Cross Sectional Facts for Macroeconomists: Wage, Income and Consumption Inequality in Turkey*

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Abstract

In this paper, we investigate the evolution of Turkey's wage, income and consumption inequalities thoroughly following a cross-country comparable methodology via the Turkish Statistical Institute's Household Budget Survey and the Survey of Income and Living Conditions micro data sets. We first show that Turkey's wage, income and consumption inequalities all exhibit downward time trends over the 2002-2016 period, which aligns well with the rapid minimum wage growth over the period of interest. We further show that in these time trends, while wage inequality estimates display strong countercyclicality, income and consumption inequalities exhibit rather acyclical time-series movements. Second, we report that while recent education premium estimates of Turkey are similar to those in the early 2000s, gender and experience premiums, as well as residual wage inequality component decrease over time. Finally, we show that Turkey's income and consumption inequality estimates exhibit similar time trends with moderate level differences, and these trends are robust to the choice of inequality metrics. As the first of its kind in its depth, robustness and cross-country comparability, we aim that this paper contributes to a better understanding of Turkey's economic inequalities.

Keywords : income distribution; gender premium; education premium; experience premium

JEL Classifications: D31; E24; H31; J31

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1 Introduction

In recent decades, greater availability of micro-level data has contributed to a more thorough exploration of the distributional properties of economic variables for several countries. Consolidation efforts over these findings not only aided in the construction of easily accessible economic inequality databases, but also contributed to a better understanding of cross-country similarities and differences. Among the consolidation efforts, a special issue of the *Review of Economic Dynamics* (*RED*): Cross-Sectional Facts for Macroeconomists edited by Krueger et al. (2010) deserves particular attention, as it is the first thorough academic attempt to contrast the evolution of economic inequalities cross-sectionally by investigating nine developed and developing economies in detail, using a comparable methodology following standardized guidelines.

Despite its sizable aggregate economic activity and a high degree of economic inequality, Turkey lacks detailed inequality estimates in the existing inequality databases.[1] Further, Turkey was not among the nine countries studied in the special issue by *RED*. Accordingly, how the levels and evolutions of Turkey's inequalities compared to those previously studied economies remains largely unveiled.

In this study, we study this issue by examining Turkey's economic inequalities via adherence to *RED*'s standardized guidelines. Specifically, we investigate the evolution of wage, income and consumption inequalities in Turkey using the Turkish Statistical Institute's (*TurkStat*) Household Budget Survey (*HBS*) and the Survey of Income and Living Conditions (*SILC*) micro data sets, and we then compare our results to those of the previously studied nine countries in *RED*'s special issue: the United States, Canada, the United Kingdom, Germany, Sweden, Italy, Spain, the Russian Federation, and Mexico.

We first demonstrate that albeit at different rates, Turkey's wage, income, and consumption inequality estimates all exhibit downward time trends over the 2002-2016 period, which strongly aligns with the rapid minimum wage growth over the period of interest. In particular, over the sample period, while the real net minimum wage grew 119% in Turkey, the average real after-tax labor earnings according to *HBS* grew only 56%. Since remuneration at (or below) the minimum wage is prevalent in the Turkish economy (estimated to be no less than 40% of employees), we argue that the rapid growth of the minimum wage served to mitigate Turkey's economic inequalities.

During this period, Turkey also experienced growth in social protection spending and a decline in the informal sector employment. Specifically, *TurkStat* reports that the share of Turkey's GDP devoted to social protection spending increased from 9.33% in 2002 to 12.83% in 2016. Our calculations via *HBS* and *SILC* reveal that the share of employees who are not registered with the Social Security Administration, a commonly used proxy for informal employment, almost halved between 2005 and 2016, from 45% to 24%. Coupled with the fact that recipients of social protection spending and employees of the informal sector prevalently earn at the lower end of Turkey's wage spectrum, we argue that these developments further contributed to the decline in Turkey's economic inequalities.

We also study the cyclicality of Turkey's economic inequalities and reveal that while wage inequality

[1] According to the World Bank estimates, Turkey ranks 13th globally in PPP-adjusted GDP in 2016. For a discussion of Turkey's income and wealth inequality, see Torul and Öztunalı (2018). To view two of the more prominent inequality databases, see World Inequality Database and World Income Inequality Database.

estimates display strong and robust countercyclicality, the correlation coefficients between GDP growth and the growth of income and consumption inequality estimates are predominantly negative yet often insignificant, thus suggesting that the inequality series of the latter two variables exhibit rather acyclical time-series movements. We observe that the acyclicality in entrepreneurial income inequality contributes to the acyclicality of the income inequality series.

We next investigate the determinants of wage and demonstrate that while Turkey's recent education premium estimates are comparable to the early 2000s, Turkey's gender and experience premiums, as well as the residual wage inequality component decrease over the sample period. We observe that the rapidly rising share of university graduates, females' education-based selective entry into the labor market and the overall aging of the Turkish workforce are instrumental in shaping the evolution of these premium estimates.

Finally, we show that Turkey's income and consumption inequalities exhibit similar time trends with moderate level differences and these trends are robust with regard to the choice of inequality metrics. We discuss that these accordant realized distributions featuring relatively lower cross-sectional dispersions and time-series variations in the consumption inequality series are consistent with predictions by economic theory, specifically, the first-generation heterogeneous-agent incomplete-market models.

Taking all of these findings into consideration, we observe that the levels and evolutions of Turkey's economic inequalities most resemble the Russian Federation among the nine countries studied in *RED*'s special issue.

Throughout our investigation, we analyze economic inequalities in Turkey at the national level without limiting our analysis to certain rural or urban sub-regions, gender groups or sectoral sub-groups, as commonly seen in the previous literature. Furthermore, we decompose Turkey's economic inequalities based on whether they stem from observables or unexplainable residual factors, thereby exploring the causal relationships in the time-series behavior of economic inequalities for the first time. Additionally, we unveil how education, gender, and experience premiums in Turkish wages evolve over time, and how the premium levels and their evolutions compare to those of other countries. In terms of wage and income variables, we cross-check all of our findings via *TurkStat*'s *HBS* and *SILC* micro-level data sets, and in terms of consumption, we report the first detailed distributional analysis via Turkey's only viable official micro data set, *HBS*. As the first study of its kind regarding its depth, rigor, robustness and cross-country comparability, we aim that this study contributes to a better understanding of Turkey's economic inequalities.

The rest of the study is organized as follows: In Section 2, we review the related literature. In Section 3, we describe the data. In section 4, we describe our methodology. In section 5, we report and discuss our findings on wage, income and consumption inequalities. In Section section 6, we conclude.

2 Related Literature

There exists a large body of literature related to the study of Turkey's economic inequalities, which largely lacks cross-country comparability and standardization. Among the first attempts, Çavuşoğlu

and Hamurdan (1966) studies Turkey's income inequality using income tax statements; Bulutay et al. (1971) analyzes individual-level income distribution using survey data while concentrating exclusively on married males whose wives are younger than 45 years of age; and Derviş and Robinson (1980) studies income distribution with a focus on the employees sector of employment. Among the more recent literature, Altınbaş et al. (2002) studies regional income convergence using GDP per capita data for the period spanning 1987 to 1998; and Gezici and Hewings (2004) studies functional and regional income inequalities using GDP per capita data for the period spanning 1980 to 1997. Among others, Aldan and Gaygısız (2006), Yıldırım and Öcal (2006), Kırdar and Saraçoğlu (2006), and Sarı and Güven (2007) also study between- and within-regional inequalities and regional convergence using GDP per capita data from Turkey.

A milestone in the study of Turkey's inequalities was the execution of the Turkish Statistical Institute's (*TurkStat*, formerly the *State Institute of Statistics*) Household Income and Consumption Expenditures Survey (*HICES*) in 1987 for the first and in 1994 for the second time, which fostered micro-level scrutiny of Turkey's income distribution. Renamed as the Household Budget Survey (*HBS*, *Hanehalkı Bütçe Anketi* (*HBA*) in Turkish) in 2003, this micro-level survey has been conducted annually by *TurkStat* since 2002. As this and other micro-level survey data sets compiled by *TurkStat* became available to researchers, the number of studies addressing Turkey's inequalities increased rapidly. Among these attempts, Başlevent and Dayıoğlu (2005) studies regional income disparity in the urban areas of Turkey from 1994 to 2003; Duygan and Güner (2006) investigates the role of education in income and consumption inequalities by comparing statistics from 1994 and 2002; Ekşi and Kırdar (2015) studies wage and income inequalities between 2002 and 2011 by focusing exclusively on males who live in urban areas between the ages of 25 and 49; Bakış and Polat (2015) studies changes in wage inequality between 2000 and 2010 via the Household Labor Force Survey (*HLFS*); Tansel and Bodur (2012) analyzes the role of education in wages and residual wage inequality from 1994 to 2002 via *HICES* and *HBS*; and Candaş et al. (2010) studies the relationship between wage and income inequalities via the Survey of Income and Living Conditions (*SILC*). One of the most recent attempts is a study conducted by Filiztekin (2015), which decomposes income inequality over socio-demographic and economic characteristics, while also focusing primarily on regional inequalities. In brief, inequality studies on Turkey concentrate predominantly on wage and regional inequalities, and earlier attempts lack a comprehensive approach, as well as cross-country comparability. To the best of our knowledge, this study is the first of its kind to collaboratively analyze wage, income and consumption inequalities for the entire population of Turkey, while also preserving compatibility with the previously studied economies, and to offer robust findings via two major official data sets, *HBS* and *SILC*.

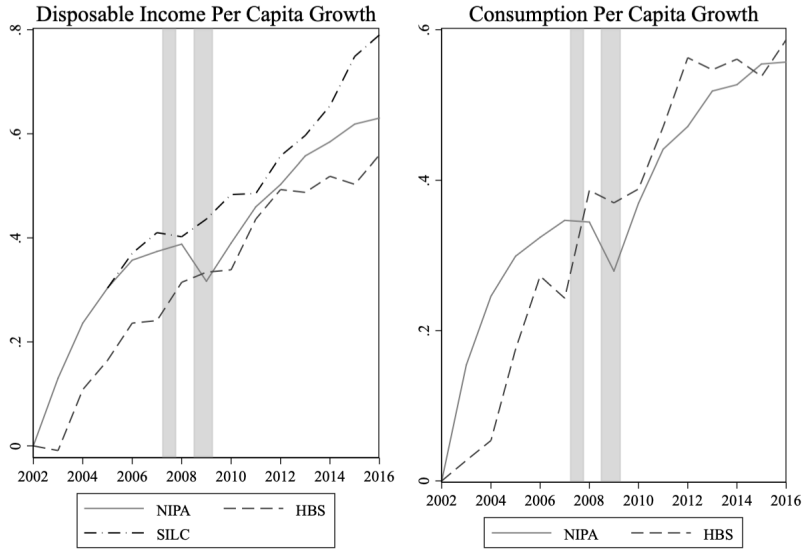
As previously discussed, while there is a plethora of empirical studies on economic inequalities for the rest of the world, a special issue of the *Review of Economic Dynamics* (*RED*): Cross-Sectional Facts for Macroeconomists represents the first combined effort to thoroughly explore cross-country similarities and differences in the evolution of economic inequalities by relying on a standardized methodology, thereby preserving cross-country comparability. In this special issue, Heathcote et al. (2010), Brzozowski et al. (2010), Blundell and Etheridge (2010), Fuchs-Schündeln et al. (2010), Jappelli and Pistaferri (2010),

Pijoan-Mas and Sánchez-Marcos (2010), Gorodnichenko et al. (2010), Binelli and Attanasio (2010), and Domeij and Flodén (2010) investigate inequality in the United States from 1980 to 2006, in Canada from 1978 to 2006, in the United Kingdom from 1978 to 2005, in Germany from 1983 to 2003, in Italy from 1987 to 2006, in Spain from 1985 to 1996, in the Russian Federation from 1998 to 2005, in Mexico from 1989 to 2002, and in Sweden from 1990 to 2001, respectively. These studies motivated numerous others, and among the follow-up papers that relied on the same proposed methodology, Lise et al. (2014) studies Japan from 1981 to 2008, and Ding and He (2018) studies urban China from 1986 to 2009. In this study, we also follow the same uniform guidelines and unveil how the evolution of Turkey's inequality estimates compares to those of the previously studied countries in *RED*'s special issue.

3 Data

Throughout our empirical investigation, we use two primary micro-level annual survey data sets from the Turkish Statistical Institute (*TurkStat*): the Household Budget Survey (*HBS*) and the Survey of Income and Living Conditions (*SILC*). *HBS* contains rich information on disposable income and consumption subcomponents at the household level, as well as labor supply, income and its subcomponents (labor earnings, asset income, self-employment income, transfers from government or other individuals) at the individual level. *HBS* covers at least 8,600 households per year spanning the 2002-2016 period. Prior to this time frame, it lacks continuity (the previous non-consecutive surveys are the Household Income and Consumption Expenditures Surveys (*HICES*), conducted in 1973-74 (only in rural areas), 1978-79 (only in urban areas), 1987 and 1994) and some of the necessary information needed to follow the *RED* guidelines. Because of these issues, we confine our working sample from *HBS* to the 2002-2016 period.

Figure 1: Comparison with NIPA



†*Notes*: Source for the NIPA estimates is Turkish Statistical Institute. Gray shades refer to Turkey's recessions by quarterly data.

SILC has been conducted since 2006 in order for Turkey to obtain income distribution statistics compatible with the European Union. As in the case of *HBS*, *SILC*'s unit of observation is the household, and *SILC* also provides detailed information on income sources for each individual in every household for at least 10,700 households per year. Contrary to *HBS*, however, *SILC* lacks information on consumption, and the reference year in *SILC* is the preceding calendar year (e.g., *SILC* micro data set 2006 surveys participants about their income in 2005). Accordingly, our working sample using *SILC* micro data sets 2006-2017 covers the 2005-2016 period. We report the participant response rates by *HBS* and *SILC* in Table A.1.[2]

Following the *RED* guidelines, we depict the *cumulative growth factors* of the average income and consumption series by *HBS* and *SILC*, and the National Income and Product Accounts (*NIPA*) statistics in Figure 1. As in the case of most countries investigated in *RED*'s special issue, Turkey's micro-level survey data sets do *not* reflect national account statistics at *level* (Table A.2): average disposable income per capita by *HBS* and *SILC* accounts, on average, for 28% and 42% of Turkey's income per capita, respectively; and average non-durable consumption by *HBS* accounts, on average, for 40% of per-capita non-durable consumption. However, as we depict in Figure 1, the cumulative growth factors of the income and consumption series (calculated as $\log(y_{t+k}/y_t)$ for the variable y in year $t+k \in \{2003, 2004, \ldots, 2016\}$, where t is the initial year 2002 for *HBS* and 2005 for *SILC*) co-move similarly with *NIPA*. Because the cumulative growth factors of the income and consumption series exhibit comparable time trends, we conclude that the two survey data sets are suitable for studying Turkey's inequalities via adherence to the *RED* guidelines.

4 Methodology

We next discuss our methodology. First, we convert nominal variables into real variables by deflating all other year prices to constant 2002 prices via Turkey's consumer price index (*CPI*). In order to study wage inequality, following the *RED* guidelines, we concentrate exclusively on working-age individuals (aged 25-60). We also exclude individuals who do not report hours worked, as well as those whose *annual* earnings are below 113 Turkish liras (i.e. half of Turkey's *monthly* minimum wage during the first half of 2002). In order to construct the *wage* rate, we first calculate *annual earnings* of person i in year t

[2]Table A.1 reports that the response rates by *HBS* were no less than 99% before 2008, as it was compulsory under statute for participants to respond to *TurkStat*'s requests. After a court order in 2009, Turkish residents were allowed to refuse to participate, as a result of which the subsequent response rates plummeted to the 70-80% level. In response to an earlier version of the study, an anonymous reviewer expressed his/her concerns regarding whether the drop in the response rates contributed to the downward time trend in the economic inequalities seen in the *HBS*. Table A.1 also reveals that the response rates from *SILC* vary between 84.3% and 93.0% over the 2005-2016 period, and exhibit neither a downward time trend nor any abrupt variation over the same period of interest. Therefore, the results could constitute a natural counterfactual experiment. Since *SILC* replicates the downward time trend in the economic inequalities by *HBS* both qualitatively and quantitatively, this counterfactual experiment could alleviate concerns over the implications of the response rates. Additionally, as an anonymous reviewer pointed out, if non-response to survey participation is more prevalent amongst high-income households, this could have contributed to the level gap between *NIPA* statistics and survey data estimates.

using equation (1):

$$ae_{i,t} = nw_{i,t} + rw_{i,t} + p_{i,t} + b_{i,t} + \alpha^{TUR}(nse_{i,t} + rse_{i,t} + ag_{i,t}) \tag{1}$$

where $ae_{i,t}$ denotes annual earnings, $nw_{i,t}$ and $rw_{i,t}$ denote annual cash and other real payments, $p_{i,t}$ and $b_{i,t}$ denote annual premiums and bonuses received from employers, α^{TUR} denotes the share of labor income in Turkey's national income, $nse_{i,t}$ and $rse_{i,t}$ denote cash and other real incomes from self-employment, and $ag_{i,t}$ denotes net agricultural income. Relying on OECD and Penn World Table 9.0 data for the Turkish economy during the initial five years of our working sample, we set α^{TUR} to 0.42, and calculate annual earnings as the sum of all cash and real payments from employers plus 42% of self-employment and agricultural income, if there is any. We calculate *annual hours worked*, $ah_{i,t}$, as hours worked in a week times weeks worked in the last 12 months.

$$w_{i,t} = \frac{ae_{i,t}}{ah_{i,t}} \tag{2}$$

We calculate the correlation coefficient between hours worked and wages (for both males and females) via the *RED* guidelines as follows:

$$\rho_{w,h,t} = \frac{\mathbb{E}\left[(w_{i,t} - \mu_{w,t})(h_{i,t} - \mu_{h,t})\right]}{\sigma_{w,t}\sigma_{h,t}} \tag{3}$$

where $\rho_{w,h,t}$ denotes the correlation coefficient between wage rate and hours worked in year t, $\mathbb{E}$ denotes the expectations operator, $w_{i,t}$ denotes wage rate, $h_{i,t}$ denotes hours worked, $\mu_{w,t}$ and $\mu_{h,t}$ denote averages of wage rate and hours worked, and $\sigma_{w,t}$ and $\sigma_{h,t}$ denote standard deviations for wage rate and hours worked, respectively.

Following Krueger et al. (2010), we also calculate gender, education (college) and experience premiums in wages. The *RED* guidelines define *gender premium* as the ratio of the average wage of males to that of females, and we follow the same definition:

$$\text{Gender Premium}_t = \frac{\overline{w_t^m}}{\overline{w_t^f}} \tag{4}$$

where $\overline{w_t^m}$ and $\overline{w_t^f}$ denote the average wage of males and females, respectively.

The *RED* guidelines define *college* (*education*) *premium* as the average wage of college-educated males divided by that of high school-educated males:

$$\text{Education (College) Premium}_t = \frac{\overline{w_t^c}}{\overline{w_t^h}} \tag{5}$$

where $\overline{w_t^c}$ and $\overline{w_t^h}$ denote the average wage of college-graduated and high school-graduated males. Especially for developing economies, including Turkey, another sizable determinant of the wage rate is *high school premium*, which we also calculate and report as the ratio of the average wage of high school-

educated males to that of secondary school-educated males:

$$\text{High School Premium}_t = \frac{\overline{w_t^h}}{\overline{w_t^s}} \tag{6}$$

where $\overline{w_t^s}$ denotes the average wage of secondary school-educated males.
The *RED* guidelines define *experience premium* as the ratio of the average wage of males aged 45-55 to that of males who are 25-35 years of age:

$$\text{Experience Premium}_t = \frac{\overline{w_t^o}}{\overline{w_t^y}} \tag{7}$$

where $\overline{w_t^o}$ and $\overline{w_t^y}$ denote the average wage of males aged 45-55 and aged 25-35, respectively.

For the income and consumption series calculations, following the *RED* guidelines, we set our unit of analysis as *household*. Moreover, following Krueger et al. (2010), we use *after-tax-and-transfers disposable income* as a proxy for income, and *non-durable expenditures* as a proxy for consumption. Non-durable expenditure includes items such as spending on food, alcohol, tobacco, personal care items, fuel, utilities, public services, household operations, public transportation, gasoline and diesel oil, apparel, reading items, entertainment spending, lodging expenses, vehicle expenses, education expenditures, and out-of-pocket health expenditures.[3] We next *equivalize* both the income and consumption series via the *OECD* equivalence scale following the *RED* guidelines.

After constructing the wage, income and consumption series, we next calculate different inequality measures for each of the variables of interest: variance of the natural logarithm (var-log), percentile ratios (`P90/P50` and `P50/P10`), and the Gini coefficient, along with the variance of residuals. The four inequality measures we use throughout our analyses differ in their properties and assign different weights to different parts of the distribution. For instance, while the Gini coefficient, the `P90/P50` ratio, and the `P50/P10` ratio are scale-invariant, the variance measure is not. The Gini coefficient and the variance measure satisfy the Pigou-Dalton transfer principle, whereas the `P90/P50` ratio and the `P50/P10` ratio do not. Hence, as different inequality measures preserve distinctly desirable properties, they can all be prioritized on different grounds (Haughton and Khandker, 2009).

We calculate the variance of the natural logarithm of a variable $y_{i,t}$ as follows:

$$\text{Var}\left[\log(y_t)\right] = \frac{1}{n}\sum_{i=1}^{n}\left\{\left[\log(y_{i,t}) - \mu_t\right]^2\right\} \tag{8}$$

where $y_{i,t}$ denotes wage, income or consumption in year t, i denotes individual (or household) index, μ_t denotes the average value of the natural logarithm of the variable of interest in t and n denotes the number of observations.

After sorting wage, income and consumption variables in ascending order, we construct the `P90/P50`

[3]For the sake of consistency, we left-truncate income via half of the minimum wage, as we do for wage. We do not truncate consumption. However, we report that comparable left-truncation on consumption yields in both qualitatively and quantitatively similar findings.

ratio by dividing the $\texttt{90}^{\texttt{th}}$ percentile's value to that of the median and the P50/P10 ratio by dividing the median's value to that of the $\texttt{10}^{\texttt{th}}$ percentile.

We calculate the Gini coefficient, a conventional inequality measure of *relative mean difference*, as the mean of the absolute difference between every possible pair of individuals in a sample of n individuals, divided by the mean of the variable of interest, μ_t, as follows:

$$\text{Gini Coefficient} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}|y_{i,t} - y_{j,t}|}{2n^2\mu_t} \tag{9}$$

where $y_{i,t}$, and $y_{j,t}$ denote wage, income or consumption levels of individuals i and j with $i \neq j$ for the year t.

Finally, in order to calculate the variance of the *residual* wage, income, and consumption, following Krueger et al. (2010), we estimate equation (10) and calculate the resultant residual error terms $\hat{\epsilon}_{i,t}$:

$$\log(y_{i,t}) = c_t + \beta_1 D^g_{i,t} + \beta_2 D^e_{i,t} + \beta_3 D^f_{i,t} + \beta_4 D^a_{i,t} + \beta_5 D^{ce}_{i,t} + \epsilon_{i,t} \tag{10}$$

where D^g denotes a gender dummy, D^e denotes a vector of 11 education dummies, D^f denotes a vector of dummies for family decompositions, D^a denotes a vector of 7 ordinal age dummies and D^{ce} denotes a vector of dummies for the educational attainment of couples.[4]

5 Results

In this section, we first present our findings on wage inequality and wage premiums. We next proceed with our findings on income and consumption inequalities.

5.1 Wage Inequality

We demonstrate the evolution of Turkey's wage inequality through the four measures in Figure 2. In doing so, we display year-specific inequality estimates (dots) along with long-term trends (lines), where trends follow from the running-line locally-weighted regression smoothing methodology with a tricube-weighted function for each point in the observation set (Cleveland, 1979).[5]

Figure 2 reveals that the variance of the log wage and the Gini coefficient series by the two data sets exhibit similar time trends, although non-monotonically and despite at different rates: both inequality measures decrease over time until 2008, increase briefly around the Great Recession, and continue with their downward time trends afterward. The P50/P10 ratios of the two data sets also exhibit a minor

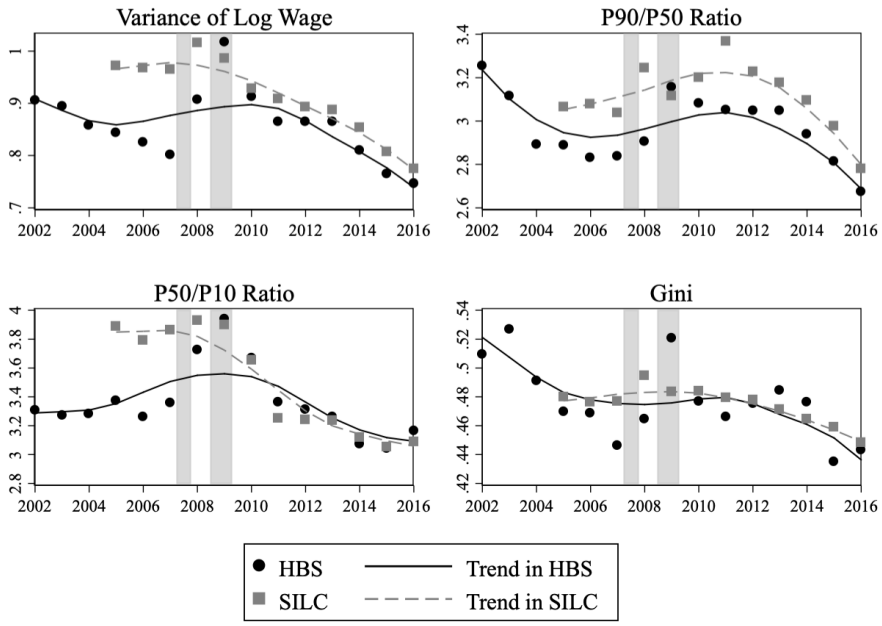
[4]The gender dummy takes a value of 1 if male, and 0 otherwise; the relevant entry of the family composition dummy takes a value of 1 if individual i belongs to one of the categories: i) single male, ii) single female, iii) couple with children and iv) couple without children, and 0 otherwise; the relevant entry of the age dummy takes a value of 1 if one's age fits in one of the following intervals: 1) [25-29], 2) [30-34], ..., 7) [55-60], and 0 otherwise; and the relevant entry of the couple's educational attainment dummy takes a value of 1 if the educational background composition of the husband and wife are: i) college-college, ii) college-high school, iii) high school-college, iv) high school-high school, respectively, and 0 otherwise.

[5]We note that as *HBS* does not provide decent information on the number of weeks worked for the year 2012, we impute wage measures for this single year as the averages of the year before and after. We also note that our results by *SILC* 2012 do not suffer from such imputation issues, and thus can be used for robustness checks.

(*SILC*) or stark (*HBS*) increase around the Great Recession, and a clear downward time trend afterward. However, contrary to the other two measures, the `P50/P10` ratios by *HBS* and *SILC* remain rather stagnant before 2008. The `P90/P50` ratio by *HBS* displays a right-skewed U-shape until 2011, and its counterpart by *SILC* parallels with the right-arm of the U-shape. However, as in the case of the other three inequality measures, the `P90/P50` ratios by both *HBS* and *SILC* exhibit a clear downward time trend after 2011.

We argue that the downward time trend in Turkey's wage inequality measures aligns well with the rapid minimum wage growth over the sample period. In particular, between 2002 and 2016, while the real net minimum wage in Turkey grew 119%, the average after-tax labor earnings according to *HBS* grew only 56%. The rapid relative growth rate of the minimum wage is particularly relevant to Turkey's wage inequality, since remuneration at (or below) the minimum wage is prevalent in the Turkish economy: both primary official data and secondary survey data suggest that remuneration at (or below) the minimum wage applies to no less than 40% of employees in Turkey.[6]

Figure 2: Wage Inequality



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

In order to focus on the instrumental role of the minimum wage, in Figure A.2 we depict the evolution of the ratio of average annual real labor income to the annualized net real minimum wage, and the Gini coefficient by *HBS*. Figure A.2 shows that when the real minimum wage grows faster than average labor income so that the ratio of interest decreases, the Gini coefficient of wage decreases in most years, as

[6] According to our survey data sets *HBS* and *SILC*, the percentage of employees whose payments from their employer is less than or equal to the minimum wage is on average 47% (over 2002-2016) and 41% (over 2005-2016), respectively. As we report in Figure A.1, EuroStat also reports a similar estimate of 42.5% for Turkey in 2010. Regarding official statistics, in response to a parliamentary inquiry (`No:68925832/610`), the Turkish Ministry of Labour and Social Security reports a statistics of 40.7% for the fraction of minimum-wage earners among registered employees in 2014.

well. This positive co-movement yields a correlation coefficient of 0.54, which is significant at $p = 0.05$, indicating that Turkey's rapid relative minimum wage growth episodes coincide, to a large extent, with decreasing wage inequality.

In order to further explore the dynamic role of the minimum wage growth on Turkey's wage inequality measures, we conduct the following *counterfactual* experiment: in Figure A.3, we display how wage inequality estimates by *HBS* would have changed if the minimum wage *counterfactually* grew at the same rate as the average labor earnings growth rate. This counterfactual exercise, the details of which we report in the Appendix, confirms that if Turkey's minimum wage had not grown as rapidly as it did, both the level and time trend in wage inequality measures would have varied notably against the moderation of Turkey's wage inequality. These findings are parallel with the results by Ekşi and Kırdar (2015), which associates declining wage inequality between 2002 and 2011 via *HBS* with rapid minimum wage growth, and Bakış and Polat (2015), which argues for the causal effect of minimum wage growth on declining wage inequality between 2002 and 2010 via *HLFS*.[7,8]

In addition to the minimum wage rate, another instrumental factor in Turkey's wage inequality is cyclicality. In particular, a careful reader familiar with Turkish GDP data could easily detect the *countercyclicality* in wage inequality estimates by *HBS*: after the drastic 2001 banking crisis, the Turkish economy, whose long-term GDP growth rate is approximately 5%, *shrank* by a considerable 5.96% in 2001. Right after the crisis in 2002, all wage inequality measures by *HBS* but the `P50/P10` ratio reached their maximum (or near-maximum) values. Immediately after the 2001 banking crisis, the Turkish economy enjoyed persistently high GDP growth until the 2008 Great Recession: 6.43% in 2002, 5.61% in 2003, 9.64% in 2004, 9.01% in 2005, 7.11% in 2006 and 5.03% in 2007. This prosperous, high-growth episode coincides with declining wage inequality estimates by *HBS*. In response to the Great Recession in 2008, the Turkish economy slowed down first and *shrank* radically afterward (by growing 0.85% in 2008 and -4.70% in 2009), which coincides with an upward jump in wage inequality estimates by *HBS*. After the Great Recession, the Turkish economy reverted back to its rapid growth trend, and grew 8.49% in 2010, 11.11% in 2011, 4.79% in 2012, 8.49% in 2013, 5.17% in 2014, 6.09% in 2015, and 3.18% in 2016. This post-crisis rapid-growth episode also parallels with the moderation of our wage inequality estimates by *HBS*. Over the 2002-2016 period, we report that the correlation coefficients between GDP growth rate and the growth rate of the variance of the log wage, the `P90/P50` ratio, the `P50/P10` ratio and the Gini coefficient by *HBS* are -0.77, -0.65, -0.68, and -0.75, respectively. These results suggest that all inequality measures by *HBS* are strongly countercyclical (significant at $p = 0.01$), which aligns well with the earlier literature documenting an inverse relationship between wage dispersion and GDP

[7] It is also worthwhile to note that the real net minimum wage growth rate exceeds the average labor earnings growth rate the most in 2003 (by 6.00%), in 2004 (by 17.88%), in 2015 (by 6.12%) and in 2016 (by 18.17%). Since *SILC*'s first year of observation is 2005, our counterfactual experiment by *SILC* yields considerably weaker results. Accordingly, we find it reasonable to conclude that the rapid minimum wage growth throughout the initial three years of the *HBS* sample is particularly decisive in the downward time trend in wage inequality in Turkey.

[8] In order to investigate whether certain deciles were more instrumental in the variations in wage inequality measures, in Table A.6 we report summary statistics of actual and normalized decile ratios. Table A.6 reveals that the volatility of the normalized `P50/P10` ratio was the highest among the decile ratios, and the bottom half of the wage distribution exhibited higher volatility than the top half. These findings also signal that developments in the left-tail of the wage distribution, plausibly due to fluctuations in the minimum wage, played a more decisive role in generating the observed trends.

growth (Storesletten et al., 2004). It is also worth noting that this countercyclicality does *not* stem from the minimum wage, as the minimum wage and the GDP growth series do not correlate significantly.

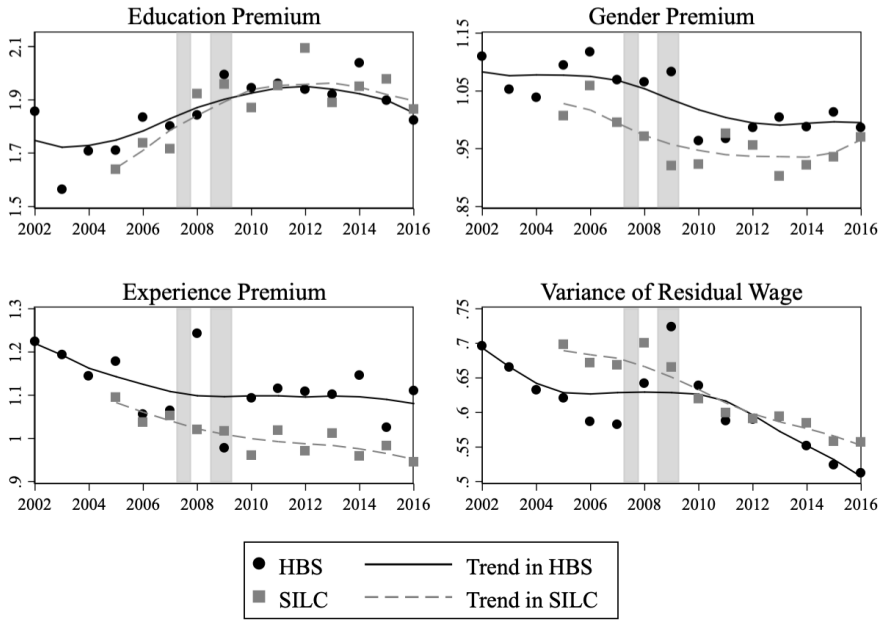
The cyclicality in wage inequality measures by *SILC* is less evident. In fact, the contemporaneous correlation coefficients between GDP growth and the growth rate of the variance of the log wage, the `P90/P50` ratio, the `P50/P10` ratio and the Gini coefficient by *SILC* are -0.21, 0.31, -0.60 and -0.03, respectively. Accordingly, all inequality measures by *SILC* except the `P50/P10` ratio yield insignificant correlations at $p = 0.10$. The *lagged correlations* of the four inequality measures by *SILC* (i.e. $\rho(\Delta x_t, \Delta GDP_{t+1})$, where Δx_t refers to the percentage change in the inequality measure of interest in year t, ΔGDP_{t+1} refers to the percentage change in GDP in year $t+1$, and $\rho(\cdot)$ refers to the correlation coefficient) are, however, all negative and large in magnitude: the correlation coefficient between GDP growth rate and the lagged growth rate of the variance of the log wage, the `P90/P50` ratio, the `P50/P10` ratio and the Gini coefficient by *SILC* are -0.77, -0.45, -0.44, and -0.69 respectively, two of which are significant at $p = 0.02$ and the other two of borderline insignificance at $p = 0.10$. One possible way to interpret this finding is that an increase in wage inequality translates into lower GDP growth the next year. Instead, we interpret this result stemming mainly from *recall bias* due to the incompatibility between *reference year* and *year of conduct* of the survey. As we discussed previously, the reference year in *SILC* is the calendar year before the survey is conducted. Under such a setting, it is not uncommon for respondents to faulty recall and erroneously report their more recent incomes instead of their true incomes throughout the reference year (Moore et al., 2000). If this measurement issue applies to *SILC*, it is not the contemporaneous but, rather, the lagged inequality growth by *SILC* that would be expected to correlate negatively with GDP growth, as it does in the actual data. Overall, combining our findings on the contemporaneous cyclicality correlations by *HBS* and the lagged cyclicality correlations by *SILC*, we conclude that the variance of the log wage and the Gini coefficient of wage in particular exhibit stark and robust countercyclicality.

A third factor that plays a role in the downward time trend in Turkey's wage inequality is the decline in informal employment. Turkey has a large informal economy: despite their reliance on different methodologies, Schneider (2002) and Elgin and Öztunalı (2012) both estimate the size of Turkey's informal sector to be roughly one-third of its GDP, which is considerably higher than that of most OECD countries. Correspondingly, earlier literature measuring informal employment in Turkey reports an estimated 40-50% of the workforce to be informal and recommends the use of *registration status with the Social Security Administration* as a reliable proxy for the measurement of informal employment in Turkey (Acar and Tansel, 2014). We follow this definition and depict the share of employees by our *HBS* and *SILC* samples who are *not* registered with the Social Security Administration in Figure A.4, data permitting. Figure A.4 displays a clear downward time trend in informal employment after 2005, and reveals that informal employment by *SILC* drops swiftly from 45% in 2005 down to 24% in 2016, and without the left-truncation we applied, the share of unregistered employees drops from 54% in 2005 down to 30% in 2016. Our calculations of non-agricultural informal employment, as it is also reported in the earlier literature, indicate that it drops from 35% in 2005 (37% without left-truncation) down to 18% in 2016 (20% without left-truncation). This downward time trend in informal employment in

Turkey accords well with the findings by Başlevent and Acar (2015). Combined with the fact that informal employees prevalently earn at the lower end of Turkey's wage spectrum (over the 2005-2016 period two-thirds of informal employees earned no more than the minimum wage), we argue that the decrease in informal employment further contributed to the decline in wage inequality.

We next display the evolution of Turkey's wage premiums and that of the residual wage inequality in Figure 3. Our findings reveal that following a hump-shaped pattern, recent education premium estimates of Turkey revert back to their early 2000 levels. The time trends of the gender premium, experience premium, and residual wage series by both *HBS* and *SILC* are downward, to a large extent, albeit with some level difference across data sets in most years. Cyclicality in the determinants of wage is less evident, except for the case of the residual wage inequality, which is strongly countercyclical. The contemporaneous correlation coefficient between the growth in the variance of residual wage by *HBS* and GDP growth is -0.81, and the *lagged* correlation coefficient by *SILC* is -0.79, both of which are significant at $p = 0.01$ and parallel with our findings on the countercyclicality of the variance of the log wage and the Gini coefficient of wage. These results and the acyclicality of the premium series jointly indicate that the cross-sectional dispersion in wages that cannot be attributable to observables decreases during high-growth episodes in Turkey, and the countercyclicality behind the wage inequality series stems at least in part from the countercyclicality in residual wage inequality.

Figure 3: Wage Premiums



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

In order to put these estimates into perspective, in Table 1 we compare the level and change in Turkish wage premiums to those countries studied by Krueger et al. (2010). Table 1 demonstrates that compared to the countries studied by Krueger et al. (2010), Turkey exhibits the *highest* wage inequality in terms of *level* via the variance of the log wage measure. These findings are parallel with the results by Torul

and Öztunalı (2018), which demonstrate that the Turkish economy is one of the most unequal economies among the OECD countries by conventional inequality metrics. Table 1 also reveals that together with Mexico, the United States and Canada, Turkey exhibits the *highest college premium* in the early 2000s. Historically, Turkish higher education institutes have been predominantly public, meritocratic and highly selective: only a small fraction of high school graduates were admitted to Turkish universities by taking a centralized university entrance exam. Accordingly, the fact that Turkey exhibits a high college premium in wages is not at odds with economic theory. Further, the recent moderation in the upward trend in the education premium despite the ongoing skill-biased technological progress can at least partially be attributed to the rapid growth in the supply of university graduates in Turkey, as depicted in Figure A.6. Turkey's declining high school premiums, depicted in Figure A.7, are also consistent with this swift and steady increase in the share of tertiary education graduates over the period of interest.

Table 1: Wage Inequality and Wage Premium

Country	Levels in 2000				Change				Period
	Var log wage	College premium	Exp. premium	Gender premium	Var log wage	College premium	Exp. premium	Gender premium	
Canada	0.45	1.80	1.32	1.33	0.17	0.22	0.31	-0.11	1978-2006
Germany	0.27	1.38	1.27	1.28	0.05	-0.08	0.22	-0.15	1983-2003
Italy	0.17*	1.51	1.34	1.03	0.03	-0.08	0.11	-0.05	1987-2006
Mexico	0.62	1.88	1.23	1.21	0.04	0.40	0.22	-0.06	1989-2002
Russia	0.77*	1.50	1.05*	1.49	-0.13*	-0.06	0.05	-0.07	1998-2005
Spain[a]	0.23	1.48	1.43	1.16	-0.18	-0.33	0.07	-0.21	1985-1996
Sweden[b]	0.18	1.61	1.20	1.22	-0.09	0.14	-0.02	-0.05	1990-2001
UK	0.33	1.62*	1.25*	1.32	0.10	0.12*	0.20*	-0.21	1978-2005
USA	0.44*	1.80*	1.38*	1.36	0.21*	0.40*	0.28*	-0.25*	1980-2006
Average	0.38	1.62	1.27	1.27	0.04	0.11	0.17	-0.10	
Turkey-HBS[a c]	**0.91**	**1.85**	**1.22**	**1.11**	**-0.16**	**-0.03**	**-0.11**	**-0.12**	**2002-2016**
Turkey-SILC[a d]	**0.97**	**1.64**	**1.10**	**1.00**	**-0.20**	**0.22**	**-0.15**	**-0.04**	**2005-2016**

†*Source*: Krueger et al. (2010) for countries other than Turkey, and authors calculations for Turkey

* Indicates the statistics is from data on males only.

[a] Data on changes refer to after-tax annual earnings.

[b] Data on levels is for 1992.

[c] Data on levels is for 2002.

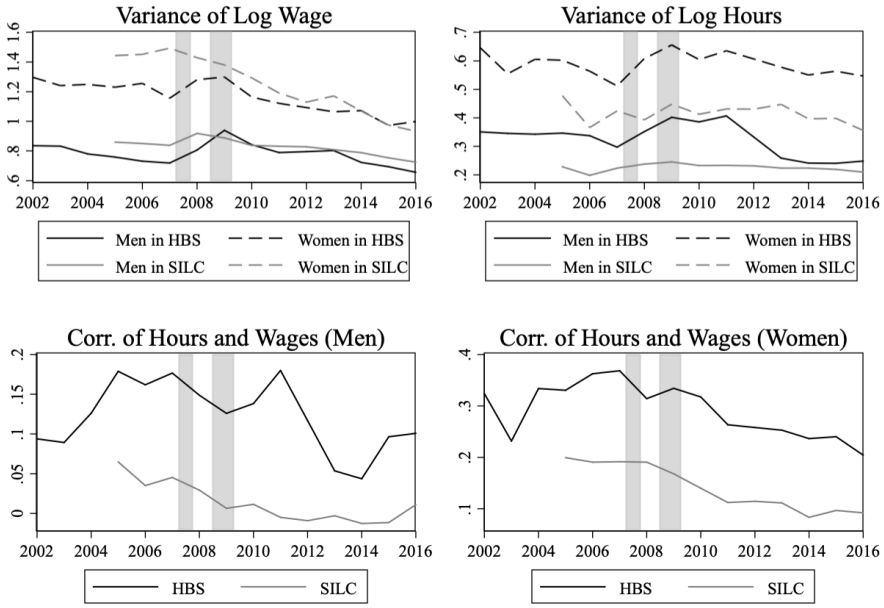
[d] Data on levels is for 2005.

In terms of the gender and experience premiums, Turkey places in the lower end of the cross-country scale in Table 1. However, the fact that the already-low gender premium in 2002 decreases even further over time is *not* the result of a more egalitarian Turkish labor market, but, rather, an indicator of *selection bias*. The Turkish female labor force participation rate has been historically low (about 30% compared to 70% for males), and job prospects for poorly educated females have been considerably worse than prospects for males (Aktuğ et al., 2018). An investigation of the composition of the Turkish female labor force reveals that poorly educated females in Turkey tend to refrain from entering into the labor market. Hence, high-skilled female employees constitute a noticeably larger fraction of the female labor pool, compared to their male counterparts. Accordingly, *despite* the fact that the *average* female employee is better educated than her male counterpart, a gender premium in favor of males shows up throughout most years by *HBS* and in early years by *SILC*. In Table A.5, we report brief educational

summary statistics of male and female labor force participants, and demonstrate that according to our survey data sets, female participants in the Turkish labor force are better educated than their male counterparts, and the gender gap in favor of females' better educational attainment increases over time, which reconciles with a declining gender premium in Turkey.

Regarding the decline in the experience premium, it is worth noting that in the aging Turkish population, the average age of the workforce is increasing, and the positive skewness of the workforce's age distribution is decreasing, as shown in Tables A.3 and A.4. These developments indicate that the relative supply of older participants has been steadily increasing in the Turkish workforce, which may contribute to the downward time trend in the experience premium.

Figure 4: Inequality in Labor Supply



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

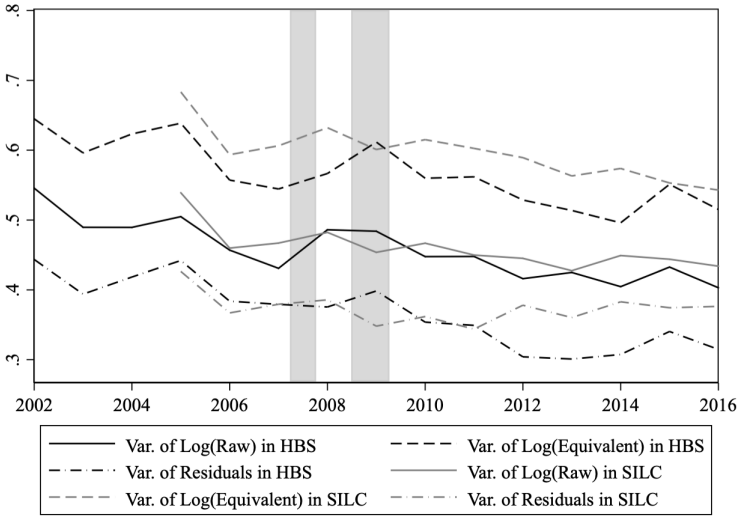
Following the *RED* guidelines, we next investigate gender inequality in the Turkish labor force. Figure 4 demonstrates that throughout our sample, inequality in both wages and hours worked is higher for females than for males. Higher inequality in the labor supply series among Turkish females most closely resembles gender disparities in the Italian, Spanish and Mexican labor markets. While the variance of the log wage estimates by *HBS* and *SILC* parallel, to a large extent, with each other, the variance of hours worked estimates by the two data sets differ considerably. Further, the correlation coefficients between wages and hours worked by *HBS* and *SILC* also differ sizably. We recommend both the level and the trend of the associated correlation coefficients to be taken with a grain of salt, as different data sets and estimation strategies yield contradictory results for Turkey's labor supply correlations. While our estimates by *HBS* and *SILC* are moderately *positive* for most years, *TurkStat*'s Structure of Earnings Survey (*SES, Kazanç Yapısı Araştırması, (KYA)* in Turkish) micro data set in 2014 predicts a *negative* correlation coefficient. Bick et al. (2018) also reports a *negative* and significant correlation for

the Turkish economy. In the absence of robust findings on this relationship, we refrain from arguing in favor of definitive conclusions. Further research on the relationship between labor supply and wages in Turkey is warranted.

5.2 Income Inequality

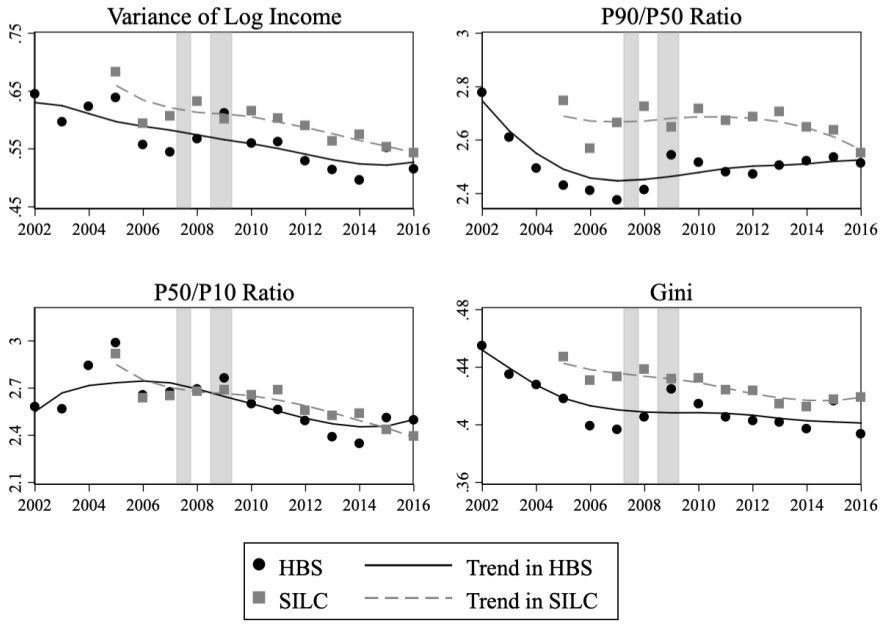
We next study Turkey's disposable income inequality. Following the *RED* guidelines, in Figure 5 we show the variance of the i) natural logarithm of (raw) disposable income, ii) natural logarithm of equivalent disposable income (via the *OECD* equivalence scale per instructed by the *RED* guidelines), and iii) residual income via equation (10) with the natural logarithm of equivalent disposable income as the dependent variable. Our findings reveal that as in the case of wage inequality, income inequality measures by both *HBS* and *SILC* decrease over time. The downward time trends in the raw disposable income series by the two data sets are almost monotonic and acyclical, except for the period around the Great Recession. The equivalent disposable income inequality series by *SILC* closely mimics its raw income counterpart, whereas the annual changes in the raw and equivalent income inequality series by *HBS* differ noticeably in some years, as in 2005, 2007, 2009 and 2015. Our investigation reveals that these discrepancies primarily stem from erratic year-to-year changes in the *variance of household* (and *equivalent household*) *size*, and thus in the equivalent income and residual equivalent income inequality series. While year-to-year variations in the variance of household size by *SILC* are modest in magnitude and infrequent (within ±4% in 9 out of 11 years), they are rather sizable and recurrent (beyond ±12% in 4 out of 14 years) by *HBS*. Accordingly, we attribute the abrupt time-series variations by *HBS* throughout dissimilar episodes of the aggregate Turkish economy primarily to measurement issues.

Figure 5: Disposable Income Inequality



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

Figure 6: Inequality in Equivalent Disposable Income



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

We further study the distributional properties of the equivalent disposable income series in Figure 6. Our findings demonstrate that the variance of the log income, the Gini coefficient and the `P50/P10` ratio series by both data sets exhibit downward time trends over the period of interest, albeit with a moderate level difference in the case of the former two variables, and a discordant increase by *HBS* before 2005 for the latter variable. These findings accord well, to a large extent, with Filiztekin (2015), which reports a decrease in Turkey's disposable income inequality via *HBS* over the 2003-2008 period (along with a moderate increase between 2009 and 2011), and with official *TurkStat* estimates, which also document a decline via *SILC* over the 2006-2016 period.

We note that the evolution of the `P90/P50` ratio singles out from the other three inequality series in Figure 6. The `P90/P50` ratio by *SILC* is rather stagnant until 2015, and the time trend of the same ratio by *HBS* is *upward* after 2007. Although contrary to the other three inequality series, this upward time trend in the the `P90/P50` ratio by *HBS* reconciles with the findings by Torul and Öztunalı (2018), which demonstrate via Credit Suisse Global Wealth Report 2014 data by Credit Suisse (2014) that Turkey's *wealth* concentration at the top, measured by the top decile's wealth share, rose from 70.2% in 2007 to 77.7% in 2014. The idiosyncrasy behind the evolution of the top income decile in Turkey is worthy of further investigation. Yet, given the well-known limitations in survey data, we leave this to future research.

In order to investigate whether the rapid minimum wage growth also contributed to the downward time trend in income inequality, we conduct a similar *counterfactual* experiment similar to what we do for wage inequality: in Figure A.5, we display how income inequality estimates would have changed if disposable incomes of households whose household head earns no more than the minimum wage *counterfactually* grew at the *average* household disposable income growth rate. The results of this

counterfactual exercise, the details of which we discuss in the Appendix, indicates that the rapid income growth of low-income households, which is at least partially due to developments in the minimum wage, is also a probable source of the moderation in Turkey's disposable income inequality.

During the sample period, another relevant factor that contributes to the decrease in income inequality is the growth in social protection expenditure. Our calculations via *TurkStat*'s official statistics suggest that the share of Turkey's GDP devoted to social protection expenditure increased from 9.33% in 2002 to 12.83% in 2016, and the OECD Social Expenditure Dataset predicts a similar growth, from 8.80% in 2002 to 12.52% in 2016. Our calculations via *HBS* reaffirm that both the share of respondents who report having received social transfers (3.43% in 2002 and 14.48% in 2016) and the total amount of social protection spending as a fraction of labor earnings (1.89% in 2002 and 5.93% in 2016) increased notably over time. Coupled with the fact that these Social Security recipients are often low-income earners (their labor earnings account, on average, for two-thirds of average labor earnings, and 56% of them earn no more than the minimum wage), we argue that the growth in social protection expenditure further served to mitigate Turkey's income inequality over the period of interest.[9]

We next study the cyclical properties of the four income inequality measures in Figure 6. We report that the correlation coefficient between GDP growth and the growth rate of the variance of the log disposable income, the `P90/P50` ratio, the `P50/P10` ratio and the Gini coefficient by *HBS* are all negative: -0.26, -0.65, -0.06 and -0.50, respectively. Further, two of these correlation coefficients (by the `P90/P50` ratio and the Gini coefficient) are significant at $p = 0.05$. We repeat this exercise via *SILC*, and report that the resultant respective contemporaneous growth correlation coefficients are -0.08, 0.09, -0.20, and -0.23, and the lagged growth correlation coefficients are -0.28, -0.26, -0.22, and -0.37, all of which are insignificant at $p = 0.10$. As the significance of the correlation coefficients by the `P90/P50` ratio and the Gini coefficient is not robust over data sets, we conclude that Turkey's income inequality series do not display the strong countercyclicality exhibited by their wage inequality counterparts.

Given that labor earning inequality estimates (especially according to the variance of the natural logarithm of wage and the Gini coefficient of the wage) are strongly countercyclical, while income inequality estimates are not, we investigate subcomponents of income that may have contributed to this acyclicality. We note that social protection spending growth and capital income growth series are countercyclical, with the respective correlation coefficients of -0.79 and -0.53. We also observe that capital income *inequality* growth is also strongly countercyclical, with a correlation coefficient of -0.76 via the variance measure. We note, however, that, entrepreneurial income growth is moderately *procyclical* (with a correlation coefficient of 0.23), and entrepreneurial income *inequality* growth is acyclical (with a correlation coefficient of -0.04). Thus, covariances of subcomponents of income aside, we argue that acyclicality in entrepreneurial income inequality contributes to acyclicality in Turkey's disposable income inequality.

[9] *TurkStat*'s Social Protection Statistics show that both *means-tested* and *non-means-tested* benefit shares increased rapidly over the sample period. While time-series moderation in economic inequality due to the increase in means-tested benefits would be expected, we note that the growth in non-means-tested benefits stems primarily from old age and survivors benefits, family and children support, unemployment benefits, and, in part, healthcare benefits, all of which may also serve to alleviate Turkey's income inequality. See *TurkStat*'s Social Protection Statistics for original data sources and further details, and data files for authors' calculations.

We note that despite having trended downward over the 2002-2016 period, Turkey's recent income inequality estimates are still comparatively high. Torul and Öztunalı (2018) reports that by *any* conventional inequality measure, Turkey's income inequality is the highest in Europe, and our estimates correspond with their findings. A comparison of Turkey's income Gini coefficient to the nine countries by Krueger et al. (2010) reveals that Turkey and the Russian Federation exhibit the highest two income inequalities within the Eurasian region, while ranking after the more unequal Mexico and the United States.

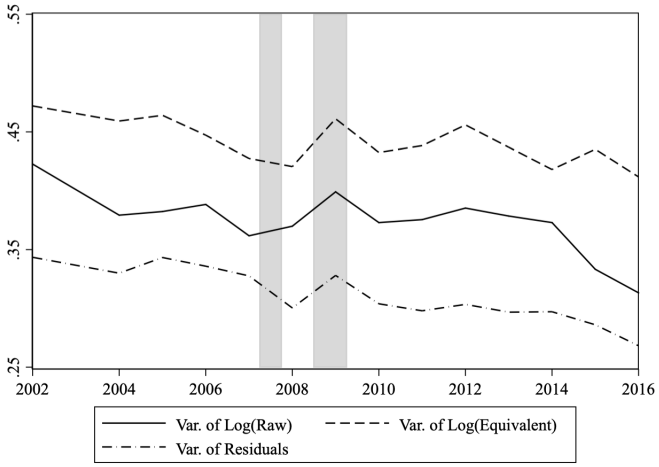
Recently, Alvaredo et al. (2019) studies income inequality in the Middle East, including Turkey. In doing so, Alvaredo et al. (2019) focuses on *before tax and transfer* income inequality, whereas we concentrate on *disposable* income inequality. Additionally, while Alvaredo et al. (2019) applies a correction to Turkey's survey data by benefitting from the disparity between Lebanese administrative and survey data, we refrain from applying any corrections in the absence of Turkish administrative data. Our findings for Turkey conform with those of Alvaredo et al. (2019) in some respects and contradict them in others. In terms of similarities, our estimates for the `P50/P10` ratio by *HBS* and *SILC* over the 2002-2016 period accord well with those by Alvaredo et al. (2019) in terms of both level and trend. Further, our findings on the downward time trends in the Gini coefficient (by both data sets) and the `P90/P50` ratio (by *HBS*) before the Great Recession reconcile with the estimates by Alvaredo et al. (2019). In terms of main differences, while Alvaredo et al. (2019) argues that Turkey's Gini coefficient increases over the 2009-2016 period, our estimates trend otherwise. Moreover, the levels of the Gini coefficient and the `P90/P50` ratio estimates by Alvaredo et al. (2019) are considerably larger than ours: the Gini coefficient and the `P90/P50` ratio estimates by Alvaredo et al. (2019) range within the [0.56, 0.62] and [3.3, 3.8] intervals over the sample period, whereas ours range within the [0.38, 0.47] and [2.4, 2.8] intervals, respectively. While we believe that the top-income correction by Alvaredo et al. (2019) plays an instrumental role in generating these discrepancies, particularly because no previous study reported such high Gini and `P90/P50` ratio estimates for Turkey, we are unable to identify the sources of the discrepancies because we lack the specifics related to their survey data correction procedure.

5.3 Consumption Inequality

We next investigate consumption inequality in Turkey. In Figure 7, we display the evolution of the variance of the i) natural logarithm of (raw) non-durable consumption, ii) natural logarithm of equivalent non-durable consumption (via the *OECD* equivalence scale per instructed by the *RED* guidelines), and iii) residual non-durable consumption via equation (10) with the natural logarithm of consumption as the dependent variable.[10] We note that in this section we only report results by *HBS*, as *SILC* lacks information on consumption. Admittedly, this constitutes a caveat to our findings on consumption, as we are unable to cross-check the robustness of these results.

[10] We note that we impute our consumption inequality estimates for the single year 2003 as the averages of the year before and after, since predictions by *HBS* 2003 micro data set were distant outliers, possibly stemming from *TurkStat*'s methodological imperfections.

Figure 7: Consumption Inequality

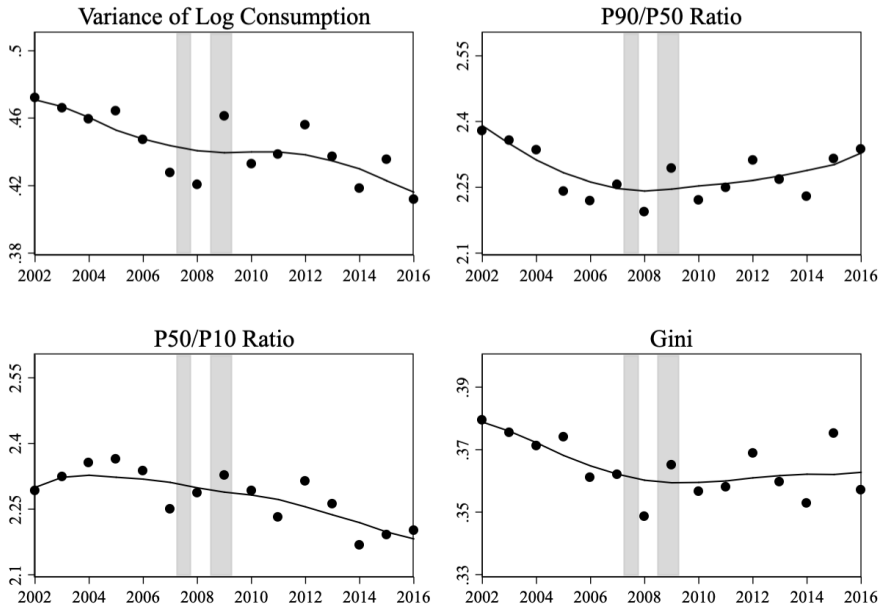


†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

A priori, one could expect consumption inequality to mimic income inequality according economic theory: the workhorse general equilibrium models in distributional macroeconomics literature, the first-generation heterogeneous-agent incomplete-market models à-la Bewley (1986), Huggett (1993) and Aiyagari (1994) predict income and consumption distributions to be similar and accordant, with the former being more unequal than the latter. Figure 7 reveals that, to a large extent, this is indeed the case: all three consumption inequality estimates exhibit downward time trends, as in the case of their income inequality counterparts. Some of the annual disparities between raw and equivalent consumption inequality series are also concurrent with their income counterparts in Figure 5, which stems from the same household equivalization procedure featuring abrupt year-to-year fluctuations in the variance of household sizes, as discussed in the previous section.

The two most notable differences between the income and consumption inequality estimates are that i) the level of cross-sectional dispersion in consumption is sizably lower than that of income, and ii) the time-series variations in the consumption inequality series are less pronounced than their income inequality counterparts. These differences are again in accordance with economic theory, the first-generation heterogeneous-agent incomplete-market models included: in response to income fluctuations, the *consumption smoothing* impetus of households (under the presence of diminishing marginal utility) requires them to vary their saving rates so as to keep their consumption levels stable and balanced over time. Turkish households' consumption patterns, which are more equal and less volatile than disposable income, align well this motive. Additionally, as in the case of their income counterparts, we report that the three consumption inequality series in Figure 7 are all acyclical.

Figure 8: Inequality in Equivalent Non-Durable Consumption

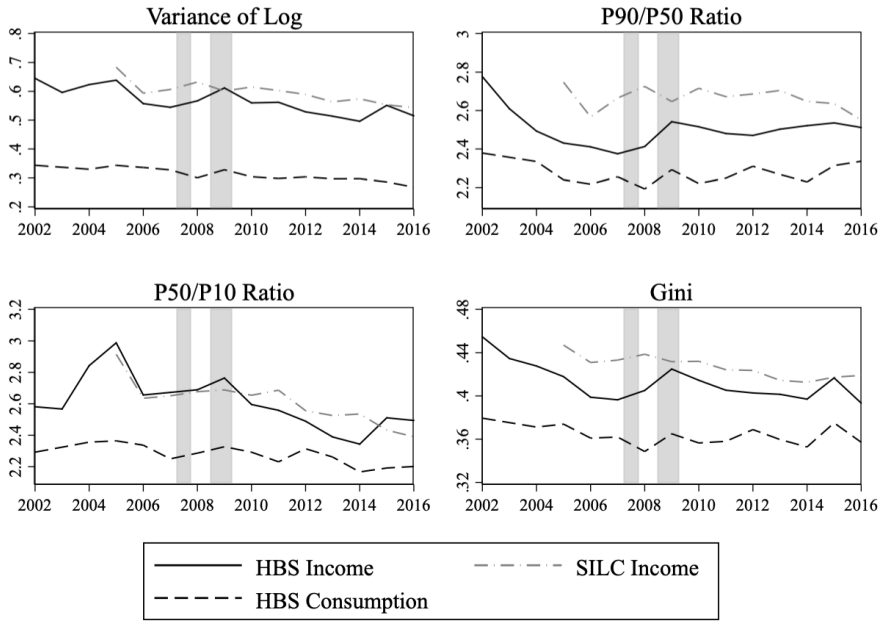


†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

Next, we study equivalent household consumption inequality in more detail and display our estimates through the four inequality measures in Figure 8. Our findings demonstrate that all consumption inequality series except the `P90/P50` ratio also decrease also over time, although not as intensively and monotonically as our income inequality estimates indicate. In addition, the idiosyncrasy behind the `P90/P50` ratio of consumption is similar to that of *HBS* income, as the time trend of both series are downward until the Great Recession, and upward thereafter. Throughout these time-series movements, the resultant contemporaneous correlation coefficients between GDP growth and the growth rate of the variance of the log disposable consumption, the `P90/P50` ratio, the `P50/P10` ratio, and the Gini coefficient are all negative yet insignificant at $p = 0.10$, with the respective coefficients being -0.44, -0.46, -0.38, -0.21.

Following the *RED* guidelines, we jointly depict the evolution of the equivalent disposable income and consumption series in Figure 9. As previously discussed, Figure 9 reaffirms that the income inequality estimates from both data sets surpass those of consumption inequality (especially for the scale-variant *variance* measure), and the income inequality series exhibit higher time-series volatility than their consumption inequality counterparts, in accordance with earlier findings from other countries in the economic inequality literature, as well as through the predictions of the Bewley-Huggett-Aiyagari-type heterogeneous-agent incomplete-market models.

Figure 9: Equivalent Disposable Income vs Equivalent Consumption Inequality



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

Table 2: Inequality Comparison

Country	Level of Inequality						Long-run Changes in Inequality					
	Bottom(50/10)			Top(90/50)			Bottom(50/10)			Top(90/50)		
	Inc.	Cons.	Gap	Inc.	Cons.	Gap	Inc.	Cons.	Gap	Inc.	Cons.	Gap
Canada	2.21	1.95	0.26	2.00	1.85	0.15	0.38	0.20	0.18	0.10	0.07	0.03
Germany	2.05	1.70	0.35	1.80	1.81	-0.01	0.35	0.00	0.35	0.15	0.10	0.05
Italy	2.45	1.91	0.54	1.93	1.88	0.05	0.22	0.09	0.13	0.05	0.01	0.04
Mexico	8.00	5.10	2.90	4.75	4.00	0.75	5.81	0.80	5.01	1.12	1.08	0.04
Russia	3.02	2.70	0.32	2.60	2.60	0.00	0.10	0.05	0.05	-0.16	-0.10	-0.06
Spain[a]	2.04	1.82	0.22	2.00	1.90	0.10	-0.16	-0.13	-0.03	-0.18	0.01	-0.19
Sweden	1.58	1.62	-0.04	1.64	1.73	-0.09	0.13	0.02	0.11	0.21	0.10	0.11
UK	2.82	N/A	N/A	2.08	N/A	N/A	0.86	0.58	0.28	0.27	0.12	0.15
USA	2.64	2.00	0.64	2.21	2.00	0.21	0.55	0.25	0.30	0.40	0.15	0.25
Average	2.98	2.35	0.65	2.33	2.22	0.15	0.91	0.21	0.71	0.22	0.17	0.05
Turkey-HBS[b]	**2.58**	**2.29**	**0.29**	**2.77**	**2.38**	**0.39**	**-0.09**	**-0.09**	**0.00**	**-0.26**	**-0.04**	**-0.22**
Turkey-SILC[c]	**2.92**	N/A	N/A	**2.75**	N/A	N/A	**-0.53**	N/A	N/A	**-0.20**	N/A	N/A

†*Source*: Krueger et al. (2010) for countries other than Turkey, and authors calculations for Turkey.

[a] Data on levels is for 1996.

[b] Data on levels is for 2002.

[c] Data on levels is for 2005.

Finally, following the *RED* guidelines, in Table 2 we jointly report Turkey's income and consumption inequality estimates via the decile ratios and present them jointly with the estimates for the countries studied by Krueger et al. (2010). Table 2 reveals that while Turkey exhibits below-average inequality estimates via the `P50/P10` ratio, it displays the second highest (next to Mexico) income inequality and third-highest (next to Mexico and the Russian Federation) consumption inequality estimates via the

P90/P50 measure. We also report that Turkey's inequality estimates by both decile ratios, as well as the gap between income and consumption inequality by the P90/P50 ratio, are yet on a decline over the period of interest.

6 Conclusions

Despite its sizable aggregate economic activity and a high degree of economic inequality, Turkey lacks a thorough and cross-country comparable inequality analysis. In this study, we investigate Turkey's economic inequalities by adhering to the standardized guidelines proposed by the *Review of Economic Dynamics*: Cross-Sectional Facts for Macroeconomists special issue, which is devoted to exploring cross-country similarities and differences in economic inequalities. In doing so, we explore how Turkey's wage, income and consumption inequalities evolve over time, and we compare our findings to those of the United States, Canada, the United Kingdom, Germany, Italy, Spain, Sweden, the Russian Federation, and Mexico.

We first show that Turkey's wage, income and consumption inequalities all exhibit downward time trends over the 2002-2016 period, which aligns well with the rapid minimum wage growth over the period of interest. Throughout this period, Turkey also experienced a growth in social protection spending and a decline in the informal sector employment, both of which further contributed to the decline in Turkey's economic inequalities. Second, we show that in these downward time trends, while wage inequality series display stark and robust countercyclicality, income and consumption inequality series exhibit rather acyclical time-series movements. Third, in studying the determinants of wage, we report that while Turkey's recent education premium estimates are comparable to those in the early 2000s, Turkey's gender and experience premiums, as well as the residual wage inequality decrease over time. Finally, we show that Turkey's income and consumption inequalities exhibit similar time trends with moderate level differences, and these trends are robust to the choice of inequality metrics. Considering all of these factors, we argue that Turkey's economic inequalities most closely resemble those of the Russian Federation among the nine countries analyzed in *RED*'s special issue.

Our findings are accompanied by some caveats. First, our time-series analysis covers a relatively limited time span, starting with the aftermath of a drastic economic crisis, and covering primarily a prosperous, high-growth episode in Turkey. Recently, the Turkish economy has entered a low-growth, high-inflation period featuring high private sector indebtedness, which differs notably from most of the years that comprise our working sample. Accordingly, we believe that how the downward time trends in economic inequalities will respond in the upcoming years is worthy of further investigation.

Second, in this study, we rely on official *survey* data sets throughout our analyses. The availability of detailed micro-level *administrative* data has aided high-quality inequality research for several developed and some developing countries. Because administrative data in Turkey is not available to researchers, we are unable to check whether our findings reconcile with predictions by micro-level state records. Accordingly, our results via *HBS* and *SILC*, although robust over *TurkStat*'s official premier data sets, are not immune to general concerns with survey data.

Third, throughout our empirical scrutiny, we exploit *TurkStat*'s two principal micro data sets, *HBS* and *SILC* to cross-check and verify the robustness of our findings on wage and income inequality measures. We also compare our results on wage and income inequality variables with findings in earlier extant literature to explore the degree of their consistency. We are unable to do this with our findings on consumption inequality measures, given data limitations and the lack of previous literature. We believe further high-quality research on the distributional properties of consumption in Turkey would be illuminating.

Fourth, as briefly discussed, existing anecdotal findings on Turkey document a recent increase in wealth concentration at the top of the distribution. Our estimates for the `P90/P50` ratios also often single out from the rest of the inequality measures, indicating that Turkey's top wage, income and consumption inequalities need not align well with other conventional inequality measures, and Turkey's top inequalities could feature their own idiosyncrasies. We believe unveiling how Turkey's wealth inequality *actually* evolves over time and how such increasing wealth concentration at the top may align well with decreasing wage, income and consumption inequalities are worthy of further investigation. Given the data limitations, we leave these questions to future research.

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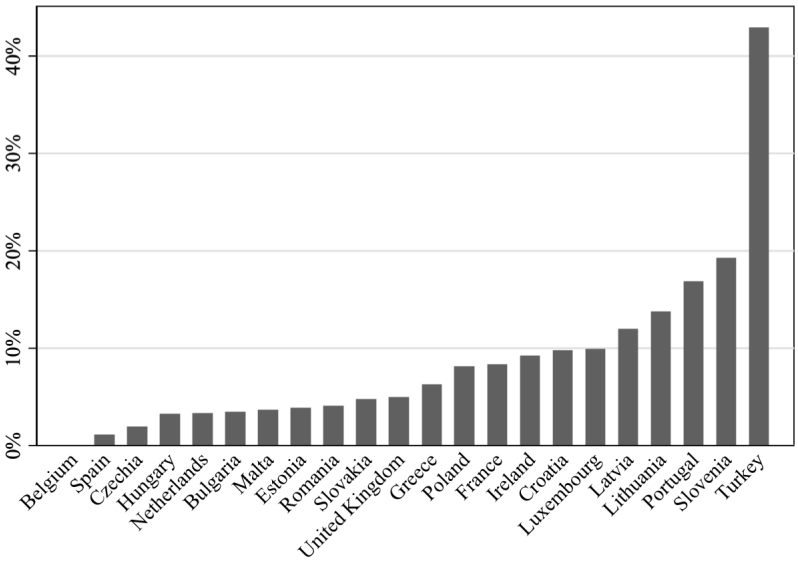
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Appendix

A Appendix Figures and Tables

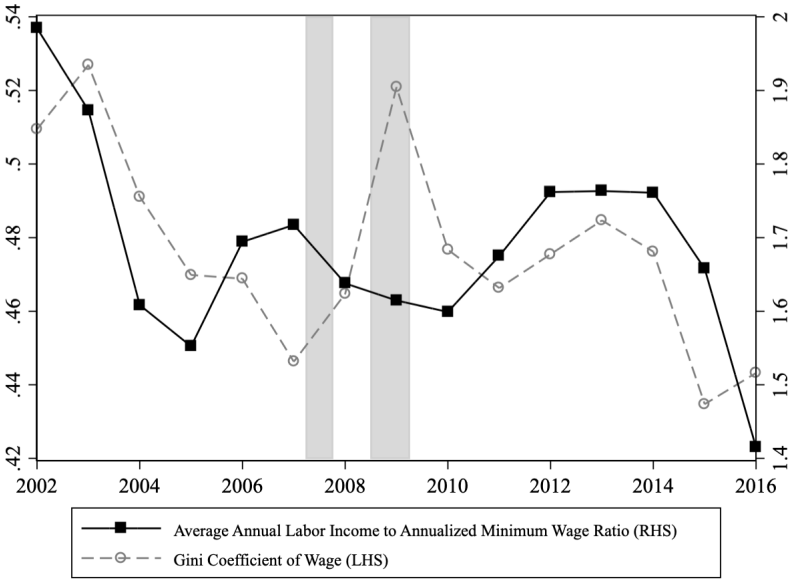
Figures

Figure A.1: Proportion of Employees Earning Less than 105% of Minimum Wage in 2010



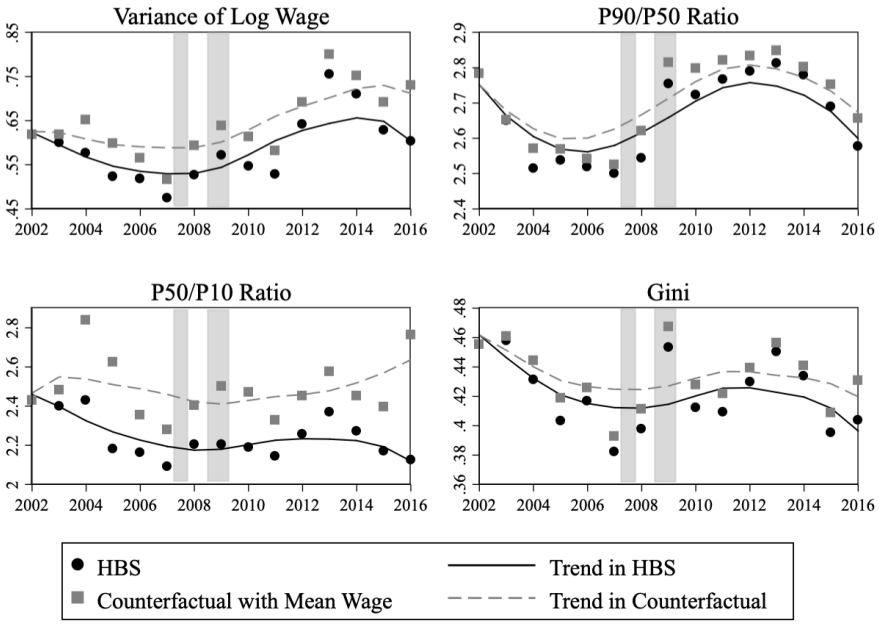
†*Source*: EuroStat

Figure A.2: Relative Minimum Wage and Wage Inequality



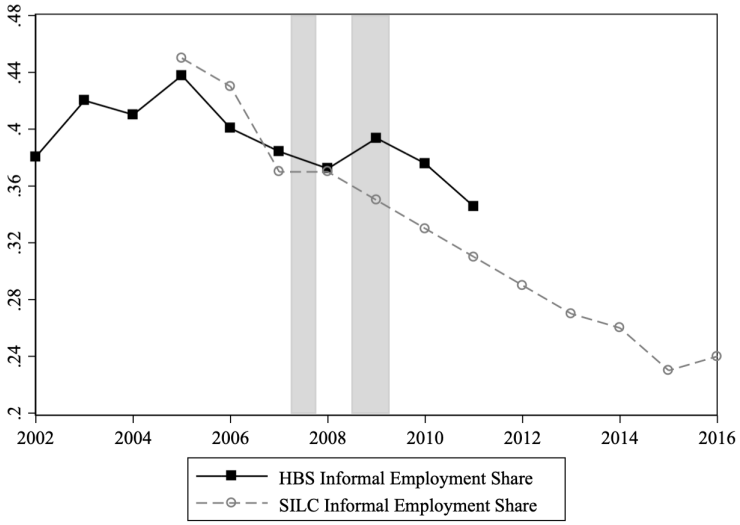
†*Source*: Author calculations via *HBS*. Gray shades refer to Turkey's recessions by quarterly data.

Figure A.3: Wage Inequality via Counterfactual Minimum Wage Growth



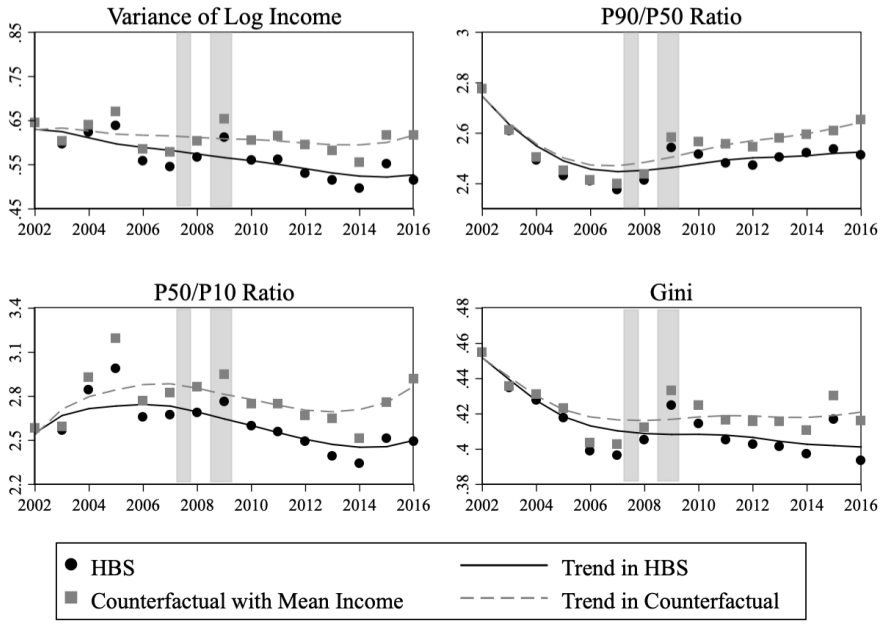
†*Notes*: The black dots (line) refer to actual wage (excluding agricultural and entrepreneurial earnings) inequality estimates (trend), and the gray dots (line) refer to the *counterfactual* wage inequality estimates (trend) if minimum wage grew at the same rate as by the average wage rate. Gray shades refer to Turkey's recessions by quarterly data.

Figure A.4: Share of Informal Employment



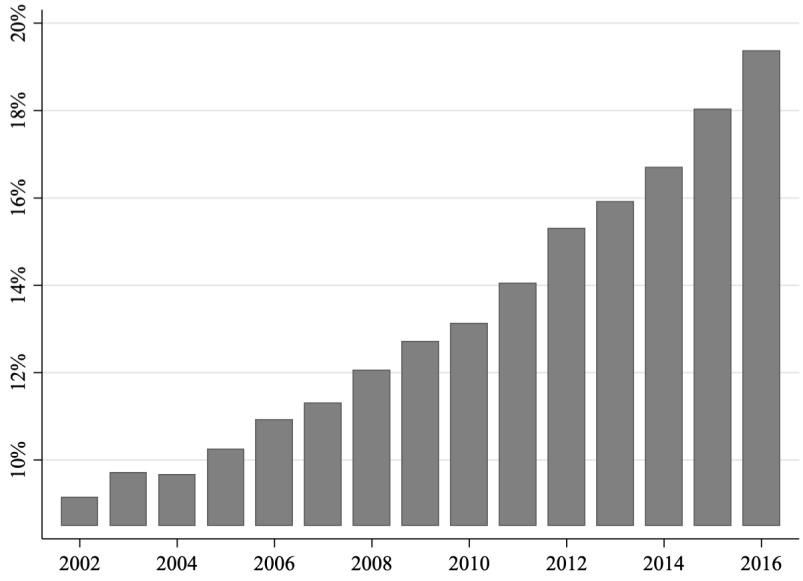
†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

Figure A.5: Income Inequality via Counterfactual Minimum Wage Growth



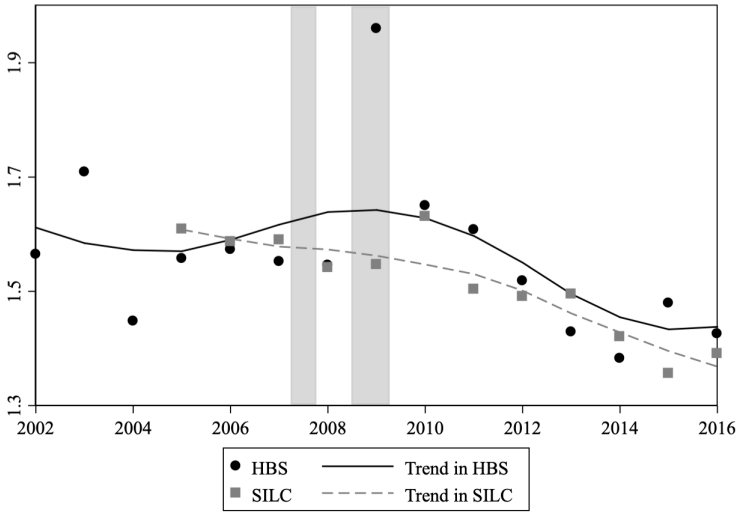
†*Notes*: The black dots (line) refer to actual disposable income inequality estimates (trend), and the gray dots (line) refer to the *counterfactual* income inequality estimates (trend) if the disposable income of households whose household-heads earn minimum wage grew at the same rate as by the average disposable income growth rate. Gray shades refer to Turkey's recessions by quarterly data.

Figure A.6: Tertiary Education (% of 25-64 Year-Olds) by Year



†*Source*: OECD Education Database

Figure A.7: High School Premium



†*Notes*: Gray shades refer to Turkey's recessions by quarterly data.

Tables

Table A.1: Response Rates

							HBS								
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Contacted Families	9600	25920	8600	8640	8640	8640	8640	12600	13248	13248	13248	13248	13248	15264	15552
Responses	9555	25764	8544	8559	8558	8548	8549	10046	10082	9918	9987	10060	10122	11491	12096
Refusals	45	156	56	81	82	92	91	2554	3166	3330	3261	3188	3126	3773	3456
Response Rate	99.53%	99.40%	99.35%	99.06%	99.05%	98.94%	98.95%	79.73%	76.10%	74.86%	75.38%	75.94%	76.40%	75.28%	77.77%
							SILC								
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Contacted Families	N/A	N/A	N/A	12800	12800	12342	13026	13414	16565	19300	21815	24554	24461	24355	24498
Responses	N/A	N/A	N/A	10920	10796	11228	11870	12107	15026	17563	19899	22740	22763	22441	22869
Refusals	N/A	N/A	N/A	1880	2004	1114	1156	1307	1539	1737	1916	1814	1698	1914	1629
Response Rate	N/A	N/A	N/A	85.31%	84.34%	90.97%	91.11%	90.26%	90.71%	91.00%	91.22%	92.61%	93.06%	92.14%	93.35%

Table A.2: Comparison of Means

Country	**Levels**		**Growth**	
	Income	**Consumption**	**Income**	**Consumption**
Canada	No	No	Yes	Yes
Germany	No	Yes	Yes	Yes
Italy	No	No	Yes	Yes
Mexico	No	No	Yes	Yes
Russia	No	Yes	Yes	Yes
Spain	No	No	Yes	Yes
Sweden	Yes	No	Yes	Yes
UK	No	No	Yes	No
USA	No	No	Yes	No
Turkey-HBS	**No**	**No**	**Yes**	**Yes**
Turkey-SILC	**No**	**N/A**	**Yes**	**N/A**

†*Source*: Krueger et al. (2010) for countries other than Turkey, and authors calculations for Turkey

Table A.3: Age Statistics of Male Labor Force

HBS															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mean	7.346	7.510	7.537	7.558	7.467	7.471	7.513	7.520	7.564	7.552	7.636	7.638	7.705	7.808	7.787
Std. D.	1.748	1.762	1.763	1.803	1.769	1.800	1.767	1.798	1.809	1.813	1.842	1.810	1.844	1.878	1.851
Skewness	0.370	0.293	0.249	0.252	0.270	0.262	0.262	0.270	0.242	0.265	0.252	0.232	0.176	0.135	0.140
Kurtosis	2.190	2.142	2.089	2.061	2.091	2.023	2.089	2.057	2.014	2.039	1.996	2.029	1.972	1.913	1.954
SILC															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mean	N/A	N/A	N/A	7.545	7.546	7.480	7.476	7.521	7.520	7.574	7.596	7.595	7.629	7.645	7.679
Std. D.	N/A	N/A	N/A	1.795	1.812	1.812	1.827	1.811	1.806	1.810	1.801	1.800	1.812	1.834	1.829
Skewness	N/A	N/A	N/A	0.244	0.222	0.257	0.272	0.256	0.262	0.250	0.234	0.216	0.193	0.198	0.185
Kurtosis	N/A	N/A	N/A	2.039	2.004	2.012	2.005	2.025	2.025	2.012	2.026	2.013	1.985	1.980	1.974

†*Notes for HBS*: Given data limitations, the above age values are calculated via ordinal age clusters by TurkStat with the following values: 5 for[25-29], 6 for [30-34], 7 for [35-39], 8 for [40-44], 9 for[45-49], 10 for [50-54] and 11 for [55-60].

Table A.4: Age Statistics of Female Labor Force

HBS															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mean	6.973	7.049	7.161	7.064	7.005	6.955	7.057	7.094	7.154	7.151	7.117	7.151	7.286	7.352	7.430
Std. D.	1.649	1.665	1.656	1.661	1.636	1.699	1.662	1.633	1.661	1.697	1.679	1.658	1.685	1.686	1.714
Skewness	0.589	0.584	0.466	0.488	0.438	0.595	0.500	0.494	0.420	0.479	0.474	0.462	0.409	0.366	0.358
Kurtosis	2.523	2.552	2.461	2.392	2.290	2.398	2.366	2.448	2.277	2.340	2.302	2.401	2.333	2.295	2.259
SILC															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mean	N/A	N/A	N/A	7.195	7.143	7.060	7.074	7.095	7.159	7.171	7.212	7.279	7.235	7.287	7.327
Std. D.	N/A	N/A	N/A	1.726	1.743	1.720	1.724	1.695	1.689	1.702	1.690	1.677	1.664	1.687	1.693
Skewness	N/A	N/A	N/A	0.445	0.480	0.546	0.510	0.511	0.464	0.443	0.425	0.384	0.440	0.385	0.354
Kurtosis	N/A	N/A	N/A	2.267	2.269	2.381	2.324	2.359	2.301	2.265	2.299	2.283	2.348	2.281	2.239

†*Notes*: Given data limitations, the above age values are calculated via ordinal age clusters by TurkStat with the following values: 5 for[25-29], 6 for [30-34], 7 for [35-39], 8 for [40-44], 9 for[45-49], 10 for [50-54], and 11 for [55-60].

Table A.5: Education Statistics of Labor Force

HBS															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Male	4.81	4.86	4.94	4.83	5.00	4.96	5.27	5.22	5.29	5.39	5.56	5.52	5.48	5.47	5.61
Female	5.22	5.48	5.42	5.26	5.44	5.47	5.77	5.71	5.83	5.94	6.23	6.22	6.12	6.10	6.25
SILC															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Male	N/A	N/A	N/A	2.98	3.02	3.08	3.17	3.26	3.29	3.22	3.38	3.41	3.50	4.19	4.18
Female	N/A	N/A	N/A	3.06	3.10	3.23	3.51	3.63	3.68	3.62	3.67	3.76	3.89	4.67	4.68

†*Notes for HBS*: Given data limitations, the above education values are calculated via ordinal education clusters by TurkStat with the following values: 1 for illiterate, 2 for literate but no schooling, 3 and 4 for primary school enrolment and completion, 5 for secondary school, 6 for training (secondary) school, 7 for high school, 8 for training (high) school, 9 for community college, 10 for university, and 11 for post-graduate.

‡*Notes for SILC*: Given data limitations, the above education values are calculated via ordinal education clusters by TurkStat with the following values: 0 for illiterate, 1 for literate but no schooling, 2 for primary school, 3 for secondary school and training (secondary) school, 4 for high school, 5 for training (high) school, 6 for community college,university and post-graduate.

Table A.6: Summary Statistics of Decile Ratios for Wage

	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Actual Decile Ratios by HBS								
Mean	2.930	2.102	1.551	1.214	3.207	1.985	1.481	1.199
Median	2.886	2.105	1.540	1.212	3.203	2.017	1.494	1.195
Std D.	0.159	0.085	0.044	0.024	0.252	0.112	0.060	0.025
Min.	2.676	1.959	1.482	1.183	2.805	1.797	1.381	1.167
Max.	3.255	2.286	1.635	1.260	3.630	2.168	1.563	1.250
Actual Decile Ratios by SILC								
	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Mean	3.114	2.265	1.654	1.242	3.500	2.090	1.512	1.212
Media	3.106	2.284	1.661	1.242	3.451	2.080	1.515	1.208
Std D.	0.150	0.105	0.046	0.018	0.364	0.174	0.075	0.030
Min.	2.778	2.060	1.550	1.204	3.051	1.833	1.390	1.155
Max	3.366	2.444	1.723	1.270	3.930	2.339	1.614	1.253
Normalized Decile Ratios by HBS								
	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Mean	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Median	0.985	1.001	0.993	0.998	0.999	1.016	1.009	0.997
Std D.	0.054	0.040	0.028	0.020	0.079	0.056	0.041	0.021
Min.	0.913	0.932	0.956	0.974	0.875	0.905	0.932	0.973
Max.	1.111	1.088	1.054	1.038	1.132	1.092	1.055	1.043
Normalized Decile Ratios by SILC								
	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Mean	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Media	0.997	1.008	1.004	1.000	0.986	0.996	1.002	0.997
Std D.	0.048	0.047	0.028	0.015	0.104	0.083	0.049	0.024
Min.	0.892	0.909	0.937	0.969	0.872	0.877	0.920	0.953
Max	1.081	1.079	1.042	1.022	1.123	1.120	1.068	1.034

Table A.7: Summary Statistics of Decile Ratios for Disposable Income

	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Actual Decile Ratios by HBS								
Mean	2.506	1.784	1.428	1.185	2.609	1.825	1.442	1.190
Median	2.503	1.774	1.432	1.183	2.581	1.822	1.433	1.189
Std D.	0.096	0.037	0.019	0.009	0.168	0.061	0.026	0.010
Min.	2.375	1.750	1.401	1.174	2.343	1.728	1.407	1.177
Max.	2.776	1.896	1.479	1.209	2.988	1.956	1.493	1.211
Actual Decile Ratios by SILC								
	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Mean	2.664	1.846	1.456	1.200	2.612	1.870	1.473	1.201
Media	2.669	1.846	1.454	1.201	2.643	1.877	1.473	1.200
Std D.	0.060	0.032	0.016	0.011	0.138	0.057	0.024	0.008
Min.	2.552	1.800	1.431	1.187	2.390	1.776	1.432	1.191
Max	2.747	1.918	1.491	1.227	2.915	1.986	1.531	1.217
Normalized Decile Ratios by HBS								
	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Mean	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Median	0.999	0.994	1.003	0.998	0.989	0.998	0.994	0.999
Std D.	0.038	0.021	0.013	0.007	0.064	0.033	0.018	0.009
Min.	0.948	0.981	0.981	0.991	0.898	0.947	0.976	0.989
Max.	1.108	1.063	1.036	1.020	1.145	1.072	1.036	1.017
Normalized Decile Ratios by SILC								
	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Mean	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Median	1.002	1.000	0.999	1.001	1.012	1.004	1.000	0.999
Std D.	0.022	0.017	0.011	0.009	0.053	0.031	0.017	0.007
Min.	0.958	0.975	0.982	0.989	0.915	0.950	0.972	0.991
Max	1.031	1.039	1.024	1.022	1.116	1.062	1.039	1.013

Table A.8: Summary Statistics of Decile Ratios for Consumption

	P90/P50	P80/P50	P70/P50	P60/P50	P50/P10	P50/P20	P50/P30	P50/P40
Actual Decile Ratios								
Mean	2.274	1.693	1.383	1.169	2.276	1.692	1.384	1.169
Median	2.262	1.688	1.384	1.169	2.289	1.684	1.383	1.169
Std D.	0.054	0.022	0.011	0.009	0.062	0.030	0.014	0.007
Min.	2.193	1.660	1.369	1.159	2.167	1.644	1.366	1.157
Max.	2.379	1.737	1.410	1.190	2.364	1.738	1.403	1.179
Normalized Decile Ratios								
Mean	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Median	0.994	0.997	1.000	1.000	1.006	0.995	0.999	1.000
Std D.	0.024	0.013	0.008	0.007	0.027	0.018	0.010	0.006
Min.	0.964	0.981	0.990	0.991	0.952	0.972	0.987	0.990
Max.	1.046	1.026	1.020	1.018	1.039	1.027	1.013	1.008

Table A.9: Time-Series Comparison of Inequalities

	Canada	Germany	Italy	Mexico	Russia	Spain	Sweden	UK	USA	**Turkey**
Var-log wage	increase	increase	increase	increase	decrease	decrease	decrease	increase	increase	**decrease**
Gini (wage)	increase	increase	increase	increase	decrease	decrease	decrease	increase	increase	**decrease**
P50/P10 (wage)	increase	increase	increase	increase	decrease	decrease	decrease	increase	increase	**decrease**
P90/P50 (wage)	increase	increase	increase	increase	decrease	decrease	decrease	increase	increase	**decrease**
Education Premium	increase	decrease	decrease	increase	decrease	decrease	increase	increase	increase	**stable**
Gender Premium	decrease	decrease	decrease	decrease	decrease	decrease	decrease	decrease	decrease	**decrease**
Experience Premium	increase	increase	increase	increase	increase	increase	decrease	increase	increase	**decrease**
Var-log residual wage	increase	increase	increase	increase	decrease	stable	decrease	increase	increase	**decrease**
Variance of income	increase	increase	increase	increase	increase	decrease	increase	increase	increase	**decrease**
Gini (income)	increase	increase	increase	increase	decrease	decrease	increase	increase	increase	**decrease**
P50/P10(income)	increase	increase	increase	increase	increase	decrease	increase	increase	increase	**decrease**
P90/P50(income)	decrease	increase	increase	increase	decrease	decrease	increase	increase	increase	**decrease**
Variance of consumption	increase	increase	increase	increase	decrease	decrease	increase	increase	increase	**decrease**
Gini (consumption)	increase	increase	increase	increase	decrease	decrease	increase	increase	increase	**decrease**
P50/P10(consumption)	increase	increase	increase	increase	decrease	decrease	increase	increase	increase	**decrease**
P90/P50(consumption)	decrease	increase	increase	increase	decrease	decrease	increase	increase	increase	**decrease**
Var-log residual consumption	increase	increase	decrease		decrease	decrease		increase		**decrease**

B Appendix on Counterfactual Growth Calculations

In this appendix, we describe our methodology for our calculations of the counterfactual growth scenarios. Following the same notation as the Methodology section, let $ae_{i,t}$ denote annual earnings of an individual i at time t, mw_t denote the minimum wage at time t, and g_t^{mw} denote the *average* growth rate of the minimum wage up to time t relative to an initial period, t_0 (i.e. $t_0 = 2002$ for the case of *HBS*). For instance, average growth rates of the minimum wage up to the year 2003 and 2004 follow:

- t=2003: $g_{2003}^{mw} = \dfrac{mw_{2003} - mw_{2002}}{mw_{2002}}$
- t=2004: $g_{2004}^{mw} = \dfrac{mw_{2004} - mw_{2002}}{mw_{2002}}$

Counterfactuals with Wage

Let $\overline{ae}_t$ denote the *actual* average annual earnings at time t, and $g_t^{\overline{ae}}$ denote the *actual* growth rate of average annual earnings up to the period t relative to an initial period, t_0. For instance,

- t=2003: $g_{2003}^{\overline{ae}} = \dfrac{\overline{ae}_{2003} - \overline{ae}_{2002}}{\overline{ae}_{2002}}$
- t=2004: $g_{2004}^{\overline{ae}} = \dfrac{\overline{ae}_{2004} - \overline{ae}_{2002}}{\overline{ae}_{2002}}$

In this counterfactual experiment, we *replace* annual earnings of below-minimum-wage earners (individuals whose annual earnings is lower than annual minimum wage earnings at time t) with a *hypothetical* annual earnings value, $hae_{i,t}$, which would have resulted if their annual earnings counterfactually grew at the average annual earnings growth rate $g^{\overline{ae}}$ instead of the *actual* minimum wage growth rate g^{mw}. For instance, if individual i's annual earnings at time t is lower than the annual minimum wage at time t, we calculate the associated hypothetical annual earnings value, $hae_{i,t}$ as follows:

$$hae_{i,t} = ae_{i,t} \frac{1 + g_t^{\overline{ae}}}{1 + g_t^{mw}}$$

After calculating $hae_{i,t}$ for all t and i whose annual earnings are less than or equal to the annualized minimum wage of the corresponding year, we calculate counterfactual wage inequality measures and compare them with actual wage inequality estimates in Figure A.3.

Counterfactuals with Household Income

Since the unit of observation for income is not *individual* but *household*, in the counterfactual experiment for income, it is not possible to calculate hypothetical household income values using the annualized minimum wage and annual earnings of individuals. Accordingly, we follow a different strategy than for wages as follows: if the annual earning of the *household head* of a certain household is less than or

equal to the annualized minimum wage earnings, we refer to this household as a *minimum-wage-earner household* and denote its annual household income as $hh_{i,t}^{mw}$. Let $\overline{hh}_t^{mw}$ be the average annual household income of households whose household head's annual earnings is less than or equal to the minimum annual earnings at time t. Further, let g_t^{mwhh} denote the average growth rate of the average annual income of *minimum-wage-earner households* up to the period t, relative to an initial period t_0. For instance:

- t=2003: $g_{2003}^{mwhh} = \dfrac{\overline{hh}_{2003}^{mw} - \overline{hh}_{2002}^{mw}}{\overline{hh}_{2002}^{mw}}$
- t=2004: $g_{2004}^{mwhh} = \dfrac{\overline{hh}_{2004}^{mw} - \overline{hh}_{2002}^{mw}}{\overline{hh}_{2002}^{mw}}$

Further, let $\overline{hh}_t$ denote the average annual household income at time t and g_t^{hh} denote the growth rate of average annual household income up to the period t relative to an initial period t_0. For instance:

- t=2003: $g_{2003}^{hh} = \dfrac{\overline{hh}_{2003} - \overline{hh}_{2002}}{\overline{hh}_{2002}}$
- t=2004: $g_{2004}^{hh} = \dfrac{\overline{hh}_{2004} - \overline{hh}_{2002}}{\overline{hh}_{2002}}$

In this counterfactual experiment, we calculate the hypothetical household income of *minimum-wage-earner households* ($hhh_{i,t}$) as the values that would have shown if its household income counterfactually grew at the average household income growth rate g^{hh} instead of the average household income growth rate experienced by *minimum-wage-earner households* g^{mwhh}. For instance, if household i's household head earns either at or below minimum wage in period t, we calculate the associated hypothetical annual household income value, $hhh_{i,t}$ as follows:

$$hhh_{i,t} = hh_{i,t} \frac{1 + g_t^{hh}}{1 + g_t^{mwhh}}$$

Again, after calculating $hhh_{i,t}$ for all t and for all i who are *minimum-wage-earner households*, we calculate counterfactual income inequality measures and compare them with actual income inequality estimates in Figure A.5.