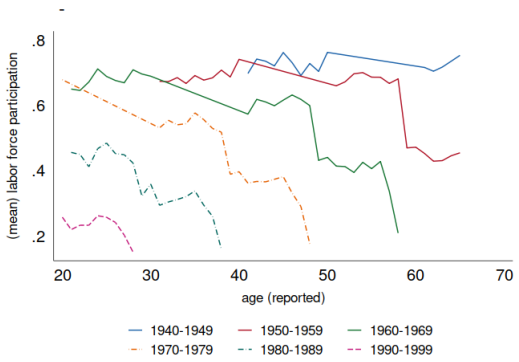
Panel B. Wage worker



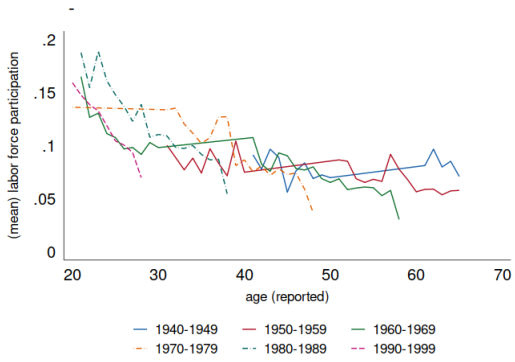
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. Observations are restricted to those who work at least one hour in the past week. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 8: Employment status by birth cohorts and sectors of employment, SAKERNAS 1990-2019, Author's calculation

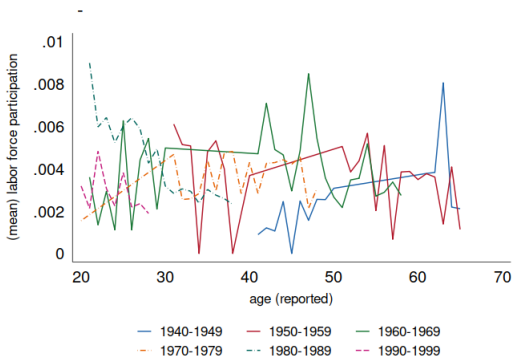
Panel A. Agriculture



Panel B. Services



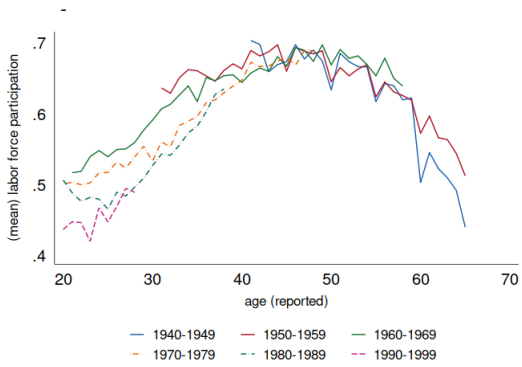
Panel C. Manufacture



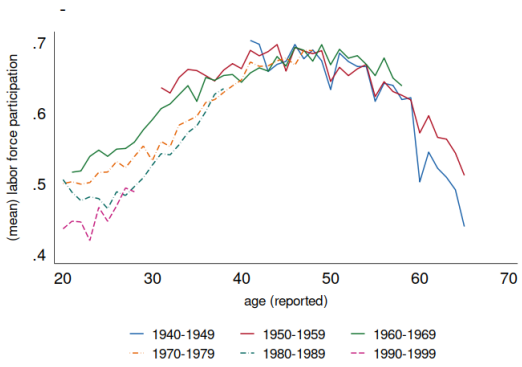
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 9: Employment status by birth cohorts and education attainment, SAKERNAS 1990-2019, Author's calculation

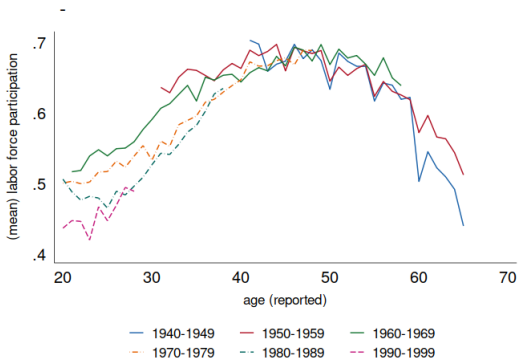
Panel A. Primary education



Panel B. Secondary education



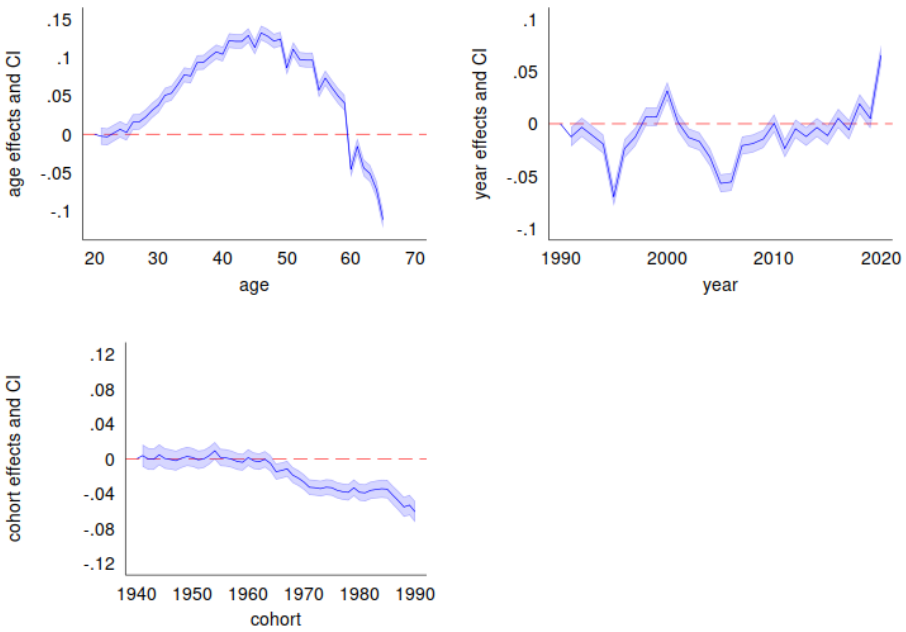
Panel C. Tertiary education



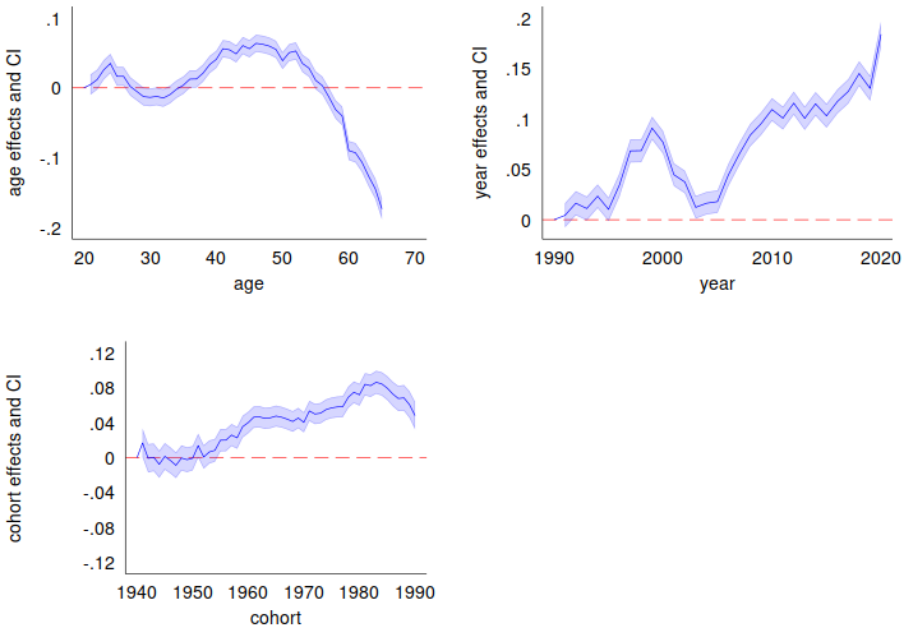
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure 10: APC results using SAKERNAS, ME approach

(a) Rural



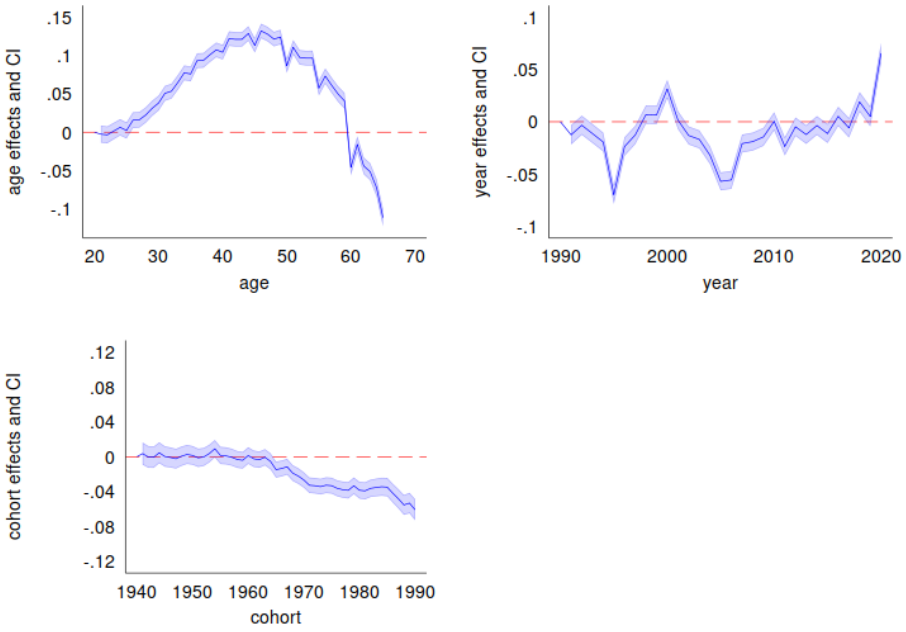
(b) Urban



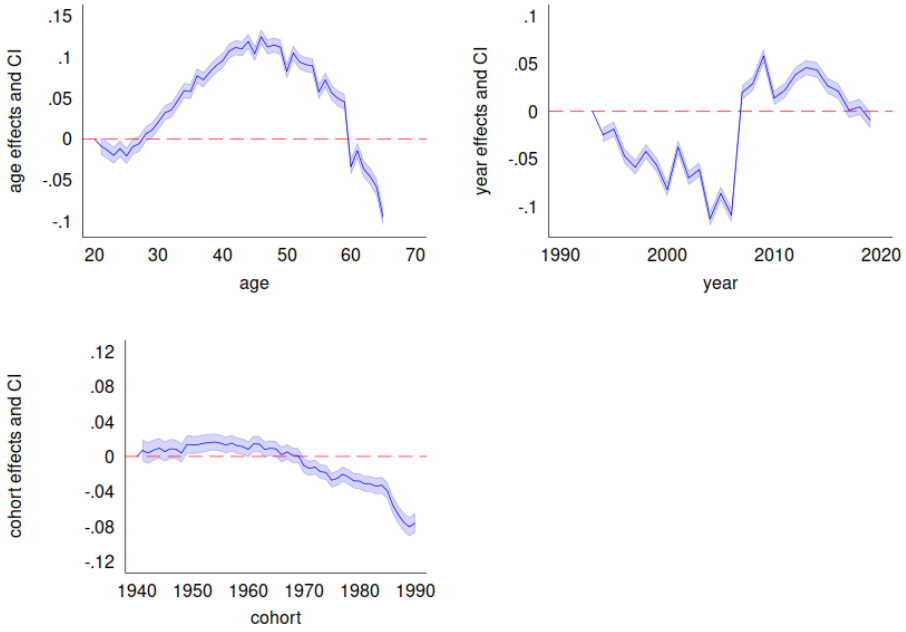
Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure 11: APC results in comparison between SUSENAS and SAKERNAS for rural women, ME approach

(a) SAKERNAS



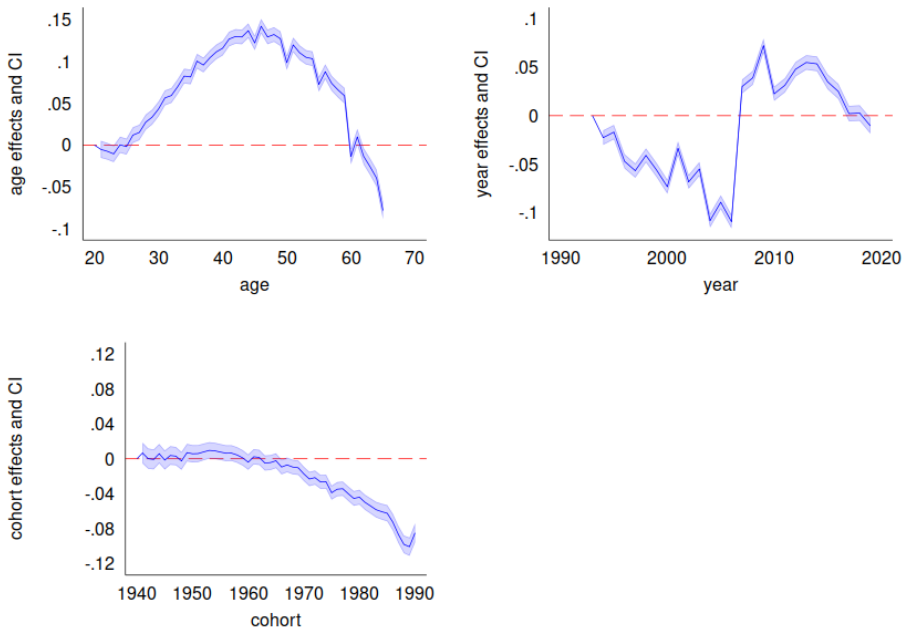
(b) SUSENAS



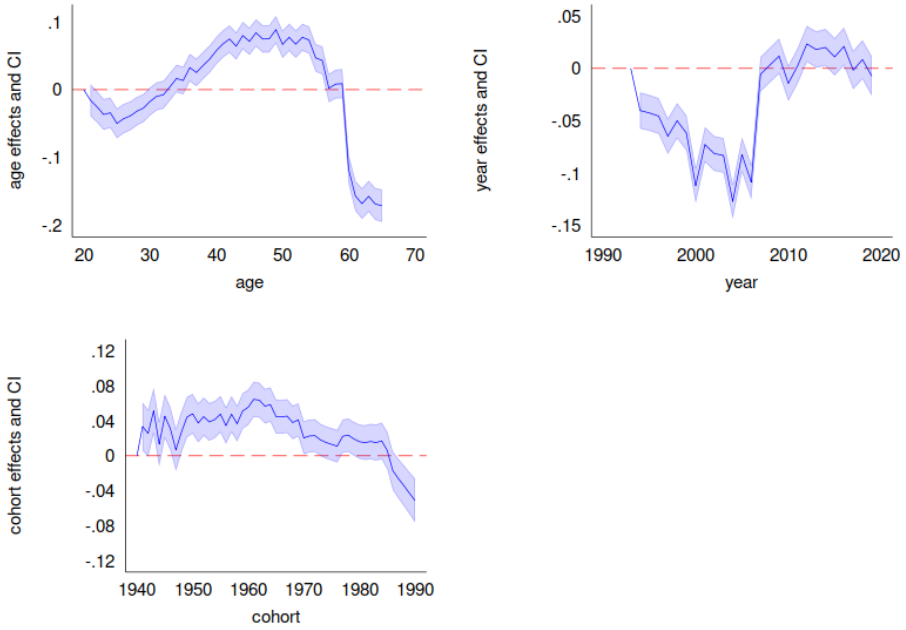
Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019 for Panel A and a series of SUSENAS from 1992-2019 for Panel B. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure 12: APC results by education status, ME approach

(a) Low Education



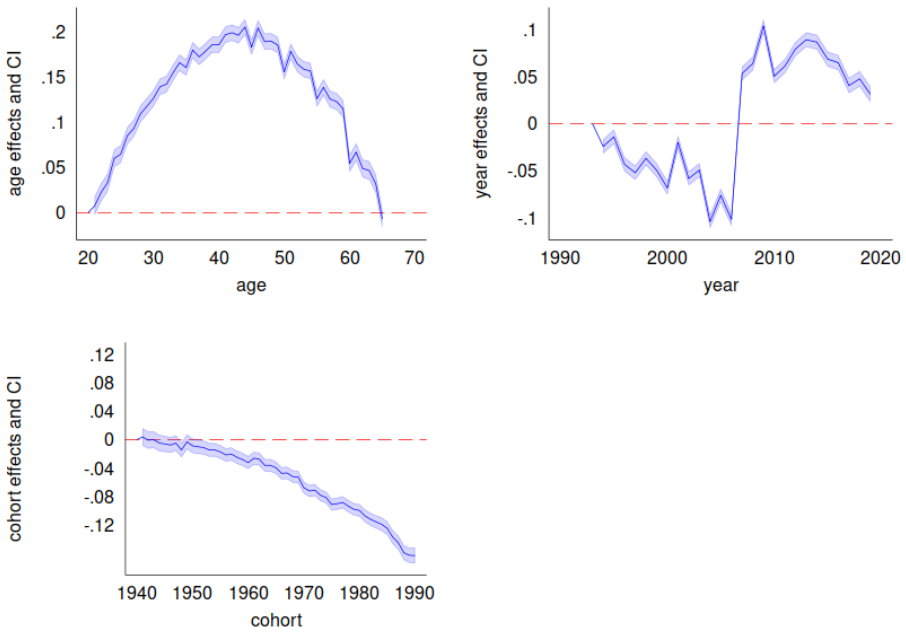
(b) High Education



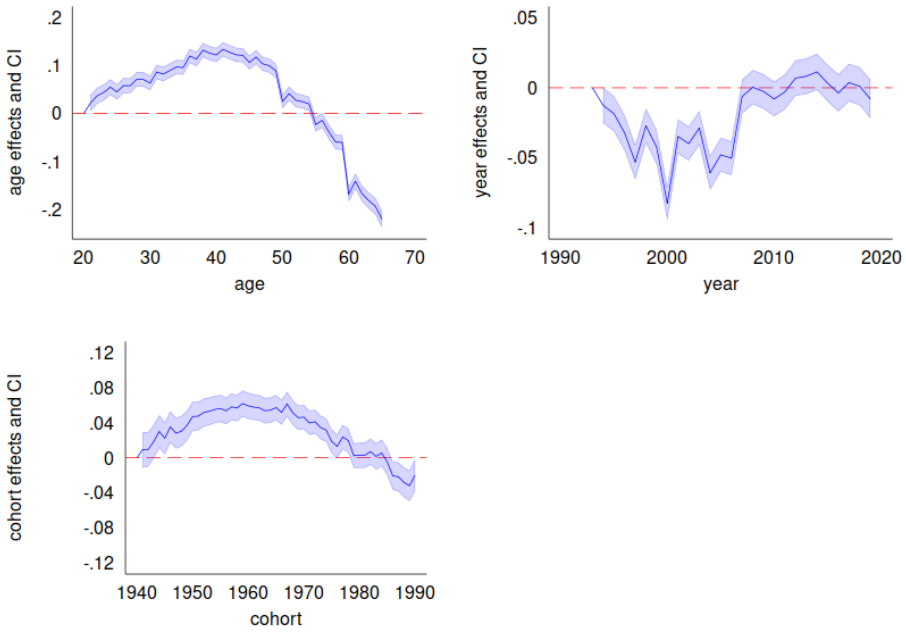
Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure 13: APC results by marital status, ME approach

(a) Married



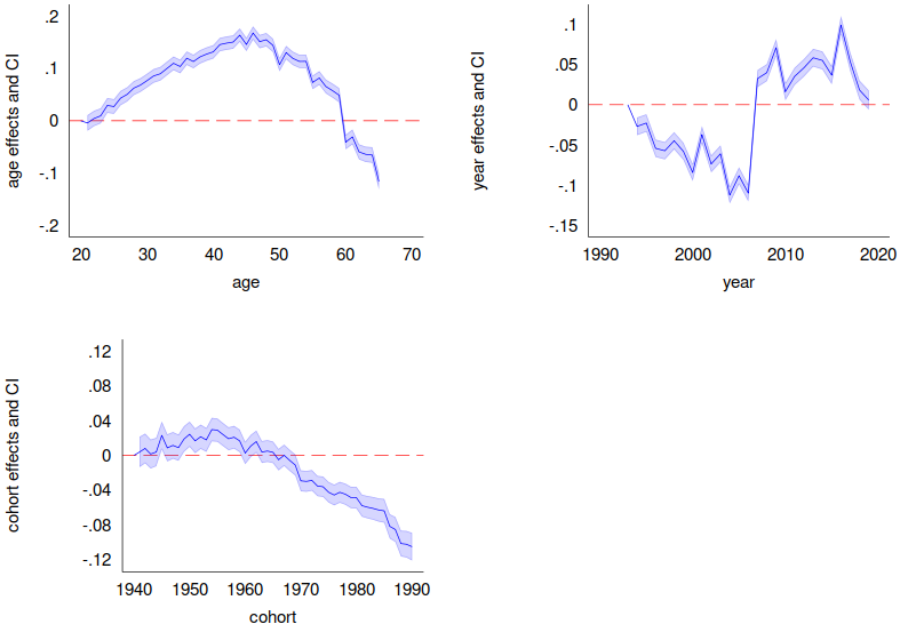
(b) Not Married



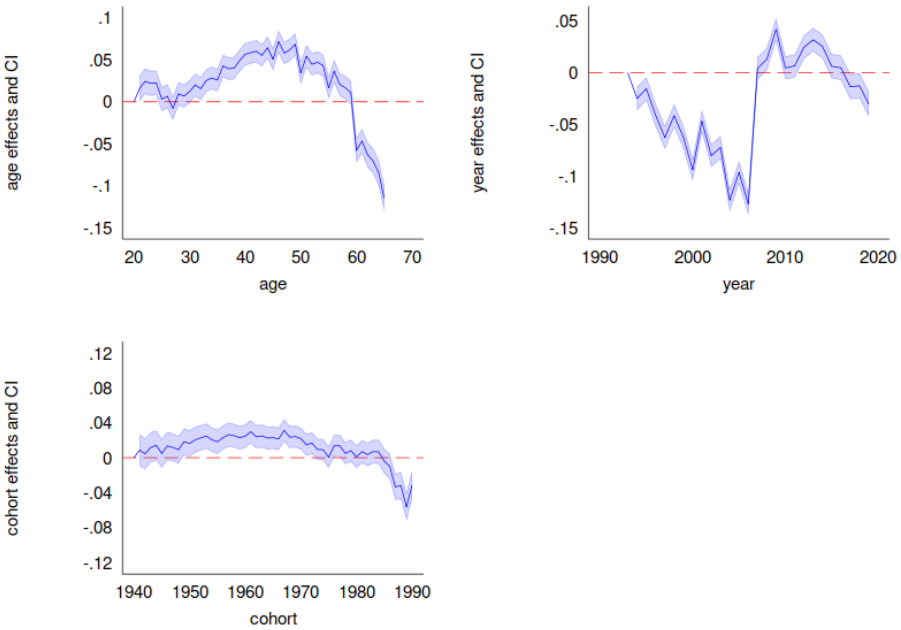
Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure 14: APC results by childbearing status, ME approach

(a) Has kids



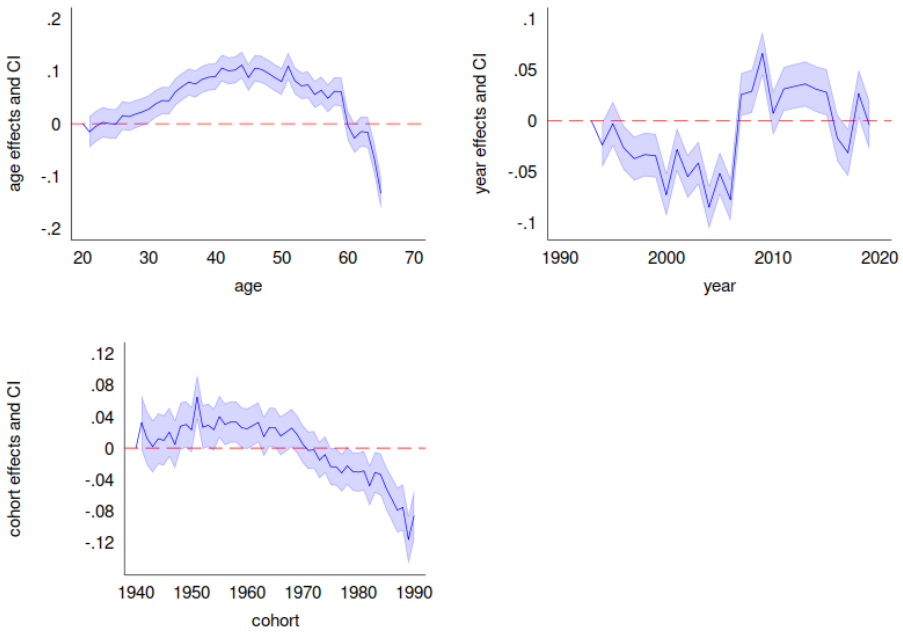
(b) No kids



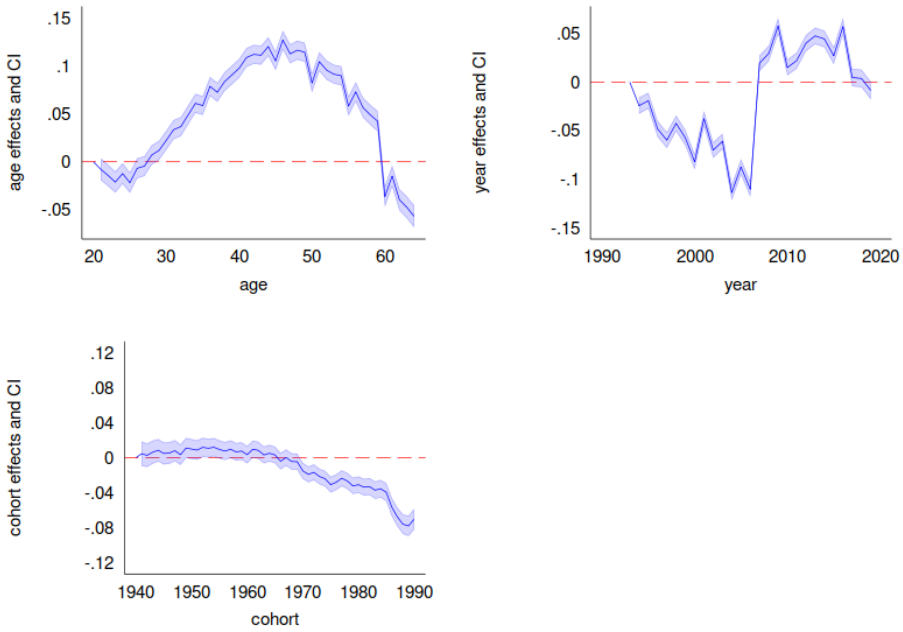
Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure 15: APC results by elderly availability status, ME approach

(a) With elder female



(b) No elder female

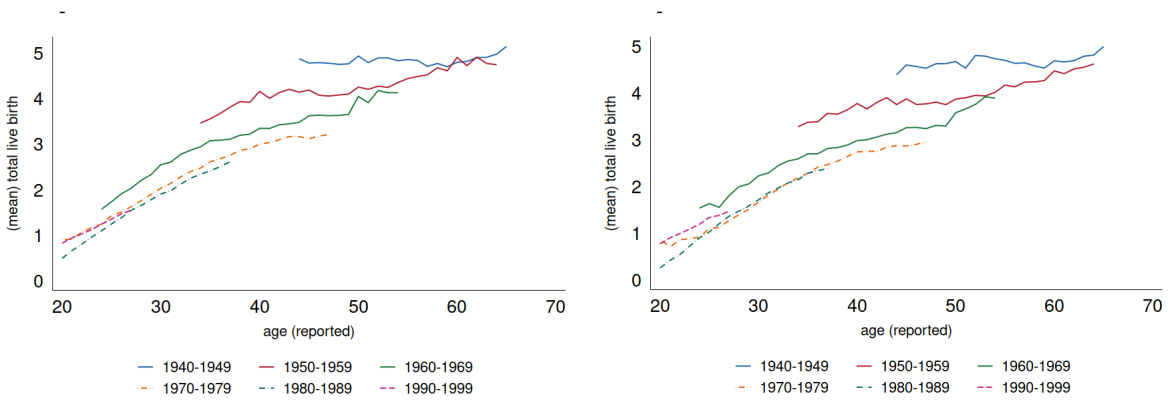


Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Appendix

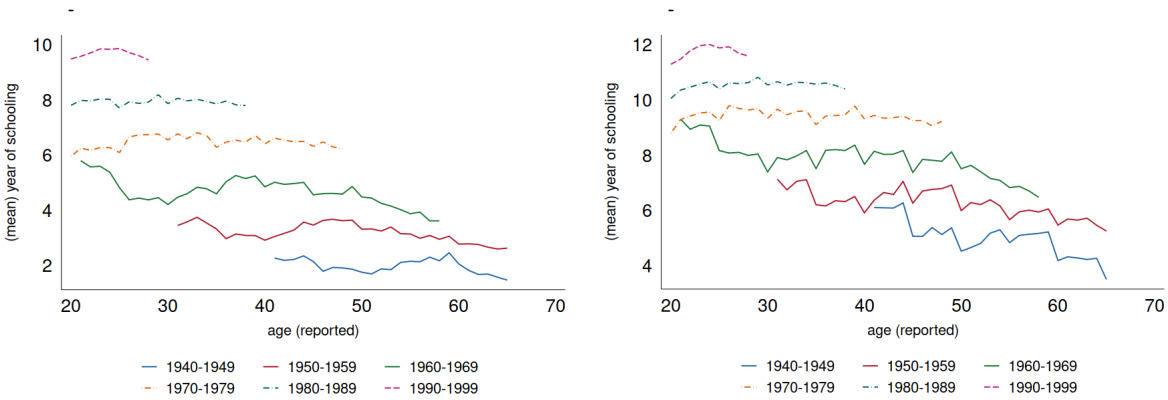
Appendix A. Figures and table

Figure A1: Total live birth by birth cohorts and location



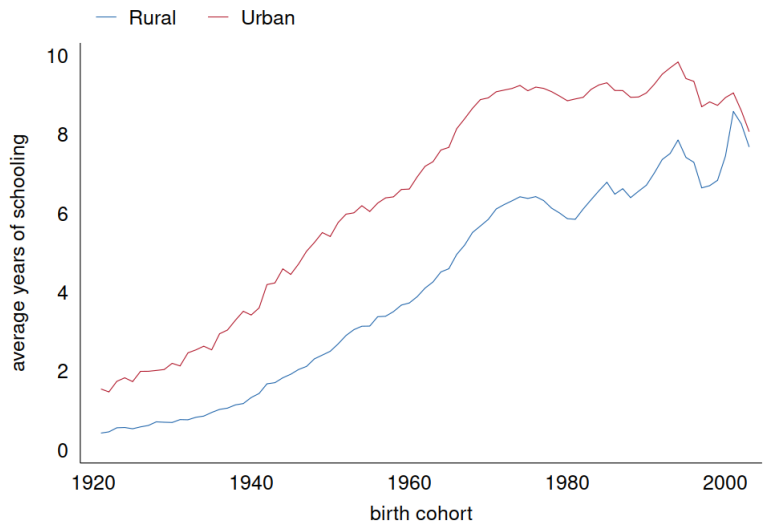
Notes: Author's calculation using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I apply individuals' weight provided by the survey.

Figure A2: Years of schooling by birth cohorts and location



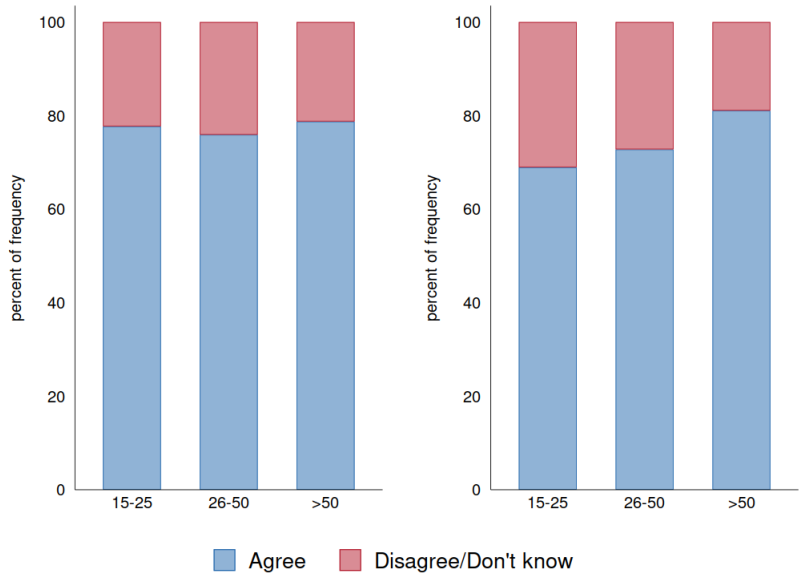
Notes: Author's calculation using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old in each survey year. I apply individuals' weight provided by the survey.

Figure A3: Years of schooling over birth cohorts



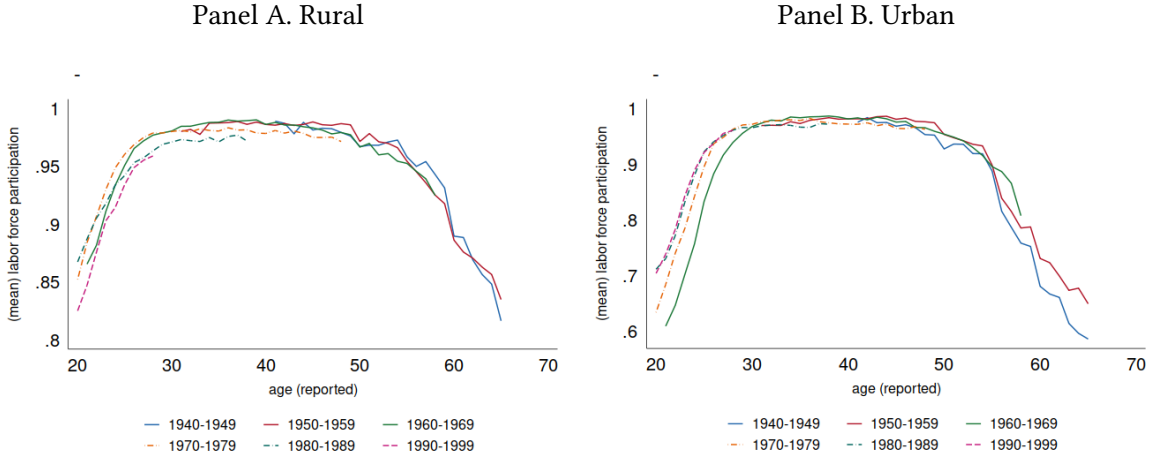
Notes: Author's calculation. Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to men aged 20-65 years old in each survey year. I also restrict the observation to be born between 1940 to 1990. Each pseudo-panel observation is weighted using the individual weight provided by the survey.

Figure A4: WVS survey: "if job scarce, men should have more right to a job than women"



Notes: Author's calculation based on World Value Survey Waves 7 (Haerpfer et al., 2020). The respondent responds to a question that ask: "if job scarce, men should have more right to a job than women".

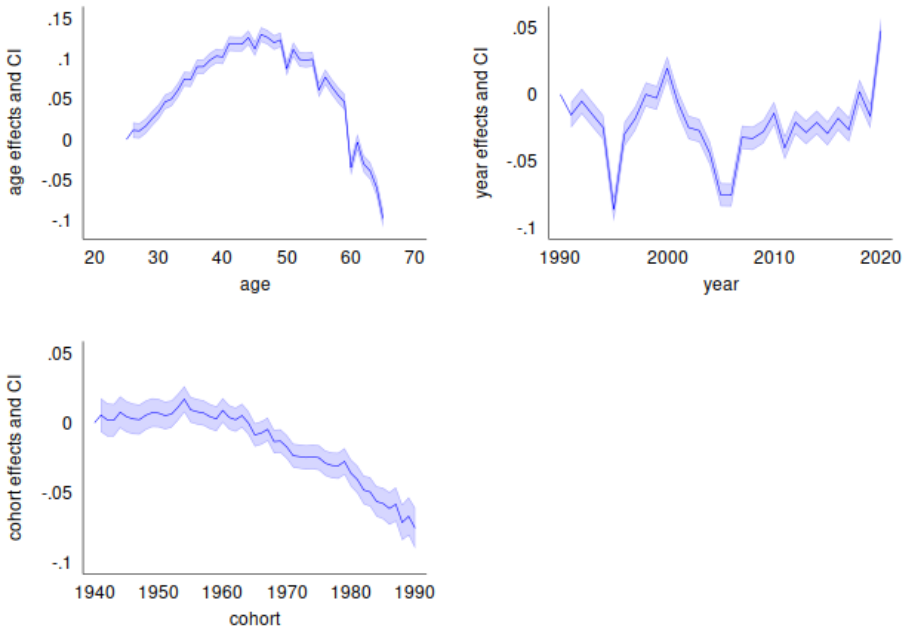
Figure A5: Labor force participation status by birth cohorts and education



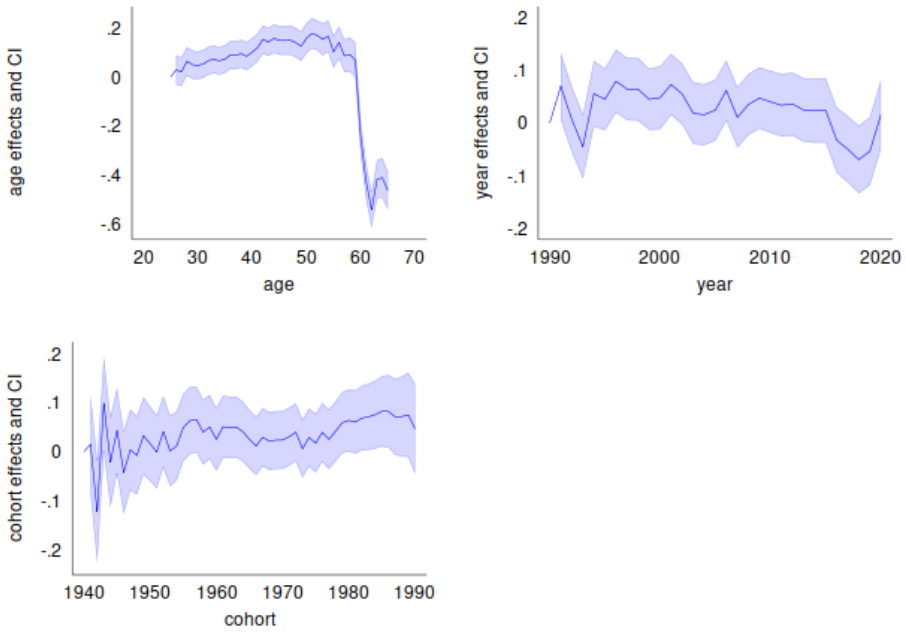
Notes: SAKERNAS 1990-2019, Author's calculation

Figure A6: Female labor force participation by education status

(a) Low Education



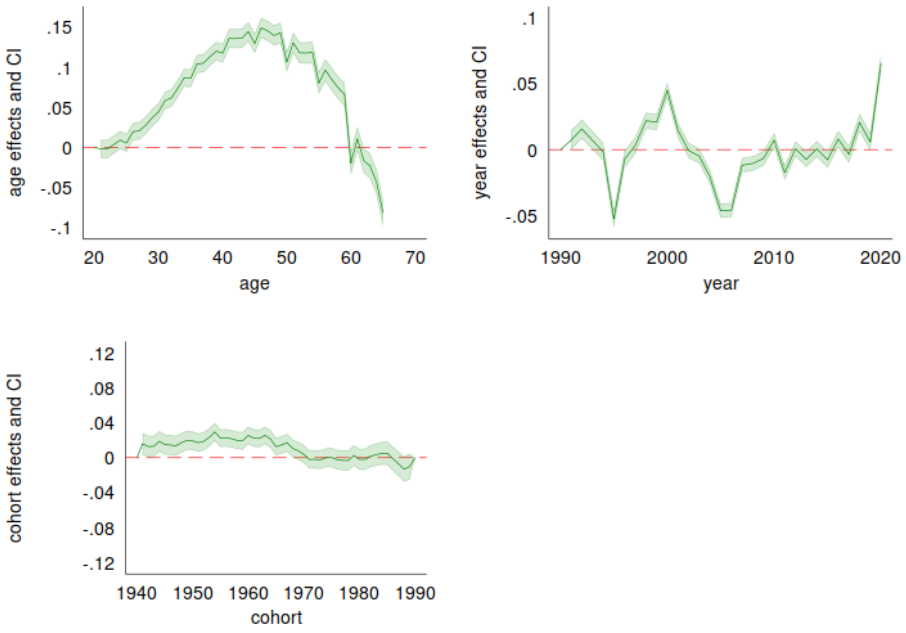
(b) High Education



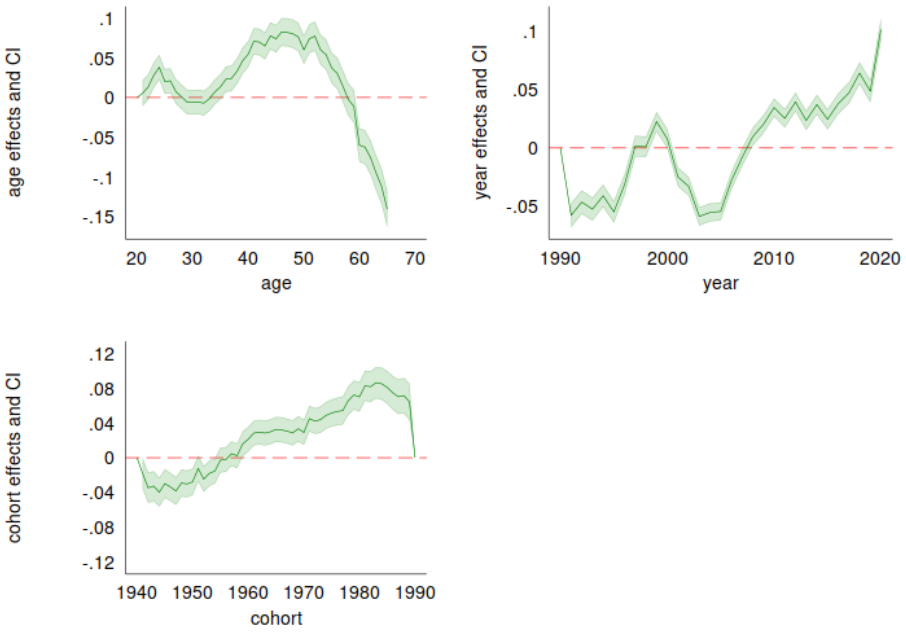
Notes: Author's calculation based on ME approach (Browning et al., 2012). Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure A7: APC results using SAKERNAS, DP approach

(a) Rural



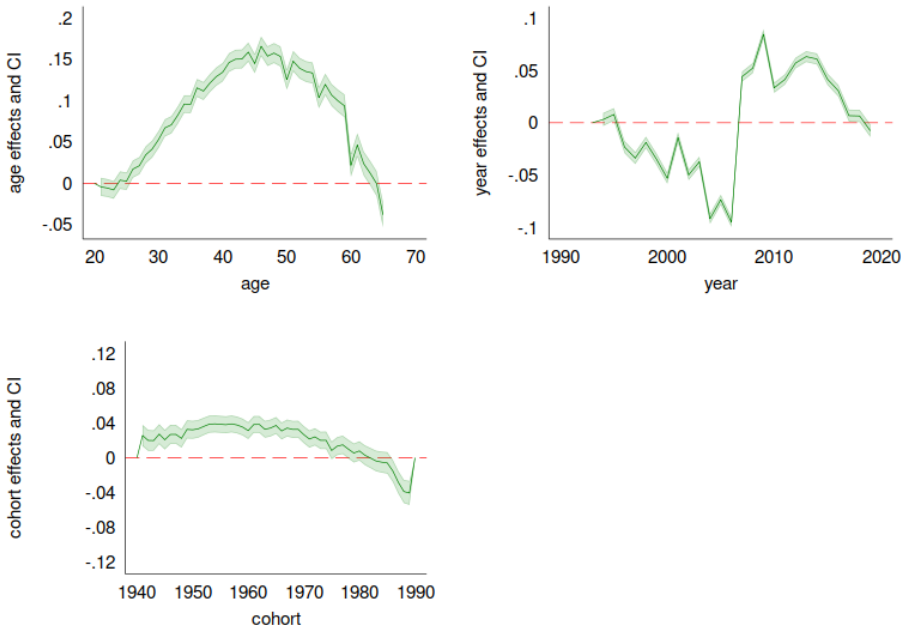
(b) Urban



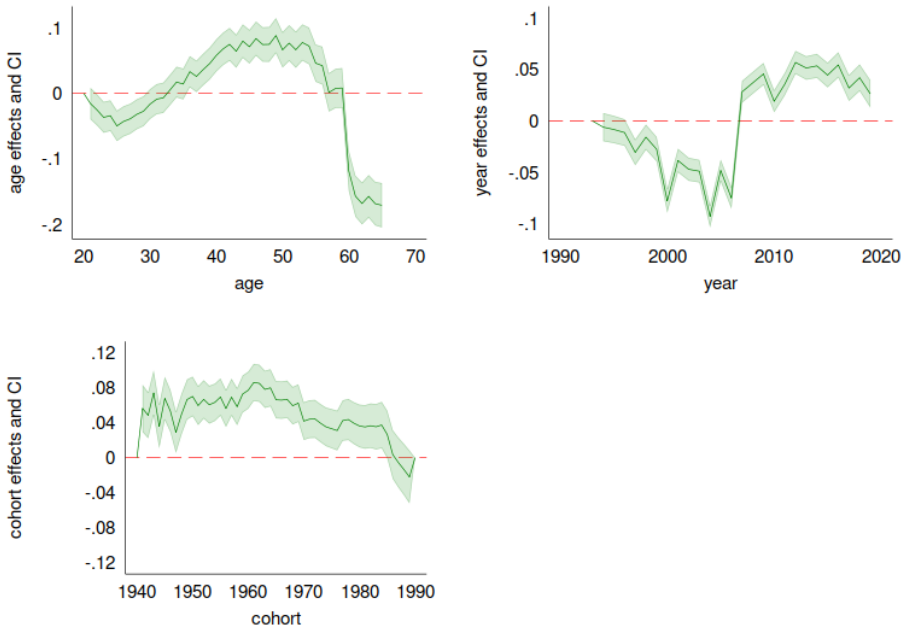
Notes: Author's calculation based on DP approach (Deaton and Paxson, 1994). Synthetic-panel observation is constructed using a series of SAKERNAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure A8: APC results using SAKERNAS education status, DP approach

(a) Low Education



(b) High Education



Notes: Author's calculation based on DP approach (Deaton and Paxson, 1994). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure A9: APC results using SAKERNAS by marriage status, DP approach

(a) Married

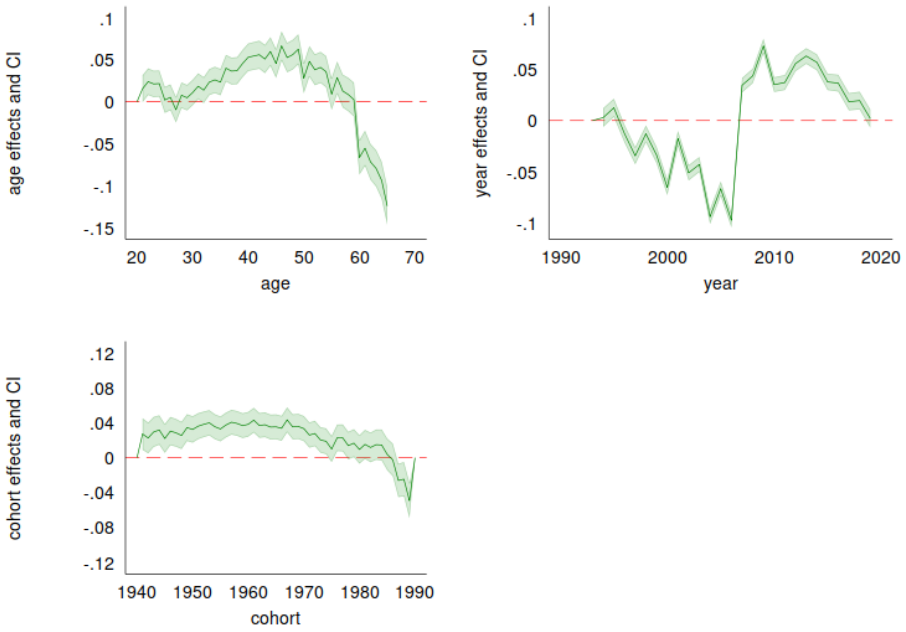
(b) Not Married

Notes: Author's calculation based on DP approach (Deaton and Paxson, 1994). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure A10: APC results using SAKERNAS by childbearing status, DP approach

(a) Has kids

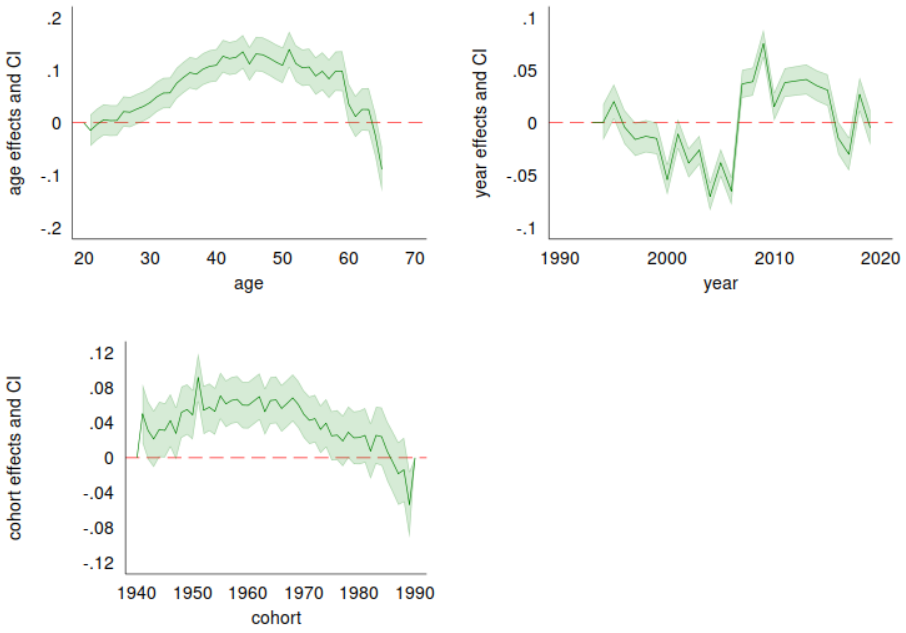
(b) No kids



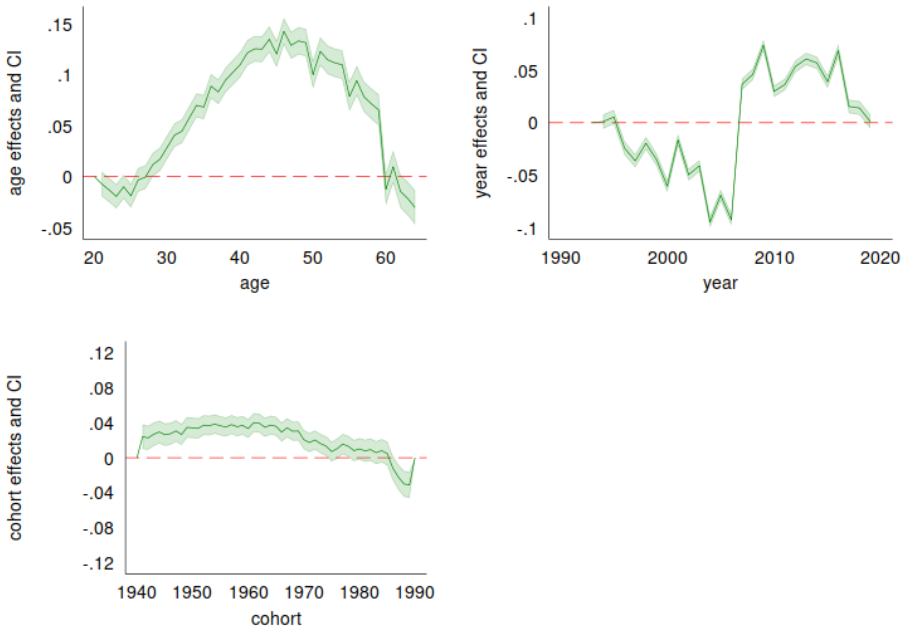
Notes: Author's calculation based on DP approach (Deaton and Paxson, 1994). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Figure A11: APC results using SAKERNAS by elderly availability, DP approach

(a) With elder female



(b) No elder female



Notes: Author's calculation based on DP approach (Deaton and Paxson, 1994). Synthetic-panel observation is constructed using a series of SUSENAS from 1990-2019. The sample was restricted to women aged 20-65 years old who live in rural areas in each survey year. I also restrict the observation to be born between 1940 to 1990. The shaded area represents the 95% confidence interval using robust standard errors. Each synthetic-panel observation is weighted using the individual weight provided by the survey.

Appendix B. Technical notes on DP (Deaton and Paxson, 1994) and ME (Browning et al., 2012) approaches

Age-Period-Cohort problems

Consider a three-factor model, as discussed in Hanoch and Honig (1985), as follows.

$$Y_{kt} = \bar{a} + \bar{b}t + \bar{c}j + \bar{d}l + \beta_t + \gamma_k + \delta_l \tag{1}$$

Where Y is labor force participation. Index t, k, l represent the year o the survey, birth cohort and age respectively. By construction, age could also be defined as $l = t + k - 1$. This implies the three indices are together linearly dependence. This prevents the identification of linear coefficients $\bar{a}$ $\bar{b}$, $\bar{d}$.

DP solution

Hanoch and Honig (1985) proposes a solution which to eliminate one linear effect, for example, the age effect such that.

$$EY_{kt} = \bar{a} + \bar{b}t + \bar{c}j + \beta_t + \gamma_k + \delta_l \tag{2}$$

where $b = \bar{b} + \bar{d}$; $c = \bar{c} + \bar{d}$ and $a = \bar{a} - \bar{d}$.

ME solution

Browning et al. (2012) offer the following approach. Consider an entropy function

$$H(p) = -p' \ln p \tag{3}$$

The constrained optimization is therefore the maximum entropy problem is summarized as

$$\max_{p \geq 0, 1'p=1} -p \ln p \tag{4}$$

subject to $b = ASp$. This is a nonlinear optimization problem with a unique solution. Since $p*$ could be interpreted as a vector of probabilities over support points, and the expectation operator for a discrete random variable is a probability-weighted convex combination

of support points the APC coefficients $\beta = Sp*$ satisfy the data constraint.