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ABSTRACT

How do average hours worked vary across the world income distribution? To answer this question, we build a new internationally comparable database of hours worked covering countries of all income levels. We document that average hours worked per adult are substantially higher in low-income countries than in high-income countries. This pattern holds for both men and women, for adults of all ages and education levels, and along both the extensive margin (employment rates) and intensive margin (hours per worker). Our results imply that labor productivity and welfare differences across countries are larger than suggested by differences in consumption per capita.

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1. Introduction

One of the most basic facts in macroeconomics is that aggregate income per capita varies greatly across countries (Klenow and Rodríguez-Clare, 1997; Hall and Jones, 1999; Caselli, 2005). Much less is known about how aggregate hours worked vary across countries. Consider the basic question: are average hours worked higher for adults in high-income countries or for adults in low-income countries? Due to data limitations, the economics literature does not have an answer to this question. This is unfortunate, because if hours enter directly into preferences, then measures of average hours worked at the country level are a key input to understanding welfare differences across countries (Jones and Klenow, 2015).

In this paper, we create a new database of average hours worked using recent household survey data from 81 countries of all income levels. The surveys we employ are nationally representative and cover workers in all sectors, including the self-employed, which represent the majority of the workforce in low-income countries. We focus most of our analysis on a set of 43 *core countries*, for which international comparability of hours data is as high as possible. In particular, we require that the data from these core countries satisfy three basic criteria. First, the surveys cover the entire calendar year (rather than, say, one month of the year). This is necessary to prevent any bias induced by seasonality in labor demand. Second, hours worked are measured in a consistent way: actual (rather than usual) hours in all jobs (not just the primary job), and in the week prior to the interview. Finally, hours worked cover the production of goods or services counted in the National Income and Product Accounts (NIPA). Thus, our hours measures cover unpaid work in agricultural or non-agricultural businesses, as well as wage employment, but do not cover home-produced services, such as child care.[1]

Our main finding is that average hours worked per adult are substantially higher in low-income countries (the bottom third of the world income distribution) than in high-income countries (the top third). In low-income countries, adults work 29.3 hours per week on average, compared to 19.1 hours per week in high-income countries. This difference is both statistically and economically significant, with cross-country differences

[1]For a smaller set of countries, we document that hours spent on home production of services in low- and high-income countries follow the same pattern as hours spent on producing goods and services counted in NIPA; we present these findings in Section 7.

in average hours per adult (10.2 hours per week) being more than twice as large as the decline in hours per adult in the United States over the twentieth century (4.7 hours per week) (Ramey and Francis, 2009). In percentage terms, adults in low-income countries work about fifty percent more hours per week than adults in high-income countries.

To better understand the sources of cross-country hours differences, we compute average hours by several disaggregated categories, in particular by sex, age group, and educational attainment. We find that the pattern of higher hours in low-income countries is quite broad-based, being present in each of the disaggregated categories. Both men and women work around ten hours more per week in the poorest third than in the richest. Prime-aged adults (aged 25-54) work 7.7 hours per week more on average in the poorest third, while young (aged 15-24) and old (aged 55+) adults work 9.4 and 13.3 more hours per week in the poorest. Individuals of all education levels work more hours on average in the poorest third than in the richest, with the largest cross-country differences coming for individuals with less than secondary schooling.

We next decompose average hours per adult into an extensive margin (employment rate) and intensive margin (average hours per worker). We find that cross-country differences in hours per adult are shaped by both margins. Employment rates are higher in the poorest third than in the middle third, and similar between the middle and top third of the world income distribution. Average hours per worker are similar between the poorest- and the middle third, and lower in the richest third. Overall, employment rates account for about two-thirds of the decline in hours per adult between low- and high-income countries, while hours per worker account for about one-third. We then further decompose average hours per worker into three broad sectoral aggregates: agriculture, manufacturing and services. We find that hours per worker in agriculture are similar across the world income distribution, while manufacturing and services workers work 8.1 and 13.5 more hours per week in the low- than in the high-income countries. We find the sectoral breakdowns reassuring, since one may expect hours worked to be measured more accurately in manufacturing and services, where workers are more likely to be wage workers, for which the measurement of hours worked may be more reliable.

One implication of our findings is that labor productivity differences across countries are larger than previously estimated. In the absence of data on hours worked, development accounting typically relies on GDP per worker as a measure of labor productivity, which

implicitly treats hours per worker as identical across countries (see e.g. Hall and Jones (1999); Caselli (2005); Hsieh and Klenow (2010)). Across our sample countries, GDP per worker is a factor 16.1 times larger in the richest third than in the poorest third of countries, while GDP per hour is 19.5 times as large. Thus, after taking hours into consideration, cross-country TFP differences are even larger than previously thought.

Our findings also have implications for welfare differences across countries. To flush out these implications, we build a simple aggregate model of how hours worked vary with development, based on the work of Prescott (2004), and Ohanian et al. (2008), and use it to construct simple welfare metrics following Jones and Klenow (2015). Our model reconciles the facts we document using a subsistence consumption requirement in preferences, which implies that the income effect dominates the substitution effect. Quantitatively, the model makes predictions that are in line with our findings, with the model predicting around two-thirds of the cross-country differences in hours that we document. The welfare measures we construct capture the flow of utility that arises not just from consumption but also from the disutility of work. Using our hours data, plus standard measures of consumption per capita, we calculate that welfare differs by a factor of 22 or more between high-income and low-income countries, compared to a factor of 16 when we ignore differences in hours. Thus, once we include differences in hours worked, welfare differences across countries are one third or more larger than the differences from consumption per capita alone. To put it succinctly, individuals in low-income countries are not just consumption poor, but also leisure poor.

The rest of this paper is structured as follows. Section 2 highlights the paper's contribution relative to the literature. Section 3 describes our underlying data sources, and our efforts to construct internationally comparable data on hours worked. Section 4 documents that hours per adult are higher in poor countries both in the aggregate and by disaggregated categories. Section 5 discusses the implications of our findings for development accounting. Section 6 presents the model, and then uses it to compute welfare differences across countries. Section 7 presents data on hours of home production. Section 8 concludes.

2. Related Literature

Our study is the first to measure and analyze average hours worked across the world income distribution. Prior studies of hours worked across countries have almost exclusively focused on rich countries, and in particular on the United States and European countries. Explanations of the U.S.-Europe gap in average hours have focused largely on differences in taxation (e.g., Prescott (2004), Rogerson (2006), McDaniel (2011) and Bick and Fuchs-Schündeln (2014)), institutions (Alesina et al., 2005) and social security systems (Erosa et al., 2012; Wallenius, 2013; Alonso-Ortiz, 2014). Other studies have focused on understanding changes in hours worked over time, though these have also concentrated on rich countries. For example, McGrattan and Rogerson (2004), Ohanian et al. (2008) and Bick et al. (2015) measure changes in hours among OECD countries over time, Costa (2000), Ramey and Francis (2009) and Francis and Ramey (2009) focus on the long-run decline in hours worked in the United States, and Aguiar and Hurst (2007) document a rise in leisure hours in the United States over the post-war period.

The existing evidence on hours worked from developing countries is quite limited. The study by Lee et al. (2007) presents some evidence on hours from largely non-representative establishment surveys covering wage earners in manufacturing. Their data thus excludes the self-employed and those working in agriculture, which together form the vast majority of all workers in the developing world. Caselli (2005) considers hours worked data for 28 countries from the International Labor Organization (ILO), though just two of these 28 countries are in the bottom half of the world income distribution. Gollin et al. (2014) compare average hours worked among workers in the agricultural and non-agricultural sectors of a large set of countries using nationally representative surveys. Their data are comparable across sectors within each country, though not necessarily comparable across countries, and their study does not attempt to measure or account for the relationship between average hours worked and average income. Jones and Klenow (2015) consider hours worked in their study of welfare differences across countries, though their micro data have limited coverage of the bottom half of the world income distribution.

Recently, the Penn World Tables and the Total Economy Database, run by the Conference Board, also released data on annual hours worked per worker, in addition to employment rates, for an unbalanced panel of countries, with the earliest data coming

from the year 1950. As we explain in detail in Online Appendix Section 1.3, these data are, particularly for many low-income countries, of far lower quality than ours in terms of consistency of hours measurement, activity coverage and potential biases from seasonality.

3. Data

In this section, we describe the survey data underlying our analysis. We then introduce the criteria that we use to define the set of core countries, which are those that have the most scope for international comparability. Next, we describe how we measure hours per adult, employment rates, and hours per worker.

3.1. Data Sources

Our analysis draws on nationally representative household surveys. The key advantage of using household surveys, as opposed to firm surveys or administrative records, is that our measures of labor supply are not restricted to activities for which individuals receive a wage, but also include self-employed and unpaid family work. As is well known, the self-employed form an important fraction of the workforce in all countries, and particularly so in developing countries (see e.g. Gollin (2008)).

All of the surveys we employ are publicly available for researchers, mostly via an application through national statistical agencies or similar institutions. We were able to collect nationally representative data for 81 countries with a population of at least one million. For 34 of our countries we can draw from harmonized data sets, for which efforts have already been made to standardize questions across countries. These comprise the European Labor Force Survey (ELFS; 27 countries) and the International Public-Use Microdata Project (IPUMS; 7 countries). For the remaining 47 countries, we draw on country-specific censuses, household or labor force surveys, including 16 surveys conducted as part of the World Bank's Living Standards Measurement Studies (LSMS).[2]

When multiple years of appropriate data are available, we choose the year closest to 2005, which is the year in which the latest benchmark estimates of GDP are available

[2]Note that this does not imply that these standardized surveys are all in our sample of core countries. All ELFS countries except Ireland are core countries, while none of the IPUMS countries and only five of the LSMS countries are core countries.

from the Penn World Tables (PWT). Most of our data are within a few years of 2005; exact years and data sources for all countries are given in Online Appendix Table A.1. Our sample sizes range from 5,000 to over 700,000 individuals. We focus on all individuals of at least age 15, whom we refer to as "adults".[3]

3.2. Core Countries

The key measurement challenge we face is that not all of our surveys are conducted in the same way, and more specifically, not all surveys collect hours information in the same way. To ensure that international comparability is as high as possible, we focus our main analysis on a set of *core countries* which we define to be those that satisfy the following three criteria.

1. Activity Definition: We restrict attention to hours worked in the production of output that is counted in NIPA. These include hours worked in wage employment as well as hours in own-account agricultural or non-agricultural work, whether or not that output is sold or used for own consumption. This is important if we want to maintain a nationally representative sample of workers, particularly in the poorest countries, where agricultural work and self-employment are widespread. Not included in our definition of hours worked are hours spent on non-market services, such as cleaning or home-provided child care; we return to the issue of home-produced services in Section 7.[4]

2. Hours Worked Information: We focus on actual hours worked, rather than usual hours worked, since individuals may work more or less than usual in a given week, due to e.g. over-time or sickness. We also focus on all jobs, rather than just the primary job, since many individuals have multiple jobs. Finally, we focus only on surveys that ask respondents about hours worked in the last week or in a recent reference week, since longer time periods may lead to recall bias.

3. Time Coverage: We restrict attention to surveys that cover the entire calendar year. The reason is that while all of our surveys are nationally representative in terms of the covered population, some are conducted over the entire year, while others are conducted over only a few months or weeks. Using these partial-year surveys creates potentially

[3]The United States is an exception here as the youngest available age is 16.

[4]Note that home-produced goods, such as agricultural output, are counted as output in NIPA, though home-produced services are not. See Gollin et al. (2014) for a more detailed discussion of how agricultural output is treated in NIPA.

biased estimates of hours worked unless the survey period happens to be representative of the entire year. This bias may be more pronounced in developing countries, which are largely agricultural and hence seasonal. Online Appendix 1.1 provides a detailed explanation of how we determine the time coverage of each survey and which surveys qualify as covering the entire year according to our definition.

Out of the 81 countries in our sample, 43 qualify as core countries. Table A.1 indicates this status for each country.

3.3. Measuring Employment and Hours Worked

Our measures of employment rates and hours worked rest on two key variables: the self-reported employment status and actual hours worked in all jobs in the last week. We measure the employment rate as the fraction of all adults that report being employed or have positive hours worked. We measure hours per worker as the average hours worked in all jobs in the reference week among all those who are employed. Both measures are calculated with the individual survey weights. We measure hours per adult as the product of the employment rate and average hours per worker. We provide more details on our calculations in Online Appendix 1.2.

Our definition of whether a country in our sample is a low- (bottom third of the world income distribution), middle- or high-income (top third of the world income distribution) country is based on GDP per capita for all countries in the PWT. We find that when comparing GDP per capita in our core and full set of countries to all countries in the PWT, they have similar levels of GDP per capita; see Online Appendix Table A.2.

4. Empirical Findings

In this section, we document that average hours worked per adult are substantially higher in low-income countries than in high-income countries. We show that this finding is quite broad-based, being present for both men and women, for all age and education groups, and along both the extensive and intensive margins.

4.1. Average Hours Worked Per Adult

Panel A of Table 1 reports in the first row the average hours per adult by income tercile in our core countries. In the core countries, average hours per adult are 29.3 hours per week in low-income countries, compared to 22.0 hours in middle- and 19.1 hours in high-income countries. In terms of economic significance, the 10.2 higher weekly hours in the low-income group correspond to 53 percent higher hours than in the high-income group.

Given that the number of core countries is relatively small, particularly in the lower end of the income distribution, we conduct statistical tests of the hypothesis that average hours worked in all countries are drawn from the same distribution. We do so using permutation tests, which have more favorable small-sample properties than other commonly used tests, such as t-tests (Lehmann and Romano, 2005).[5] Panel B of Table 1 reports the results of these permutation tests. For the core countries, shown in the first row, the observed difference in mean hours between the low- and high-income groups is 10.2 hours per week, and the p-value is well under one percent. The difference in mean hours between the low- and middle-income groups is 7.3 hours, while the difference between the middle- and high-income groups is 2.9 hours. Both differences have p-values less than five percent. We conclude that the decreasing average hours over the income terciles are unlikely to be a coincidence.

Figure 1 plots average weekly hours per adult against log GDP per capita for our core countries. Also plotted for reference are the mean hours per adult per tercile, given at the mean GDP of the sample countries in each tercile, and vertical lines separating the terciles. In our sample, 9 countries fall in each of the bottom- and middle terciles, while 25 fall in the top tercile. The figure shows that average hours per adult are downward sloping in income per capita, as documented in Table 1. The poorest countries in the world range from a low of around 24 hours per week in Uganda and Rwanda to a high of slightly over 40 hours per week in Cambodia. The richest countries average between a low of around 16 hours in Italy, Spain, Belgium and France and a high of 24.4 hours in the United States. Iraq has the lowest hours per adult in our sample, which is driven

[5] The logic of the permutation test is that, if average hours in each country are drawn from the same underlying distribution, one can resample the data many times to ask how likely it is that we get the observed differences in mean hours by chance.

entirely by women, as discussed in Section 4.2.

Rows 2 and 3 of Table 1, Panel A, report average hours per adult by income tercile in two broader sets of countries: (i) the core plus those countries having a survey that covers part of the year (but not the whole year), and (ii) all countries in our data set, regardless of how hours are measured. These two broader sets of countries offer more coverage in terms of number of countries covered, but at the cost of lower international data comparability. Across the 74 core plus partial-year survey countries, average hours worked are 25.9 in the low-, 21.9 in the middle-, and 19.9 in the high-income countries. Thus, within the low-income countries average hours worked are slightly lower in this group than in the core (an issue which we discuss further in Section 4.8), while hours worked in the middle- and high-income groups are similar to the core. Across our full set of 81 countries, average hours per adult are still 25.9 in the low-income group, and rise slightly to 22.4 hours in the middle- and 20.1 hours in the high-income group.[6] As Panel B of Table 1 shows, all differences across the income groups are at the one- or five-percent level in the broader set of countries. We conclude that our finding of higher hours per adult in poor countries than in rich countries holds in a broader set of countries as well as in our core countries. From here on we focus on the core countries due to their higher degree of international comparability.

4.2. Average Hours per Adult by Sex

We now look at average hours worked separately by sex across our set of core countries. Figure 2 plots average hours per adult for men (top panel) and women (bottom panel). While the patterns differ by sex, for both men and women it is clear that hours per adult are higher on average in the low-income countries.[7] Table 2, Panel A, reports the averages by sex and country income group. For the low-income countries, men average 32.9 hours per week, while in the middle- and high-income countries they average 29.3 and 23.6 hours per week, for a difference of 9.3 hours per week between low and high. Women work fewer hours than men in all income groups, but show the same pattern of higher hours in poorer countries. Women average 25.8 hours in the low-income group, 15.2 hours in the middle-income group and 14.9 hours in the high-income group, for a

[6] Online Appendix Figure A.3 shows how hours per adult in all countries vary with GDP per capita.

[7] Another notable feature of the graphs by sex is that female hours are substantially lower for countries with large Muslim populations, such as Iraq, Pakistan and Turkey.

low-high difference of 10.9 hours per week.

These differences are again statistically and economically significant. In percentage terms, men work 39 percent longer hours on average in the poorest countries than in the richest, while women work 73 percent longer hours in the poorest countries. Panel B of Table 2 shows that the differences between low- and high-income countries are significant at the one percent level for both men and women. Between the middle- and high-income countries, the difference in hours is statistically significant for men but not women, while the opposite is true between the low- and middle-income countries.

4.3. Average Hours per Adult by Age

In this subsection, we document the facts separately for three age groups, namely the young (aged 15-24), the prime aged (aged 25-54), and the old (aged 55+). Figure 3 plots average hours for these groups. On average hours are higher in the low-income countries for all three groups, with higher levels of hours among the prime-aged. Table 3, Panel A, reports those averages by age group for each country income group. The largest differences arise for the old. Old adults in the low-income countries work 21.1 hours per week on average, compared to 12.9 and 7.8 hours in the middle and rich countries. Young adults show a similar pattern, with almost identical hours to the old in low- and middle-income countries, but have higher hours in high-income countries (11.7). One might expect higher hours worked in low-income countries for young and old individuals, given on average higher education and thus more time spent on schooling in high-income countries, and given the existence of social security programs that provide some form of pensions for the old in high-income countries. Yet, prime-aged adults also work substantially more in the poorest countries, with an average of 36.0 hours per week in the low-income countries, compared to 29.3 hours and 28.3 hours in the middle and rich countries, for a difference of 7.7 hours per week between low and high.

Panel B of Table 3 reports the results of permutation tests on differences for the three age groups. For young and prime aged adults, the differences between low- and middle-income countries are 7.5 hours and 6.7 hours, and are significant at the five percent level. For middle- and high-income countries, however, the differences are smaller, at 1.9 and 1.0 hours, and the p-values there are much higher, and well above ten percent in the case of the prime-aged. For old adults, on the other hand, differences are large and significant

throughout the income distribution, with an overall difference of 13.3 hours per week between the low- and high-income groups.[8]

Given that we observe systematic differences in hours per adult by age, and that the age composition differs across countries, the question arises how much these differences in the age composition matter in explaining aggregate differences in hours across countries. To answer this question, we first compute average hours per person for 5 year age groups, starting from 15-19 and ending at 95+. We then calculate hypothetical average weekly hours per adult by multiplying U.S.-population weights for the 5 year age groups with average hours of the corresponding age group in each country, and then summing up over all age groups. Panel C of Table 3 reports these hypothetical hours worked by country income tercile. As the table shows, average weekly hours per adult essentially do not change when the U.S. age structure is imposed. Thus, differences in the age composition of adults between the United States and the other core countries accounts for little of the patterns of average hours that we document.

4.4. Average Hours by Education Group

Patterns of hours worked have been shown to differ systematically by education group within the United States (see e.g. Aguiar and Hurst (2007)). We therefore find it informative to compute average hours by education group in our set of countries. Our data allow us to consistently define three broad education groups: those with (1) less than secondary school, (2) secondary school completed (but not more), and (3) more than secondary school. We restrict attention in this exercise to adults aged 25 and above, so as to focus on those that have most likely completed schooling.

Figure 4 plots average hours by education group. As the graphs show, all groups have higher hours in the poorer countries. Table 4 confirms this by reporting the average hours per adult by education group. Among those with less than secondary school, average hours are 32.6 in the low-income countries compared to 20.9 in the middle- and just 11.9 in the high-income countries. Thus, for the lowest education group the difference between hours in low- and high-income countries amounts to 20.7 hours.[9]

[8] Disaggregating by sex and age, we find similar cross-country patterns for men and women at each age group. For both sexes, the biggest differences across countries come for young and old individuals, though there are still significant declines for prime-aged men and women.

[9] This dramatic difference is partly caused by an age-composition effect, because individuals with less

For those with secondary school completed, hours are 38.1 in the low-, 29.6 in the middle- and 23.6 in the high-income countries. For those with more than secondary school, hours are 39.5 in the low-income countries, 30.9 in the middle- and 26.9 in the high-income countries. Within each country group, average hours tend to be higher for the more educated individuals than for the less educated. Panel B shows that all differences between low- and high-income countries are statistically significant at the one-percent level.

Of course, shares of workers by education group differ dramatically across countries, with higher average education levels in the richer countries. To gauge how important this composition of workers by country is for understanding the aggregate hours differences, we conduct another counterfactual exercise where we impose the United States' education composition on all the other countries in our data (but keep the country-specific hours in each education group). We then report the hypothetical average hours across each income group in Panel C of Table 4. As one can see, the hypothetical hours difference between low- and high-income countries imposing the United States' education composition is even larger than the actual hours difference. By imposing the United States' education composition, the share of higher educated individuals in the low-income countries rises, increasing the hypothetical hours there. However, since the hours gradient in education is smallest in the low-income countries, the difference in hypothetical hours is still relatively close to the difference in actual hours.

4.5. Extensive and Intensive Margins

Differences in hours worked per adult stem from differences in employment rates, which represent the extensive margin, and average hours per worker, which represent the intensive margin. We now present our findings for those two margins. Figure 5 plots the employment rates (top panel) and the average hours per worker (bottom panel) for our core countries. The figure shows that employment rates are decreasing for much of the income distribution, with a modest increase for the richest countries among the high-income countries, while hours per worker are similar between low and middle-income countries on average, and substantially lower in the richer countries.

than secondary education are most prevalent among the old in high-income countries. Focusing on prime-aged individuals (instead of all individuals aged over 25) reduces the hours difference between high- and low-income countries of the lowest education group from 20.7 hours to 13.3 hours.

Panel A of Table 5 reports the average employment rates and hours per worker in each country income group. In the low-income countries, the average employment rate is 73.6 percent. In middle- and high-income countries, employment rates are 52.8 and 54.9 percent, respectively. Along the intensive margin, workers in low-income countries average 40.2 hours per week, compared to 41.6 hours and 35.0 hours in the middle- and high-income countries.

Panel B of Table 5 reports the differences in means by income group and the result of permutation tests of the hypothesis that employment rates and average hours per worker are drawn from the same distribution in all countries. For employment rates, the large difference between the low- and middle-income countries (20.8 percentage points) is statistically significant at the one-percent level, while the (negative) difference between the middle- and high-income countries is not significant. For hours per worker, the opposite is true. The small low-middle difference is statistically insignificant, while the large middle-high difference (6.6 hours per week) is significant at the one-percent level. The differences between low- and high-income countries are highly statistically significant for both margins. Thus, average hours per adult are shaped by the two margins differently, with employment rates accounting for the decline in hours per adult between low- and -middle income countries, and hours per employed accounting for the decline between middle- and high-income countries. Overall, we calculate that employment rates account for around two-thirds of the cross-country differences in hours per adult, while hours per employed account for around one-third.

4.6. Hours Per Worker by Sector

Which sectors contribute most to the patterns of hours per worker that we document? To answer this question, we compute average hours per worker by three broad sectoral aggregates, which we can define consistently across countries. These are agriculture (including forestry and fisheries), manufacturing (including mining and utilities), and services. We assign each worker to one of these sectors based on their primary sector of employment (though their hours cover all jobs).[10] We focus on hours per worker (rather than hours per adult), since industry is only well defined for those currently working.

[10] Gollin et al. (2014) compute average weekly hours worked separately by primary and secondary sectors of employment in a set of six developing countries. They find that, on average, more than 90 percent of weekly hours worked are in the worker's primary sector of employment.

Table 6 (Panel A) presents the average hours per worker by industry. Among agricultural workers, differences in average hours are statistically insignificant across the three country groups, with the low-, middle- and high-income countries working 36.8, 36.7 and 39.5 hours per week, respectively. Manufacturing workers work longer hours in the low-income countries, at 44.8 hours per week, compared to 42.9 in the middle-income and 36.7 in the high-income countries. The differences are even more substantial for services, where workers in the low-income countries average 47.8 hours, compared to 42.7 and 34.3 hours per week in the middle- and high-income countries. Table 6, Panel B, shows that low-high differences are significant at the one-percent level for manufacturing and services.[11]

We find it reassuring that the hours differences are so pronounced in manufacturing and services, where hours may be better measured. One may worry that workers in agriculture, who are predominately self-employed, may be more likely to mix work and non-work time when reporting their hours of work.

To consider further the role of sectoral composition in overall average hours worked, we compute the hypothetical average hours per worker in each country that would result if each country had the United States' shares of workers in each sector. Since the United States has just two percent of its workers in agriculture, this means that our hypothetical average hours for most countries are influenced far more by manufacturing and services than in the actual data. We present the hypothetical values in Panel C of Table 6. What we find, not surprisingly, is that the hypothetical hours per worker would be even higher in low-income countries if those countries had the United States' industry composition. In other words, differences in sectoral composition between the United States and other countries do not help much in accounting for differences in hours per worker.

4.7. Comparison to Time-Series Data from the United States

Our research is motivated by the question of how hours worked vary with development in the cross-section of countries. Independent evidence on the relationship between development and hours worked, which may not necessarily coincide with the cross-sectional evidence, comes from time-series evidence on hours worked. How did hours worked look like in the currently rich countries back when they were poor? Comprehen-

[11] Hours by sector for each country are plotted in Online Appendix Figure A.4.

sive and reliable historical data on hours worked are unfortunately hard to obtain, and the discussion on the complications of constructing reliable hours worked data in Section 3 makes clear why this is the case. However, for the United States, data spanning over 100 years are available from Ramey and Francis (2009). Yet, even 100 years ago, the United States was as rich as current middle-income countries, so we do not cover the full range of development with these data.

Figure 6 plots Ramey and Francis (2009)'s U.S. time series of average hours worked per adult (individuals aged 14+) from 1900 to 2005 (grey line), and average hours per adult from our data (black dots). Average adult hours per week in the United States decreased from 27.7 hours per week in 1900 to 23.0 hours in 2005, corresponding to a decline of 4.7 hours per week. Interestingly, the patterns for hours in the cross-section of countries is similar over the range of GDP per capita spanned by the United States in the last century, only with slightly higher overall hours in the United States.

4.8. Potential Biases Resulting from Survey Methodology

No matter how carefully one tries to ensure comparability of different surveys across countries, there is still the potential for bias arising from limitations in the survey methodology. One such potential bias may arise from surveyors avoiding specific regions during periods of peak regional labor demand, such as harvest times, to maximize participation in the surveys. If anything, we argue that it would bias downward our measured average hours in low-income countries, which have higher shares of employment in agriculture. Thus, the actual difference between hours in low- and high-income countries would be even larger than the one we report above for our core countries. An indication for our prior is that hours in low-income countries fall if we add countries with partial-year surveys to the set of core countries, as shown in Table 1. This is much less pronounced in middle- and high-income countries, in which seasonality likely plays less of a role.

A second potential bias may arise from vacation periods, such as annual leave and public holidays. As Bick et al. (2015) show, hours lost due to vacation days and public holidays are likely underreported even in surveys that cover each week of the year. While data on vacation days across countries are not readily available, we suspect that vacation days are increasing in GDP per capita, which would imply that hours worked are likely overstated to a larger degree in high-income countries than in low-income ones.

A third possible bias comes from child labor, i.e. hours worked by individuals under our lower age bound of fifteen. Since child labor is more prevalent in low-income countries (Basu, 1999), this would mean that actual hours worked may be even higher in low-income countries compared to rich countries than our current calculations suggest. Thus, all these three potential biases indicate that our reported hours difference between low- and high-income countries is likely a lower bound of the true difference.

5. Implications for Development Accounting

Until now we have documented that hours per adult are higher in low-income countries than in high-income countries, and that this pattern is quite broad-based. We now turn to implications of this fact for development accounting. The literature on development accounting has attempted to explain cross-country differences in output per worker using aggregate stocks of human and physical capital per worker. One basic piece of information missing from this literature has been hours worked per capita, which has limited the ability of researchers to accurately measure labor productivity (Klenow and Rodríguez-Clare, 1997; Hall and Jones, 1999; Caselli, 2005; Hsieh and Klenow, 2010). In the absence of data on hours worked, virtually all previous studies in this literature have measured labor productivity as GDP per worker.

Our data suggest that GDP per worker underestimates the true labor productivity differences across countries. To investigate this quantitatively, Table 7 shows three different measures of labor productivity: GDP per adult, GDP per worker, and GDP per hour. The first three columns report the respective values for our three country income groups, normalizing the value of the high-income countries for each measure to 100, and the last column presents the ratio of the respective variable for high- to low-income countries. Focusing on this ratio, GDP per adult is 12.9 times higher in our core high-income countries than in our core low-income countries. Higher employment rates in poor than in rich countries bring the ratio of hours per worker up to 16.1.

We can improve on this by adding our data on hours worked in each country. Since hours per worker are on average 5.2 hours per week higher in low-income countries, the ratio of GDP per hour in high- over low-income countries is higher than the ratio of GDP per worker, specifically amounting to 19.5 instead of 16.1. This corresponds to twenty percent larger labor productivity differences across countries than implied by

GDP per worker. Middle-income countries are also less productive relative to high-income countries based on hours worked compared to based on employment alone.

Our findings imply that development accounting rests even more on the residual total factor productivity (TFP) term once cross-country differences in hours are taken into consideration. This casts doubt on theories of development that operate through lower labor input in poorer countries. Landes (1999), for example, points to the hot weather in the tropics as a cost of working there. In the theory of Leamer (1999), TFP differences across countries are in part explained by differences in labor effort, with high effort in economies with higher TFP.

6. Implications for Welfare

In this section, we aim at quantifying the welfare differences implied by our cross-country findings for hours worked. This requires us to take a stand on preferences and a modelling framework. Because our finding of higher hours in low-income countries is so broad-based, we abstract from heterogeneity and assume a single representative household in each country. Specifically, we use a variant of the standard neo-classical growth model, following the literature analyzing U.S.-Europe hours differences, e.g. Prescott (2004) and Ohanian et al. (2008). The key modification is a non-homotheticity in preferences in the form of a subsistence consumption requirement.[12]

We first show that the calibrated model is quantitatively broadly consistent with the facts we document above. We then use the model to measure welfare differences across countries, building on the work of Jones and Klenow (2015). We conclude that once cross-country differences in hours are taken into consideration, welfare differences across countries are at least a third larger than suggested by income differences alone.

[12] These preferences have been used extensively in multi-sector models; see Herrendorf et al. (2013) and the references therein. Recently, Restuccia and Vandenbroucke (2014) use a human capital model with subsistence preferences to explain the convergence of average schooling levels across countries over the last half century while also matching the decline in average hours in the United States.

6.1. Model Environment

Following Prescott (2004), each country has a representative, infinitely lived household which maximizes life-time utility:

$$\max_{\{c_t,h_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \left(\log\left(c_t - \bar{c}\right) - \alpha v(h_t)\right), \tag{1}$$

where c_t is consumption, $v(h_t)$ represents the disutility of hours worked, h_t, and α determines the relative disutility of work. As in Ohanian et al. (2008), we introduce a subsistence consumption requirement, $\bar{c}$, which implies that the income effect dominates the substitution effect. As consumption rises, this dominance becomes weaker and in the limit when consumption goes to infinity the income and substitution effect cancel out.

The household budget constraint is standard and amounts to $c_t + k_{t+1} = w_t h_t + (1 + r_t)k_t$, where w_t and r_t are the return to working and capital k_t.[13] There is a representative firm with a Cobb-Douglas production function $y_t = A_t k_t^{\theta} h_t^{1-\theta}$, where y_t denotes output, A_t the efficiency of production, and θ the capital share. As is standard, household optimality implies that the marginal rate of substitution between leisure and consumption equals the price ratio. Profit maximization of the representative firm implies that the marginal product of labor equals the wage. Combining these two conditions yields the following expression, in which we for simplicity omit the time subscript t:

$$hv'(h) = \frac{(1-\theta)}{\left(\frac{c}{y} - \frac{\bar{c}}{y}\right)\alpha}. \tag{2}$$

Rather than solving the full-dynamic model, Prescott (2004) interprets Equation (2) as the equilibrium value of hours worked given parameters and values for the consumption-output ratio; our specification adds values for the subsistence consumption-output ratio. The consumption-output ratio, directly taken from the data, captures the dynamic com-

[13] Prescott (2004) and Ohanian et al. (2008) use the above framework to quantify in how far cross-country differences in consumption taxes, labor income taxes, and government consumption can account for the differences in hours per adult across countries and over time in OECD countries. To keep the analysis focused, we abstract from these public policies. In a robustness exercise for a subset of countries for which we have information on these policies, we show that introducing them does not substantively change our main conclusions; results are available on request.

ponent of the neo-classical growth model. The difference between the consumption-output ratio and the subsistence consumption-output ratio in turn determines the size of the income effect. In the context of our data, the higher is output, y, the lower is the role of subsistence consumption for determining hours, holding everything else equal. This naturally generates a decreasing relationship between hours worked and output.

6.2. Calibration and Quantitative Results

We now calibrate the model, and assess its predictions for hours worked in the cross-section of countries. We pin down α by matching the average hours per adult in high-income countries given the average of $\frac{c}{y}$ and $\frac{\bar{c}}{y}$ in high-income countries. In a next step, we compute the model's predictions for each country given the country-specific values of $\frac{c}{y}$ and $\frac{\bar{c}}{y}$. We take c and y for the year 2005 from the PWT, and set the capital share to be 0.3224, which is the value chosen by Prescott (2004). We set the level of subsistence consumption to one dollar per day, which is a common threshold for absolute poverty used by the World Bank. For the disutility of labor supply, we use as a benchmark the specification by Prescott (2004) and Ohanian et al. (2008): $v(h) = -\log(\bar{h} - h)$, with a weekly time endowment $\bar{h}$ of 100 hours. These preferences imply a rather high labor supply elasticity. For robustness, we therefore explore specifications which give us direct control over the elasticity. Specifically, we use the following functional form assumption: $v(h) = \frac{1}{1+\frac{1}{\phi}} h^{1+\frac{1}{\phi}}$, and explore different values of ϕ, ranging from $\phi = \infty$ (linear disutility of working) to $\phi = 2$ and 1.[14] For each specification of $v(h)$, we recalibrate α to match the data on average hours per adult among the high-income countries, and then compute the model's predictions for all countries.

Figure 7 plots these for our benchmark case of log leisure preferences along with empirically observed hours against log GDP per capita.[15] The second row of Table 8 summarizes this figure by reporting the model's predictions for each country income group. In the data, hours per adult are 10.2 hours higher in low-income countries than in high-income countries, while the model predicts a difference of 6.8 hours (26.0 - 19.2), i.e. two-thirds of the observed difference. The difference between middle- and high-income countries amounts to 2.9 hours in the data and 1.8 hours in the model,

[14] When $\bar{c} = 0$, ϕ is exactly equal to the Frisch elasticity. See Shimer (2010) for a clear exposition of the various labor supply elasticities in this version of the model.

[15] Figure A.5 in the Online Appendix shows the cross-country variation in $\frac{c}{y} - \frac{\bar{c}}{y}$ fed into the model.

i.e. slightly less than two-thirds of the observed difference. Thus, the model generates substantially higher hours in low-income countries, and modestly higher hours in middle-income countries. Comparing the results from the log leisure preferences to the Frisch specifications, the linear case ($\phi = \infty$) gives the best fit of the data and on average replicates hours in the low- and middle-income countries almost perfectly. Decreasing the labor supply elasticity naturally generates smaller labor supply responses. However, even for $\phi = 1$, the model still predicts a sizeable difference of 4.2 hours between low- and high-income countries, i.e. more than 40 percent of the observed hours difference.

6.3. Welfare

We now use the model to compute a simple welfare metric across countries, building on the work of Jones and Klenow (2015). Conceptually, the welfare metric imagines giving the representative household of some country i a choice between two options: first, to work the average hours of individuals in the high-income countries and to consume a fraction λ of the average consumption in these high-income countries. The second option is to stay in country i, and to work i's average actual (not model predicted) hours and enjoy i's average consumption. Formally, the welfare metric in country i is the λ_i that solves

$$u(c_i, h_i) = u(\lambda_i \cdot c_{HI}, h_{HI}) \tag{3}$$

where c_{HI} and h_{HI} are the average consumption and hours of individuals in our sample of high-income countries.

Table 9 presents our average λ_is by income tercile for several cases. In row one, we consider only cross-country differences in consumption, and ignore differences in hours worked. Countries in the bottom third of the world income distribution have around 6.4 percent of the welfare level of the richest third. The middle third features 26.3 percent of the welfare of the richest third. The final column shows that the ratio of the top to bottom third is 15.7, meaning, as expected, very sizable differences in welfare coming through consumption alone.

The next four cases consider both consumption and hours worked, using our hours data, for alternative specifications of the disutility of working. Each specification corresponds to one row of Table 9 below the first. For the case of log utility of leisure, average welfare in the low-income countries falls to 4.5 percent of welfare in the high-income

countries, leading to a welfare ratio of 22.1 between top and bottom.[16] This is similar to the case of an infinite Frisch elasticity, which yields a welfare ratio of 21.7 between the top and the bottom. Frisch elasticities of two and one imply that welfare is 29.7 and 38.4 times higher in the richest third than in the poorest third of countries. Thus, once we include differences in hours worked, welfare differences across countries are at least 38 percent (=21.7/15.7 for $\phi = \infty$) larger than the differences coming from consumption per capita alone. Lower Frisch elasticities, as argued by e.g. Chetty et al. (2013), produce even larger welfare differences, as do higher values of the subsistence consumption requirement.

Measuring welfare differences across countries is not an exact science, and our calculations leave out a lot of elements of reality that certainly matter for welfare, such as life expectancy and inequality, as emphasized by Jones and Klenow (2015). The point of our calculations is simply that, all else equal, including cross-country differences in hours worked leads to substantially larger welfare differences across poor and rich countries than when ignoring differences in hours.

7. Time Spent on Production of Home Services

Until now, we have focused attention entirely on hours worked in the production of output counted in NIPA, both in terms of facts and in terms of implications. A large literature has emphasized broader notions of work, however, including hours spent on home production of services (Parente et al., 2000; Aguiar and Hurst, 2007; Ngai and Pissarides, 2008; Ramey, 2009; Aguiar et al., 2012, 2013; Rendall, 2014; Duernecker and Herrendorf, 2015). In this section, we consider hours of home production using a smaller set of countries for which we have data.

Hours spent producing home services are notoriously hard to measure. The two most important reasons are the difficult differentiation between leisure and home production of services in some categories, and the possibility of multi-tasking. Both difficulties apply especially when it comes to child care, but can also arise in other categories like cooking (see Aguiar and Hurst (2007) and Ramey (2009) for excellent discussions of the difficulties of measuring leisure and home production hours in general). Questions

[16] Online Appendix Figure A.6 plots the ratio of welfare to consumption in each country for this case.

covering time spent on home production of services are therefore not usually included in labor force surveys or censuses. However, a few of the surveys we use do in fact ask about time spent on some categories of home production of services. We complement these surveys with data from the Multinational Time Use Study (MTUS).[17]

We provide evidence on average weekly hours spent in five aggregated service categories, namely cooking (including preparing food and washing dishes), cleaning, child care, shopping, and collecting water and firewood. These data should be considered suggestive evidence: we do not apply the same standards to ensure comparability across countries that we apply when calculating hours worked in the market or in the production of home produced goods. The MTUS covers all five categories except collecting water and firewood. The other individual country surveys often cover only a subset of the categories. For each category and each income tercile, we have data from at least four countries, with the exception of hours spent on collecting water and firewood, which has minimal data outside the bottom tercile.

Table 10 presents the average hours spent on each of the time use categories by income group, with the number of countries for each category and group in parentheses. Overall, average hours are lowest for the high-income countries in every single category except shopping. The totals amount to 25.6 weekly hours in the bottom tercile, 25.7 hours in the middle tercile, and 18.1 hours in the top tercile. We conclude that our main finding of higher hours worked in low-income countries is still present once we consider time spent on broader categories of work, at least using these data.

8. Conclusion

In this paper, we document that the average adult in the developing world works about fifty percent more hours per week than the average adult in a rich country. To do so, we compile and harmonize international survey data from countries of all income levels, focusing on the set of countries with the most scope for international comparisons. Average hours worked are higher in developing countries both for men and for women, by all age and education groups, and along both the extensive and intensive margins.

[17] For each country, we use the year closest to 2005. Online Appendix Table A.3 provides an overview of the countries with data on time use by income terciles. All data from the bottom and middle terciles except Uganda come from our main data source for the respective country.

Our findings have important implications for labor productivity and welfare differences across countries. The literature on development accounting has almost exclusively focused on output per worker as its measure of labor productivity. We show that by instead using output per hour, labor productivity differences across countries are even higher than previously thought. Ignoring hours worked also leads to misleading conclusions about the extent of welfare differences across across. When we take our finding of higher hours in the poorest countries into consideration, welfare differences are at least one third larger than suggested by consumption per capita alone. Put simply, residents of the poorest countries are not only consumption poor, but leisure poor as well.

References

Aguiar, M. and E. Hurst (2007). Measuring Trends in Leisure: The Allocation of Time Over Five Decades. *Quarterly Journal of Economics 122*(3), 969–1006.

Aguiar, M., E. Hurst, and L. Karabarbounis (2012). Recent Developments in the Economics of Time Use. *Annual Review of Economics 4*, 373–98.

Aguiar, M., E. Hurst, and L. Karabarbounis (2013). Time Use During the Great Recession. *American Economic Review 103*(5), 1664–1696.

Alesina, A., E. Glaeser, and B. Sacerdote (2005). Work and Leisure in the United States and Europe: Why So Different? *NBER Macroeconomics Annual 20*, 1–64.

Alonso-Ortiz, J. (2014). Social Security and Retirement Across the OECD. *Journal of Economic Dynamics and Control 47*(300-316).

Basu, K. (1999). Child Labor: Cause, Consequence, and Cure, with Remarks on International Labor Standards. *Journal of Economic Literature 37*(3), 1083–1117.

Bick, A., B. Brüggemann, and N. Fuchs-Schündeln (2015). Hours Worked in Europe and the US: New Data, New Answers. Working Paper, Goethe University Frankfurt.

Bick, A. and N. Fuchs-Schündeln (2014). Taxation and Labor Supply of Married Couples Across Countries: A Macroeconomic Analysis. Working Paper, Arizona State University and Goethe University Frankfurt.

Caselli, F. (2005). Accounting for Cross-Country Income Differences. In P. Aghion and S. Durlauf. (Eds.), *Handbook of Economic Growth*.

Chetty, R., A. Guren, D. Manoli, and A. Weber (2013). Does Indivisible Labor Explain the Difference Between Micro and Macro Elasticities? A Meta Analysis of Extensive Margin Elasticities. In *NBER Macroeconomics Annual 2012*, Volume 27, pp. 1–56. MIT Press.

Costa, D. L. (2000). The Wage and the Length of the Work Day: From the 1890s to 1991. *Journal of Labor Economics 18*(1), 156–181.

Duernecker, G. and B. Herrendorf (2015). On the Allocation of Time: A Quantitative Analysis of the US and France. Working paper, University of Mannheim and Arizona State University.

Erosa, A., L. Fuster, and G. Kambourov (2012). Labor Supply and Government Programs: A Cross-Country Analysis. *Journal of Monetary Economics 59*, 84–107.

Francis, N. and V. A. Ramey (2009). Measures of Per Capita Hours and Their Implications for the Technology-Hours Debate. *Journal of Money, Credit and Banking 41*, 1071–1098.

Gollin, D. (2008). Nobody's Business But My Own: Self-Employment and Small Enterprise in Economic Development. *Journal of Monetary Economics 55*(2), 219–233.

Gollin, D., D. Lagakos, and M. E. Waugh (2014). The Agricultural Productivity Gap. *Quarterly Journal of Economics 129*(2), 939–993.

Hall, R. E. and C. I. Jones (1999). Why Do Some Countries Produce So Much More Output per Worker than Others? *Quarterly Journal of Economics 114*(1), 83–116.

Herrendorf, B., R. Rogerson, and A. Valentinyi (2013). Growth and Structural Transformation. In P. Aghion and S. Durlauf (Eds.), *Handbook of Economic Growth*, Volume 2B, Chapter 6, pp. 855–941. North-Holland.

Heston, A., R. Summers, and B. Aten (2012). Penn World Table Version 7.1. Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

Hsieh, C.-T. and P. J. Klenow (2010). Development Accounting. *American Economic Journal: Macroeconomics 2*(1), 207–223.

Jones, C. I. and P. J. Klenow (2015). Beyond GDP? Welfare Across Countries and Time. Unpublished Working Paper, Stanford University.

Klenow, P. J. and A. Rodríguez-Clare (1997). The Neoclassical Revival in Growth Economics: Has it Gone Too Far? In B. S. Bernanke and J. Rotemberg (Eds.), *NBER Macroeconomics Annual 1997*. Cambridge, MA: MIT Press.

Landes, D. S. (1999). *The Wealth and Poverty of Nations*. New York: W.W. Norton and Company.

Leamer, E. (1999). Effort, Wages, and the International Division of Labor. *Journal of Political Economy 107*(6), 1127–1162.

Lee, S., D. McCann, and J. C. Messenger (2007). *Working Time Around the World: Trends in Working Hours, Laws and Policies in a Global Comparative Perspective*. Routledge.

Lehmann, E. and J. P. Romano (2005). *Testing Statistical Hypotheses*. Springer Texts in Statistics.

Maddison, A. (1995). *Monitoring the World Economy, 1820-1992*. Paris: OECD.

McDaniel, C. (2011). Forces Shaping Hours Worked in the OECD, 1960-2004. *American Economic Journal: Macroeconomics 3*, 27–52.

McGrattan, E. R. and R. Rogerson (2004). Changes in Hours Worked. *Federal Reserve Bank of Minneapolis Quarterly Review 28*(1), 14–33.

Minnesota Population Center (2015). Integrated Public Use Microdata Series, International: Version 6.4. Minneapolis: University of Minnesota.

Ngai, R. L. and C. A. Pissarides (2008). Trends in Hours and Economic Growth. *Review of Economic Dynamics 11*(2), 239–56.

Nomura, K. and T. Amano (2012). Labor Productivity and Quality Change in Singapore: Achievements in 1974-2011 and Prospects for the Next Two Decades. *KEO Discussion Paper No. 129*.

Ohanian, L., A. Raffo, and R. Rogerson (2008). Long-Term Changes in Labor Supply and Taxes: Evidence from OECD Countries, 1956-2004. *Journal of Monetary Economics 55*(8), 1353–1362.

Parente, S. L., R. Rogerson, and R. Wright (2000). Homework in Development Economics: Household Production and the Wealth of Nations. *Journal of Political Economy 108*(4), 680–687.

Prescott, E. C. (2004). Why do Americans Work So Much More Than Europeans? *Federal Reserve Bank of Minneapolis Quarterly Review 28*, 2–13.

Ramey, V. A. (2009). Time Spent in Home Production in the 20th Century United States: New Estimates from Old Data. *Journal of Economic History 69*(1), 1–47.

Ramey, V. A. and N. Francis (2009). A Century of Work and Leisure. *American Economic Journal: Macroeconomics 1*(2), 189–224.

Rendall, M. (2014). Rise of the Service Sector and Female Market Work. Working paper, University of Zurich.

Restuccia, D. and G. Vandenbroucke (2014). Explaining Educational Attainment across Countries and over Time. *Review of Economic Dynamics 17*(4), 824–841.

Rogerson, R. (2006). Understanding Differences in Hours Worked. *Review of Economic Dynamics 9*(3), 365–409.

Shimer, R. (2010). *Labor Markets and Business Cycles*. Princeton University Press.

Wallenius, J. (2013). Social Security and Cross-Country Differences in Hours: A General Equilibrium Analysis. *Journal of Economic Dynamics and Control 37*, 2466–2482.

Tables and Figures

Table 1: Average Hours Worked Per Adult: Core vs. Broader Sets of Countries

Panel A: Means

	Country Income Group			
	Low	Middle	High	No.
Core Countries	29.3	22.0	19.1	
	(9)	(9)	(25)	(43)
Core + Partial-Year	25.9	21.9	19.9	
	(18)	(25)	(31)	(74)
All Countries	25.9	22.4	20.1	
	(20)	(28)	(33)	(81)

Panel B: Tests of Differences in Means

	Country Income Group		
	Low-High	Low-Middle	Middle-High
Core Countries	10.2***	7.3***	2.9**
Core + Partial-Year	6.0***	4.0**	2.0**
All Countries	5.8***	3.5**	2.3**

Note: Panel A reports average weekly hours worked per adult by country income group in the core countries, the core countries plus those with partial-year surveys, and in our full set of countries. The number of countries in each group is in parentheses. Panel B reports differences in mean hours among pairs of country income groups. The stars represent the p-values from a permutation test of the hypothesis that the distribution of hours worked is the same in the two groups in question: *** means a p-value less than 0.01, ** means a p-value less than 0.05, and * means a p-value less than 0.10.

Table 2: Average Hours Worked Per Adult by Sex

Panel A: Means

Sex	Country Income Group		
	Low	Middle	High
All	29.3	22.0	19.1
Women	25.8	15.2	14.9
Men	32.9	29.3	23.6

Panel B: Tests of Differences in Means

Sex	Country Income Group		
	Low-High	Low-Middle	Middle-High
All	10.2***	7.3***	2.9**
Women	10.9***	10.6***	0.3
Men	9.3***	3.6	5.7***

Note: Panel A reports average weekly hours worked per adult among the core countries by sex and country income group. Panel B reports differences in mean hours among pairs of country income groups. The stars represent the p-values from a permutation test of the hypothesis that the distribution of hours worked is the same in the two groups in question: *** means a p-value less than 0.01, ** means a p-value less than 0.05, and * means a p-value less than 0.10.

Table 3: Average Hours Worked Per Adult by Age

Panel A: Means

Age Group	Country Income Group		
	Low	Middle	High
All	29.3	22.0	19.1
Young	21.1	13.6	11.7
Prime	36.0	29.3	28.3
Old	21.1	12.9	7.8

Panel B: Tests of Differences in Means

Age Group	Country Income Group		
	Low-High	Low-Middle	Middle-High
All	10.2***	7.3***	2.9**
Young	9.4***	7.5***	1.9*
Prime	7.7***	6.7**	1.0
Old	13.3***	8.2**	5.1***

Panel C: Hypothetical Hours per Adult with U.S. Age Composition

	Country Income Group		
	Low	Middle	High
Actual Hours	29.3	22.0	19.1
Hypothetical Hours	29.2	21.7	19.7

Note: Panel A reports average weekly hours worked per adult among the core countries by age group and country income group. Panel B reports differences in mean hours among pairs of country income groups. Panel C reports the hypothetical mean hours using the U.S. age composition rather than the actual country-specific age composition. The stars represent the *p*-values from a permutation test of the hypothesis that the distribution of hours worked is the same in the two groups in question: *** means a *p*-value less than 0.01, ** means a *p*-value less than 0.05, and * means a *p*-value less than 0.10.

Table 4: Average Hours Worked Per Adult by Education Level

Panel A: Means

Education	Country Income Group		
	Low	Middle	High
All	29.3	22.0	19.1
All (*Ages 25+, Non-missing Educ.*)	33.9	25.3	21.0
Ages 25+			
Less than Secondary	32.6	20.9	11.9
Secondary Completed	38.1	29.6	23.6
More than Secondary	39.5	30.9	26.9

Panel B: Tests of Differences in Means

Education	Country Income Group		
	Low-High	Low-Middle	Middle-High
All	10.2***	7.3***	2.9**
All (*Ages 25+, Non-missing Educ.*)	12.9***	8.6**	4.3***
Ages 25+			
Less than Secondary	20.7***	11.7***	9.0***
Secondary Completed	14.5***	8.5***	6.0***
More than Secondary	12.6***	8.6**	4.0***

Panel C: Hypothetical Hours per Adult with U.S. Education Composition

	Country Income Group		
	Low	Middle	High
Actual Hours (*Age 25+, Non-missing Educ.*)	33.9	25.3	21.0
Hypothetical Hours (*Age 25+*)	38.6	26.7	24.6

Note: Panel A reports average weekly hours worked per adult among the core countries by education group and country income group. Panel B reports differences in mean hours among pairs of country income groups. The sample is restricted to individuals aged 25 or more for whom the education status is known, and excludes Turkey, for which education data are unavailable. For comparison, the first rows in Panels A and B show the data for all ages including also observations with a missing education status. Panel C reports the hypothetical mean hours using the U.S. education composition rather than the actual country-specific education composition. The stars represent the p-values from a permutation test of the hypothesis that the distribution of hours worked is the same in the two groups in question: *** means a p-value less than 0.01, ** means a p-value less than 0.05, and * means a p-value less than 0.10.

Table 5: Extensive and Intensive Margins

Panel A: Means

	Low	Middle	High
Hours Per Adult	29.3	22.0	19.1
Employment Rate	73.6	52.8	54.9
Hours Per Worker	40.2	41.6	35.0

Panel B: Tests of Differences in Means

	Country Income Group		
	Low-High	Low-Middle	Middle-High
Hours per Adult	10.2***	7.3***	2.9**
Employment Rate	18.7***	20.8***	-2.1
Hours per Employed	5.2***	-1.4	6.6***

Note: Panel A reports average weekly hours worked per adult, average employment rates, and average weekly hours worked per worker in the core countries by country income group. Panel B reports differences in these three variables among pairs of country income groups. The stars represent the p-values from a permutation test of the hypothesis that the distribution of employment rates is the same in the two groups in question: *** means a p-value less than 0.01, ** means a p-value less than 0.05, and * means a p-value less than 0.10.

Table 6: Average Hours per Worker by Sector

Panel A: Means

Sector	Country Income Group		
	Low	Middle	High
All	40.2	41.6	35.0
All (*Non-missing Sec.*)	40.3	41.2	35.1
Agriculture	36.8	36.7	39.4
Manufacturing	44.8	42.9	36.7
Services	47.8	42.7	34.3

Panel B: Tests of Differences in Means

Education	Country Income Group		
	Low-High	Low-Middle	Middle-High
All	5.2***	-1.4	6.6***
All (*Non-missing Sec.*)	5.2***	-0.9	6.1***
Agriculture	-2.6	0.1	-2.7
Manufacturing	8.1***	1.9	6.2***
Services	13.5***	5.1**	8.4***

Panel C: Hypothetical Hours per Worker with U.S. Sectoral Structure

	Country Income Group		
	Low	Middle	High
Actual Hours (*Non-missing Sec.*)	40.3	41.2	35.1
Hypothetical Hours	47.0	42.6	34.9

Note: Panel A reports average weekly hours worked per adult among the core countries by sector of main job and country income group. Panel B reports differences in mean hours among pairs of country income groups. The sample is restricted to individuals for whom the sector of employment is known, and excludes Switzerland and Turkey, for which sectoral data are unavailable. For comparison, the first rows in Panels A and B show the data including observations with a missing sector of employment. Panel C reports the hypothetical mean hours using the U.S. sectoral composition rather than the actual country-specific sectoral composition. The stars represent the p-values from a permutation test of the hypothesis that the distribution of hours worked is the same in the two groups in question: *** means a p-value less than 0.01, ** means a p-value less than 0.05, and * means a p-value less than 0.10.

Table 7: Labor Productivity Differences Across Countries

	Country Income Group			
	Low	Middle	High	High/Low
GDP per Adult	7.7	29.5	100.0	12.9
GDP per Worker	6.2	32.6	100.0	16.1
GDP per Hour Worked	5.1	26.4	100.0	19.5

Note: Labor productivity is computed as the average labor productivity within each country income group relative to the average labor productivity of the high-income group, which is normalized to 100.

Table 8: Model Predictions

	Country Income Group		
	Low	Middle	High*
Data	29.3	22.0	19.1
Model			
Log	26.0	21.0	19.2
ϕ=∞	29.3	22.0	19.2
ϕ=2	25.1	20.8	19.2
ϕ=1	23.3	20.3	19.1

Note: The Table shows average weekly hours worked per adult by country income group in the data and in different model specifications.

*The mean hours in high-income countries are the calibration target. We match those hours perfectly by using the average $\frac{c}{y}$ and $\frac{\bar{c}}{y}$ in high-income countries. Since we solve the model for each country with the country-specific $\frac{c}{y}$ and $\frac{\bar{c}}{y}$, the *average of the predicted hours* for the high-income countries can slightly differ from the *predicted hours for the average* high-income country model inputs.

Table 9: Welfare Differences Across Countries

	Country Income Group			
	Low	Middle	High	High/Low
Consumption	6.4	26.3	100	15.7
+ Hours Per Adult				
Log	4.5	23.8	100	22.1
ϕ=∞	4.6	23.9	100	21.7
ϕ=2	3.4	22.2	100	29.7
ϕ=1	2.6	21.7	100	38.4

Note: Average welfare is depicted for each country income group relative to the welfare of the average high-income country, which is normalized to 100. The first row includes only consumption and ignores differences in hours. The other rows each correspond to one specification of the disutility of hours worked.

Table 10: Hours Spent in Production of Home Services

	Country Income Group		
	Low	Middle	High
Cooking	8.6	8.6	6.1
	(6)	(4)	(9)
Childcare	6.0	6.3	2.6
	(7)	(4)	(9)
Cleaning	5.7	7.6	5.7
	(6)	(4)	(9)
Collecting Water	3.4	1.3	–
	(8)	(3)	(0)
Shopping	1.9	1.9	3.7
	(6)	(4)	(9)
Total	25.6	25.7	18.1

Note: Average weekly hours for each activity are computed only over countries where data have been collected. The number of countries is in parentheses.

Figure 1: Average Hours Worked per Adult

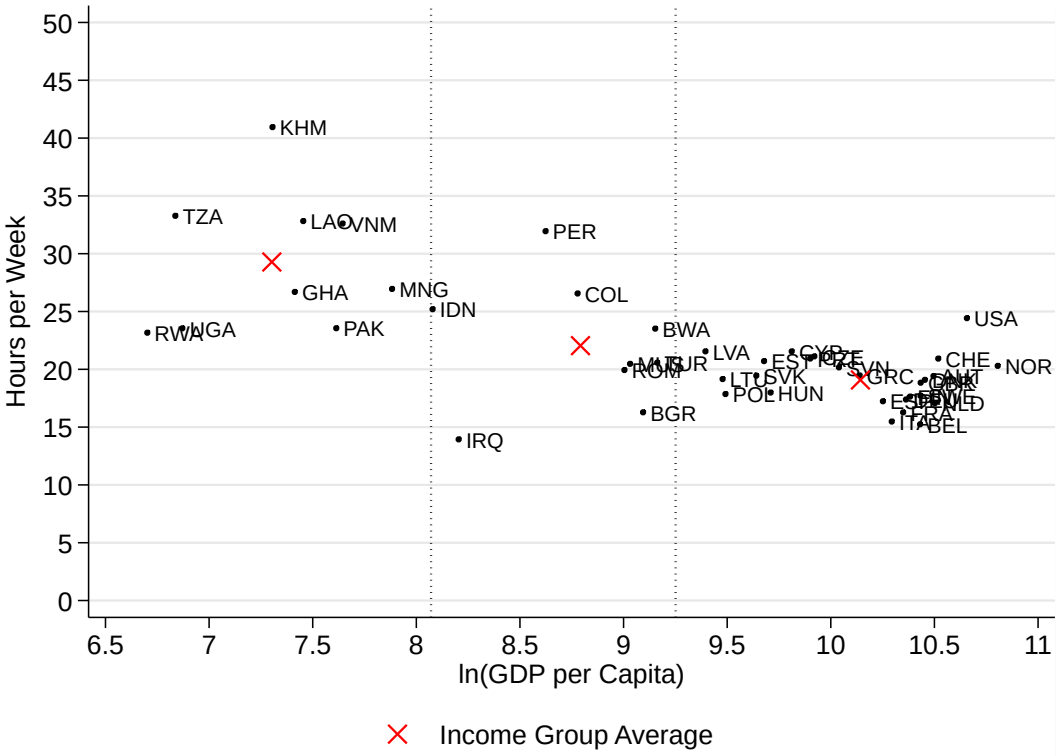
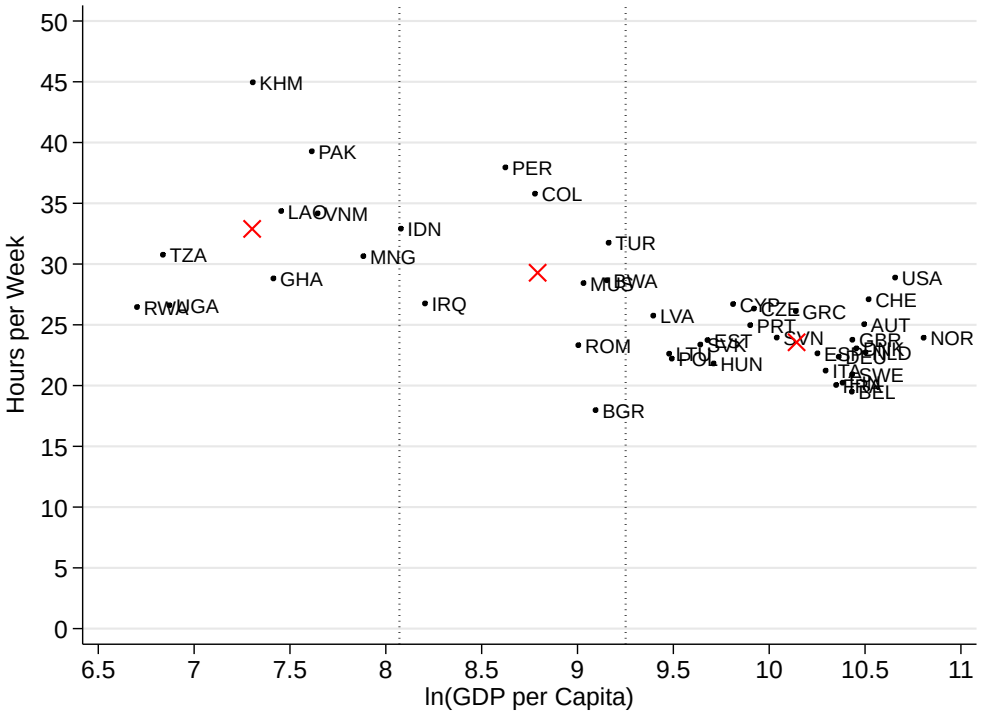


Figure 2: Average Hours per Adult by Sex

(a) Men



(b) Women

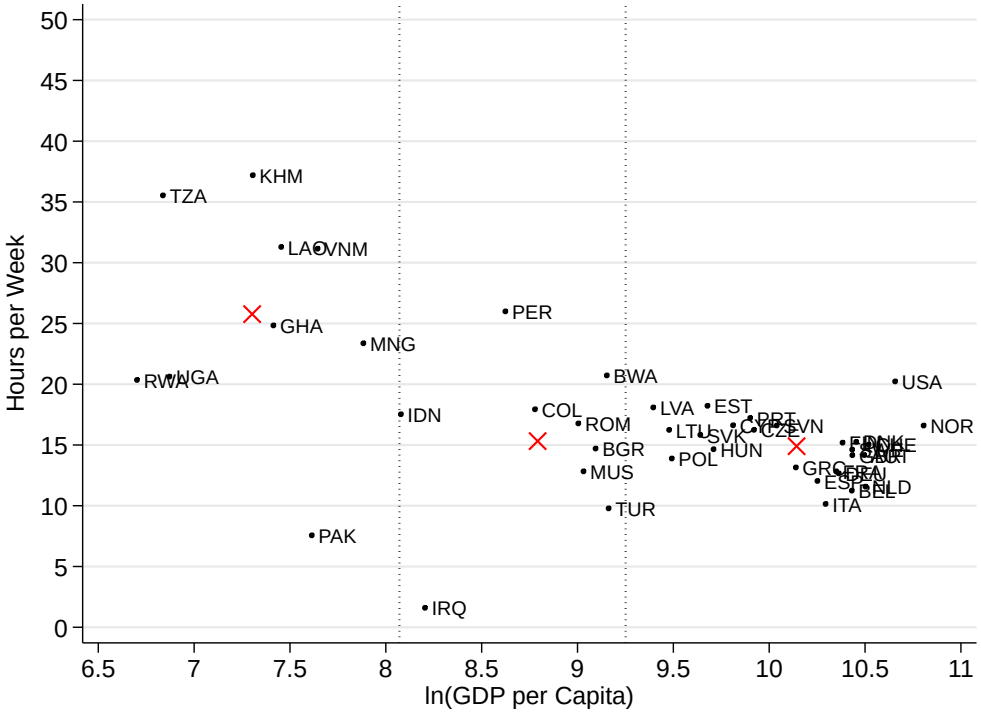
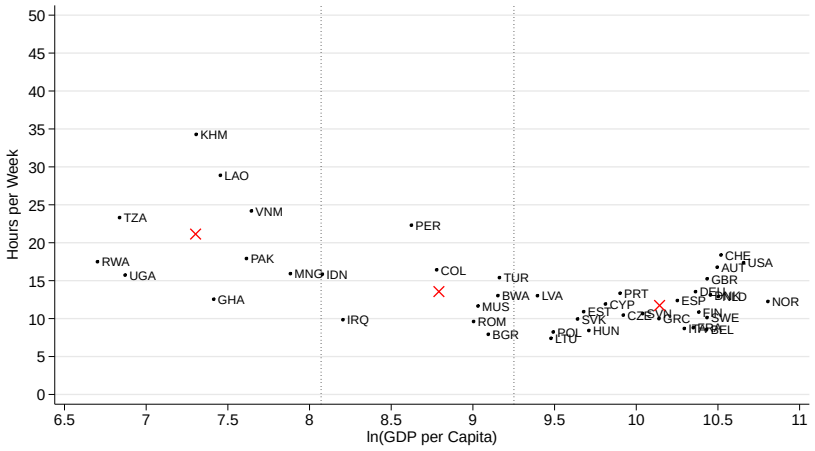
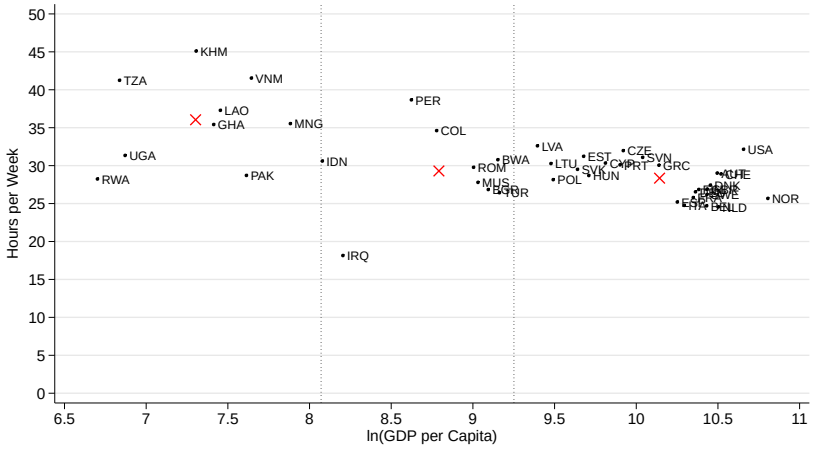


Figure 3: Average Hours per Adult by Age

(a) Young (Ages 15 to 24)



(b) Prime (Ages 25 to 54)



(c) Old (Ages 55+)

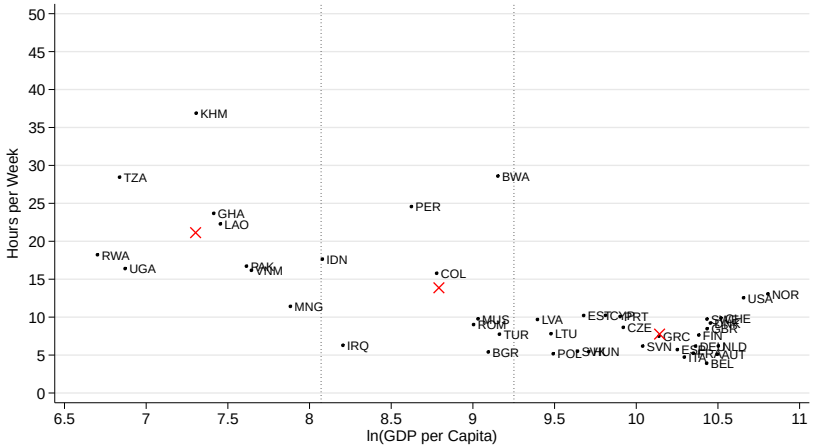
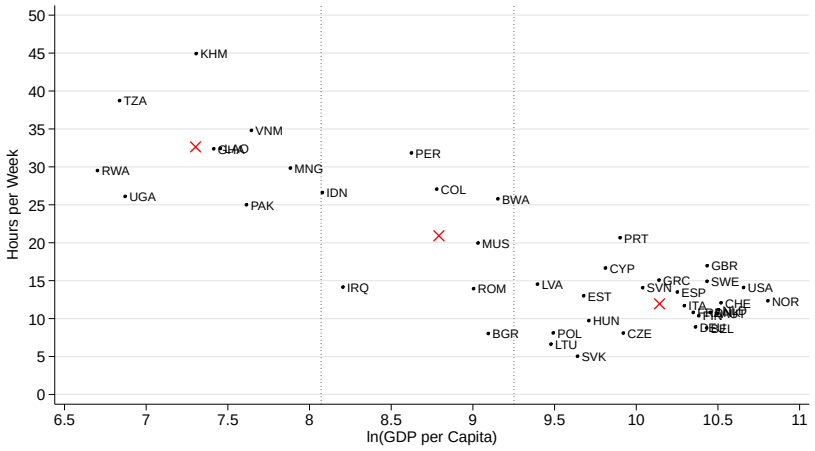
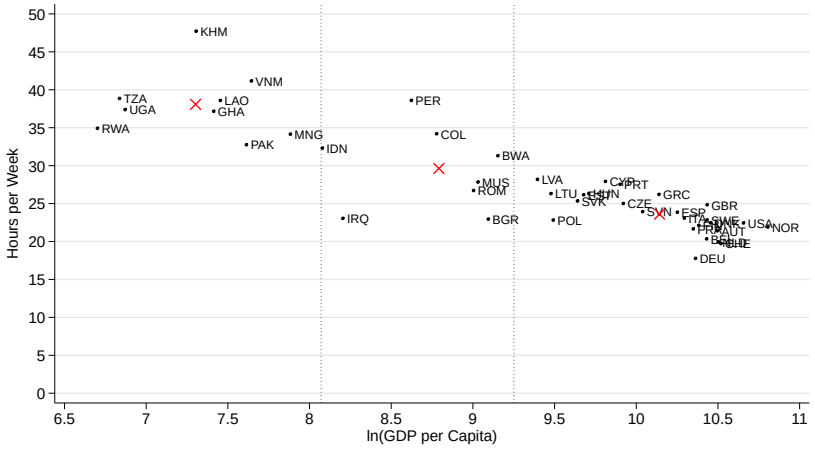


Figure 4: Average Hours per Adult by Education (Ages 25+ only)

(a) Less than Secondary School



(b) Secondary School Completed



(c) More than Secondary School

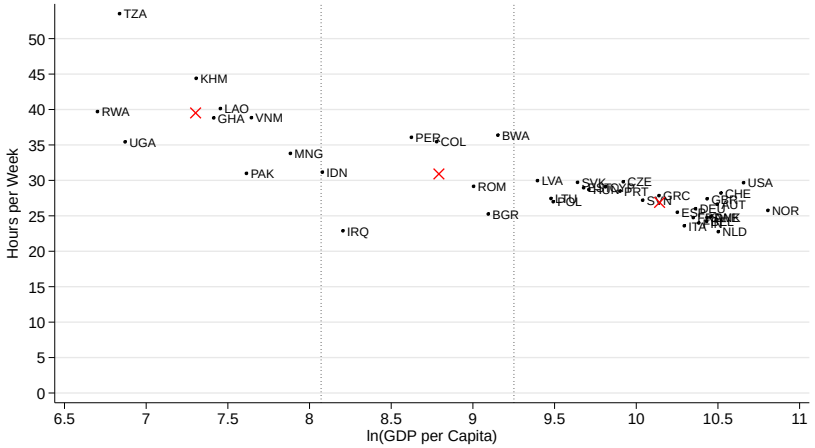
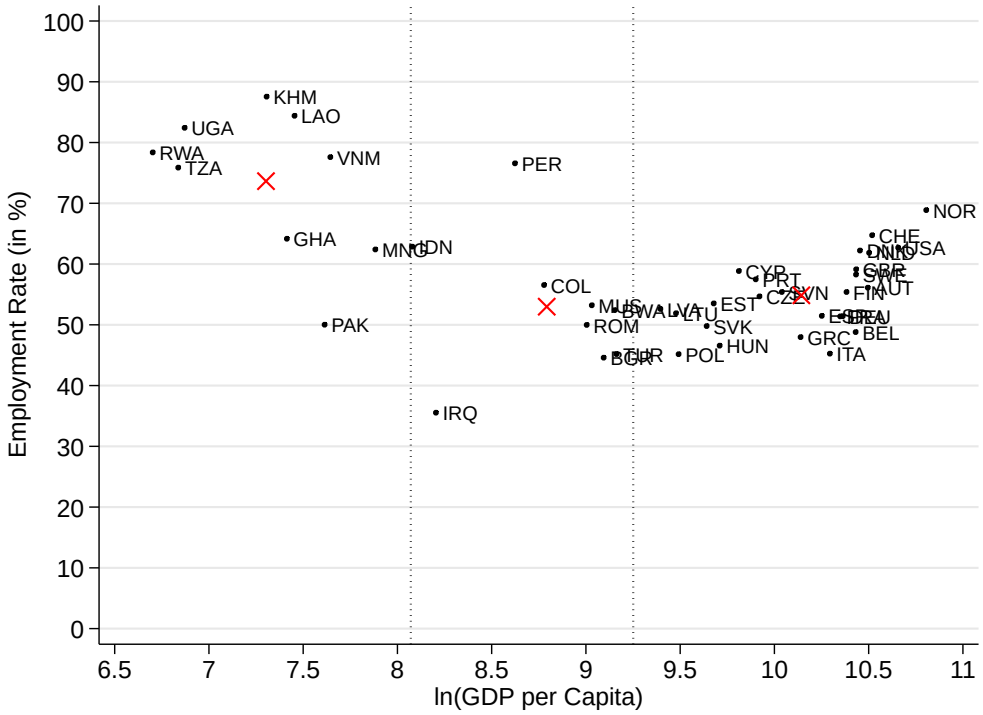


Figure 5: Extensive and Intensive Margins

(a) Employment Rate



(b) Hours per Worker

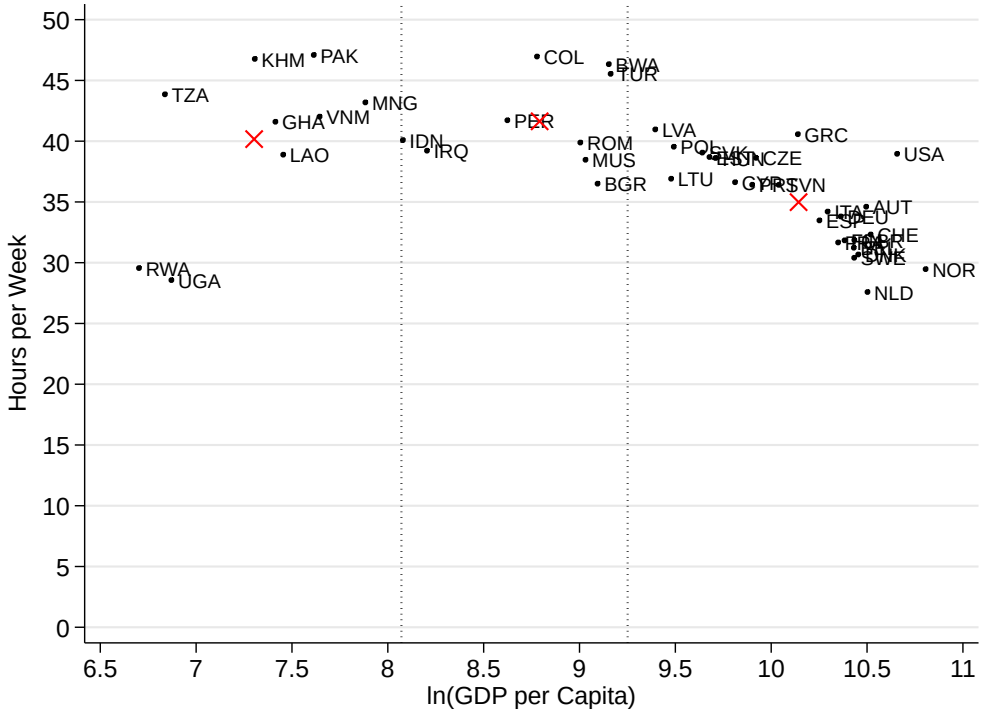


Figure 6: Average Hours per Adult – Core Countries vs. U.S. Time-Series

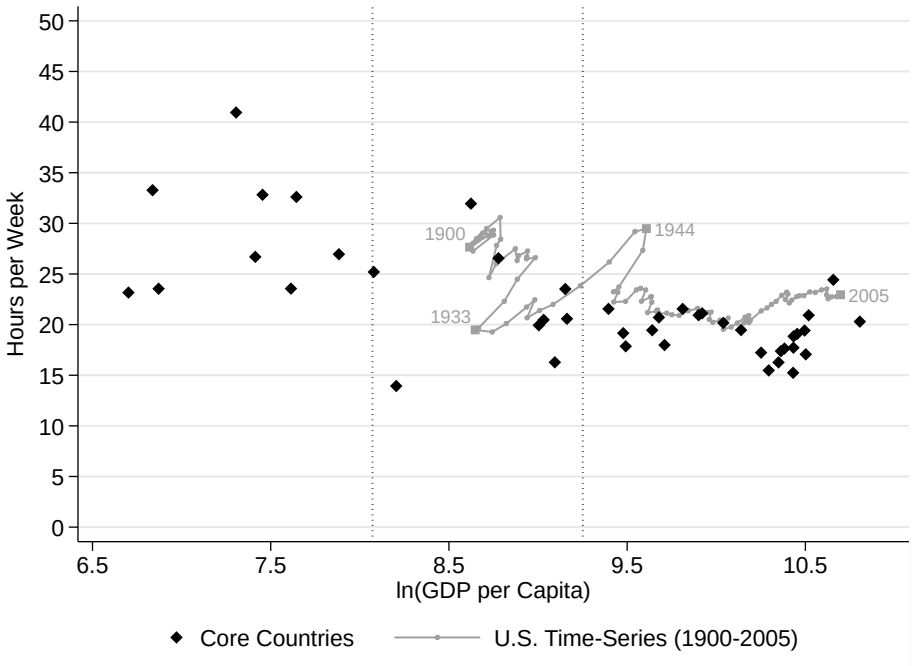
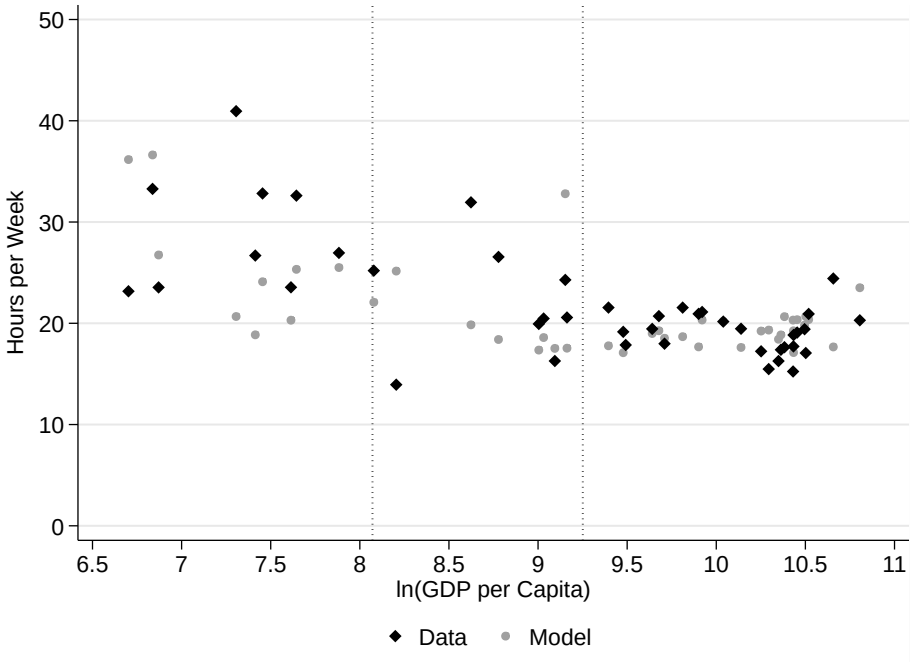


Figure 7: Average Hours per Adult – Model (Log) vs. Data



Appendix (For Online Publication Only)

A. Data Appendix

1.1. Survey Time Coverage

Our core countries have the restriction that their surveys cover the entire calendar year. Because surveys are structured differently across countries, this classification is however not as straightforward as one may think. We categorize the surveys as follows, based on how much we know about the timing of household interviews:

(a) For any individual interview the week is known.

(b) For any individual interview the month is known, but not the week.

(c) Any individual interview falls within a period longer than a month and shorter than a quarter, but neither the week nor the month is known.

(d) Any individual interview falls within a quarter, but neither the week nor the month is known.

(e) Any individual interview falls within a period longer than a quarter, but neither the week nor the month is known.

Going from (a) to (e), the information about the individual interview date becomes less precise. In order to qualify as a core country, a country has to

i. fall in category (a) or (b) and cover each month of the year

ii. fall in category (d) and cover each quarter

iii. fall in category (c) or (e) and cover the entire year.

To give a concrete example, the CPS in the US is conducted in each month but only covers one week (specifically, the reference week contains the 12th of a month). Hence, the US falls into category (a) and in our set of core countries. Brazil also falls in category (a) since we know the exact reference week. However, the Brazilian survey was conducted only in one week of the year, such that Brazil is not a core country. Except for case i, it may very well be that not each month is covered since we do not know for sure whether for countries in categories (c) to (e) interviews took place in each month. Of the 43 core countries four low-income and five middle-income countires fall in categories (c) to (e), though. Figures A.1 and A.2 split the countries by core and non-core countries, respectively, and show for each country the relevant category (a) to (e) and the covered weeks. Angola is not a core country despite covering the entire year since it misses information on actual hours worked.

1.2. Measuring Employment and Hours Worked

Our population of interest contains $i = 1, ..., N$ individuals and may be only a subset of all individuals in our survey data (e.g., only men). For all our calculations, we use individual survey weights, but refrain from displaying them in the following paragraphs for the ease of notation. To measure employment, we use the self-reported employment status e_i of each individual i. It takes the value 1 for anyone reporting to be employed, which includes self-employed and unpaid family workers, and 0 otherwise. We replace a missing employment status (including answers like "Don't know" and "Refuse to Answer") with 1 if positive actual hours worked are reported, and leave it missing otherwise. In general, missing employment status information is not very common in our data, with 38 of the 43 core countries having less than one percent of observations with missing employment status.

Letting the indicator $\mathbf{1}_{\mathbf{e_i}=\mathbf{nm}}$ (where nm stands for non-missing) take the value one if the employment status is known and zero otherwise, the employment rate (ER) is given by

$$ER = \frac{\sum_{i=1}^{N} e_i \mathbf{1}_{\mathbf{e_i}=\mathbf{nm}}}{\sum_{i=1}^{N} \mathbf{1}_{\mathbf{e_i}=\mathbf{nm}}}. \tag{4}$$

Our measure of hours per worker (H^e) is based on the actual number of hours worked in all jobs h_i in the reference period. This variable is directly available in some surveys, while in other surveys we add up actual hours in the main job and in all additional jobs. We assign zero hours to non-employed individuals. Employed individuals may have zero hours if they have been absent from work for the entire reference period, e.g. because of annual leave or sickness.

We impose a common cap of 112 weekly hours (7 days x 16 hours per day), though slightly lower country-specific caps may in fact be binding, since the maximum possible hours reported vary by survey. For example, for the United States, the reported number of actual hours worked in all jobs cannot exceed 99, while in the ELFS the reported actual hours in the main job are capped at 80 and in all additional jobs at 80 as well. In our data, the number of observations that are top-coded is small and exceeds 0.1 percent in only seven core countries, with the maximum being 0.87 percent in Tanzania. Bick et al. (2015) show that capping of hours in all jobs at 80 hours makes little difference for the United States and a subset of European countries from the ELFS.

Letting $\mathbf{1}_{\mathbf{h_i}=\mathbf{nm}}$ take the value one if actual hours worked in all jobs are available, hours worked employed are given by

$$H^e = \frac{\sum_{i=1}^{N} e_i h_i \mathbf{1}_{\mathbf{h_i}=\mathbf{nm}}}{\sum_{i=1}^{N} e_i \mathbf{1}_{\mathbf{h_i}=\mathbf{nm}}}. \tag{5}$$

Our measure of hours per adult (H^a) is then obtained by multiplying the extensive (ER) with the intensive (H^e) margin of labor supply:

$$H^a = ER \times H^e = \frac{\sum_{i=1}^{N} e_i \mathbf{1}_{\mathbf{e_i}=\mathbf{nm}}}{\sum_{i=1}^{N} \mathbf{1}_{\mathbf{e_i}=\mathbf{nm}}} \times \frac{\sum_{i=1}^{N} e_i h_i \mathbf{1}_{\mathbf{h_i}=\mathbf{nm}}}{\sum_{i=1}^{N} e_i \mathbf{1}_{\mathbf{h_i}=\mathbf{nm}}}, \tag{6}$$

which is how Ramey and Francis (2009) measure hours per adult as well. For each country in our data we use (4), (5) and (6) to compute H^a, H^e and ER in the aggregate, and by sex, age and education groups, as well as H^e by sector. Note that an alternative approach is to drop all individuals with any missing data, and to compute H^a as the sum of hours over the sum of adults. We prefer our current approach since it drops fewer observations, though in practice the two approaches provide similar results, since missing observations are a small fraction of the total in our data.

1.3. Hours Data from Penn World Tables and Total Economy Database

Recently, the Penn World Tables (PWT, version 8.1) and the Total Economy Database (TED), run by the Conference Board, also released data on annual hours worked per worker, in addition to employment rates, for an unbalanced panel of countries, with the earliest data coming from the year 1950. Data on hours worked per worker are missing much more often than data on employment rates. In the recent cross-section of countries, the hours data from both data sources cover less countries from the bottom third of the world income distribution than we do: compared to our 9 core countries and 20 total countries, the TED covers only 4 countries (Bangladesh, Pakistan, Sri Lanka, and Vietnam), and the PWT none. Moreover, the four countries in the TED have an average GDP per capita that is one third higher than the average GDP per capita in our bottom tercile countries. As such, both data sets are ill suited to answer the question of how hours worked in poor countries compare to the ones in rich countries nowadays.

Yet, going back in time, both data sources cover more countries that would qualify as low-income countries today. However, by reading the documentation, and the sources cited to construct these databases, we found several notable concerns with data quality in the time-series. The PWT report that hours worked are taken from the TED. Yet, the PWT apparently decided to include less observations and in many cases, the year-country observations between both data sets do not coincide, pointing to data revisions. Moreover, in many cases, the year-country observations between both data sets do not coincide, pointing to data revisions. TED itself reports the sources for each country-year observation. Many of these observations are either interpolated between two years (often spread a decade apart), or even extrapolated based on average growth rates from countries with available data in the same continent. Once we exclude these inter- or extrapolated observations, we are left with 215 observations from 14 countries (down from originally 304 observations from 17 countries) that would qualify as low-income countries today.

Looking further into the sources of these data, we still find extrapolated or interpolated values. For example, the value for Peru in 1950 is taken from Maddison (1995), who in turn reports that it is set to the average value of six other available Latin American countries. Most of the 215 observations, namely 196 observations from 8 countries, come from the Asian Productivity Organization (APO). The APO, while being generally very careful in constructing total hours worked, itself uses interpolations and extrapolations to get complete time series of hours for the Asian countries. From conversations with the APO,[18] we got some information on the sources of their data for five out of the eight countries (China, Indonesia, Sri Lanka, Thailand, and Vietnam). Only for 42 out of the 113 respective country-year observations do the original sources include any data on hours. Even for these, the sources might not necessarily use the same concept of hours across countries, and the hours measurement might not necessarily cover the entire year, but we have no further information on this. As an example for a richer country, namely Singapore, Nomura and Amano (2012) report for the APO construction of hours that, while in theory they would like to use actual hours, they have to rely on "mid-year estimates of usual weekly hours worked multiplied by 48 weeks per year as a crude assumption".

Thus, we want to stress that the comparability over time and across countries of data from the TED is much more questionable than the comparability of our data. Moreover, there are much less independent observations in the country-year database than a first look suggests.

[18] We are extremely grateful to Koji Nomura for providing this information.

B. Appendix Tables and Figures

Table A.1: Data Sources

Country	Source	Year	Tercile	Core
Albania	Living Standards Measurement Study (LSMS)	2005	2	No
Angola	Inquerito Integrado sobre o Bem Estar da Popu-lacao (IBEP)	2008	1	No
Armenia	Labour Force Survey	2008	2	No
Australia	Household, Income and Labour Dynamics in Australia (HILDA-CNEF)	2005	3	No
Austria	European Union Labour Force Survey	2005	3	Yes
Belgium	European Union Labour Force Survey	2005	3	Yes
Benin	Enquete Modulaire Integree sur les Conditions de Vie des Menages (EMICOV)	2010	1	No
Bolivia	Encuesta de Hogares (RIGA)	2005	2	No
Bosnia and Herzegovina	Living Standards Measurement Survey (LSMS)	2001	2	No
Botswana	Labour Force Survey	2005	2	Yes
Brazil	National Household Sample Survey (PNAD)	2009	2	No
Bulgaria	European Union Labour Force Survey	2005	2	Yes
Cambodia	Cambodia Socio-Economic Survey (CSES)	2011	1	Yes
Canada	Census of Canada (IPUMS)	2001	3	No
Chile	National Socioeconomic Survey (CASEN)	2009	3	No
Colombia	Integrated Household Survey (GEIH)	2008	2	Yes
Cyprus	European Union Labour Force Survey	2005	3	Yes
Czech Republic	European Union Labour Force Survey	2005	3	Yes
Denmark	European Union Labour Force Survey	2005	3	Yes
Ecuador	Population and Housing Census, 2001 (IPUMS)	2001	2	No
Egypt	Labor Market Panel Survey	2006	2	No
El Salvador	VI Population and V Housing Census	2007	2	No
Estonia	European Union Labour Force Survey	2005	3	Yes

Table A.1: Data Sources

Country	Source	Year	Tercile	Core
Finland	European Union Labour Force Survey	2005	3	Yes
France	European Union Labour Force Survey	2005	3	Yes
Germany	European Union Labour Force Survey	2005	3	Yes
Ghana	Living Standards Survey (LSMS)	1998	1	Yes
Greece	European Union Labour Force Survey	2005	3	Yes
Guatemala	Encuesta Nacional Sobre Condiciones de Vida (ENCOVI) (LSMS)	2000	2	No
Hungary	European Union Labour Force Survey	2005	3	Yes
Indonesia	Sakernas (National Labour Force Survey)	2010	2	Yes
Iraq	Household Socio-Economic Survey (LSMS)	2007	2	Yes
Ireland	European Union Labour Force Survey	2005	3	No
Italy	European Union Labour Force Survey	2005	3	Yes
Jamaica	Population Census (IPUMS)	2001	2	No
Jordan	Population and Housing Census (IPUMS)	2004	2	No
Kazakhstan	Living Standards Measurement Survey (LSMS)	1996	2	No
Kenya	Labor Force Survey	1999	1	No
Kyrgyzstan	Living Standards Measurement Survey (LSMS)	1998	1	No
Lao PDR	Expenditure and Consumption Survey	2007	1	Yes
Latvia	European Union Labour Force Survey	2005	3	Yes
Lesotho	Integrated Labour Force Survey	2008	1	No
Lithuania	European Union Labour Force Survey	2005	3	Yes
Malawi	Integrated Household Survey (LSMS)	2010	1	No
Malaysia	Integrated Public Use Microdata Series	1991	3	No
Mali	Permanent Household Survey (EPAM)	2010	1	No
Mauritius	Continuous Multi Purpose Household Survey (CMPHS)	2010	2	Yes
Mexico	Population and Housing Census (IPUMS) 2010	2010	3	No

Table A.1: Data Sources

Country	Source	Year	Tercile	Core
Mongolia	Labour Force Survey	2006	1	Yes
Namibia	Labour Force Survey	2012	2	No
Netherlands	European Union Labour Force Survey	2005	3	Yes
Nicaragua	National Household Survey Measurements on Living Standards (EMNV) (LSMS)	2005	1	No
Norway	European Union Labour Force Survey	2005	3	Yes
Pakistan	Labor Force Survey	2011	1	Yes
Panama	Encuesta de Niveles de Vida (ENV) (LSMS)	2008	2	No
Paraguay	Encuesta de Hogares (household survey)	2011	2	No
Peru	Encuesta Nacional de Hogares (ENAHO)	2010	2	Yes
Philippines	Labor Force Survey (Jan, Apr, Jul, Oct)	2010	1	No
Poland	European Union Labour Force Survey	2005	3	Yes
Portugal	European Union Labour Force Survey	2005	3	Yes
Romania	European Union Labour Force Survey	2005	2	Yes
Russia	Russia Longitudinal Monitoring Survey (RLMS)	2009	3	No
Rwanda	Enquete Integrale sur les conditions de vie des menages 2010-2011	2011	1	Yes
Serbia	Living Standards Measurement Survey (LSMS)	2007	2	No
Slovak Republic	European Union Labour Force Survey	2005	3	Yes
Slovenia	European Union Labour Force Survey	2005	3	Yes
South Africa	Census 2001 (IPUMS)	2001	2	No
Spain	European Union Labour Force Survey	2005	3	Yes
Sweden	European Union Labour Force Survey	2005	3	Yes
Switzerland	European Union Labour Force Survey	2010	3	Yes
Taiwan	Labor Force Survey	2011	3	No
Tajikistan	Living Standards Survey (LSMS)	2007	1	No
Tanzania	National Panel Survey (LSMS)	2009	1	Yes

Table A.1: Data Sources

Country	Source	Year	Tercile	Core
Timor Leste	Living Standards Survey (LSMS)	2001	1	No
Tunisia	Enquete Nationale sur la Population et l'Emploi de 2010 (ENPE 2010)	2010	2	No
Turkey	Household Labour Force Survey	2010	2	Yes
Uganda	National Panel Survey (LSMS)	2010	1	Yes
United Kingdom	European Union Labour Force Survey	2008	3	Yes
United States	Current Population Survey	2005	3	Yes
Venezuela	Population and Housing Census (IPUMS)	2001	2	No
Vietnam	Household Living Standards Survey (LSMS)	2002	1	Yes

Table A.2: GDP per Capita in 2005 US-Dollar, PPP-adjusted

Sample	Country Income Group		
	Low	Middle	High
Penn World Tables	1411 (63)	6428 (63)	28211 (64)
Core Countries	1594 (9)	7034 (9)	27353 (25)
Core + All non-core Countries	1575 (20)	6253 (28)	26400 (33)

Note: The number of countries in each group is in parentheses.

Table A.3: Home Production Hours by Individual Country and Category

	cooking	cleaning	childcare	shopping	collwf	Tercile
BEN	–	6.9	–	3.9	–	1
GHA	6.9	1.9	8.0	2.8	3.1	1
KGZ	–	–	9.8	–	3.7	1
LSO	–	–	2.1	0.1	1.9	1
MLI	5.1	2.7	3.3	–	3.1	1
MNG	6.3	4.4	2.0	1.0	4.3	1
PAK	16.4	13.9	7.2	2.1	0.8	1
RWA	6.9	4.3	–	1.3	3.4	1
UGA	10.0	–	9.7	–	6.6	1
EGY	10.8	9.3	9.6	2.6	0.3	2
GTM	8.6	8.3	10.3	1.7	3.6	2
IRQ	7.3	5.7	3.2	2.1	–	2
KAZ	–	–	–	–	–	2
ZAF	7.7	7.2	2.2	1.4	0.0	2
AUT	6.6	7.8	3.0	4.4	0.0	3
DEU	6.1	4.9	2.3	3.3	0.0	3
ESP	7.4	6.5	2.1	3.3	0.0	3
FRA	6.3	5.7	2.0	4.1	0.0	3
GBR	6.2	5.6	2.6	3.7	0.0	3
ITA	7.5	7.6	1.9	4.2	0.0	3
NLD	6.3	3.9	2.4	3.7	0.0	3
RUS	4.6	4.4	3.7	2.4	–	3
USA	3.7	4.7	2.9	4.1	0.0	3

Figure A.1: Survey Coverage – Core Countries

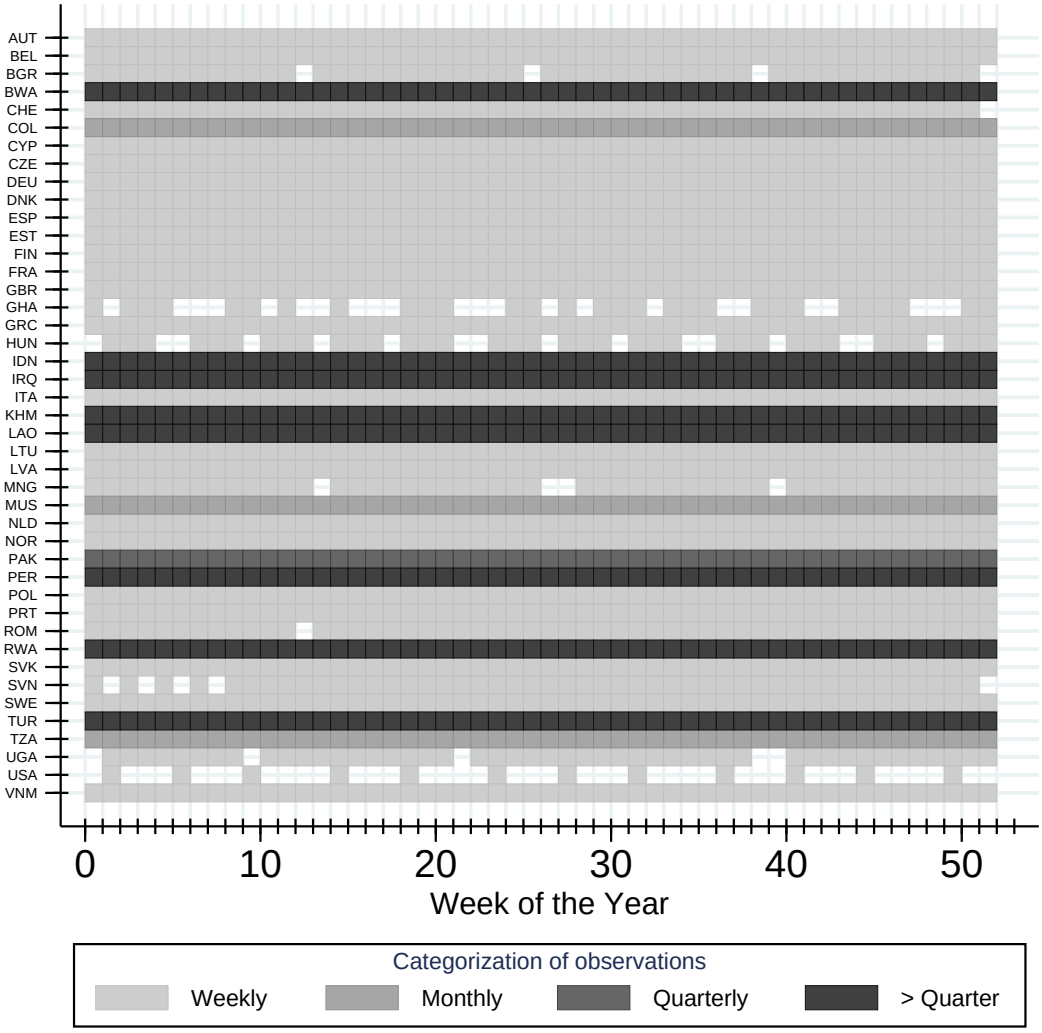


Figure A.2: Survey Coverage – Non-core Countries

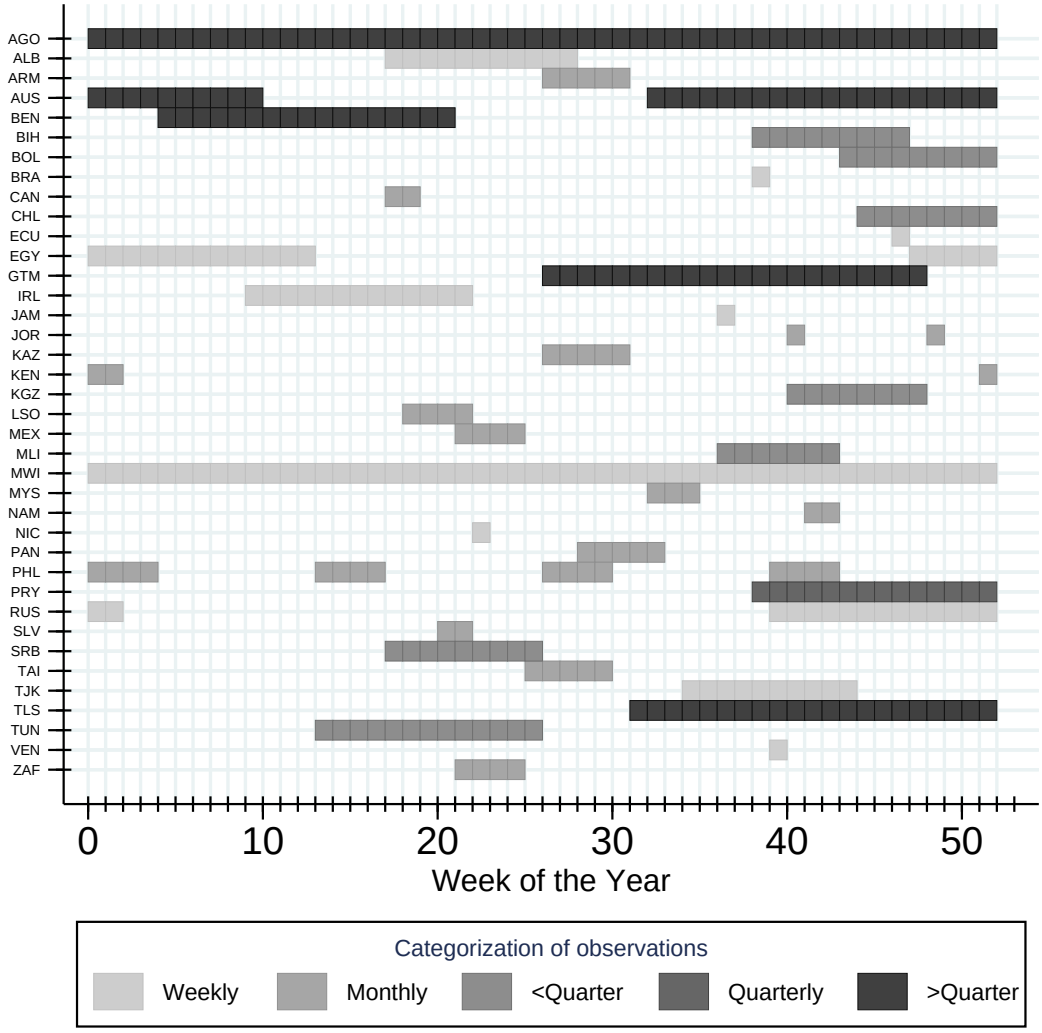


Figure A.3: Average Hours Worked per Adult: Core vs. All Non-Core Countries

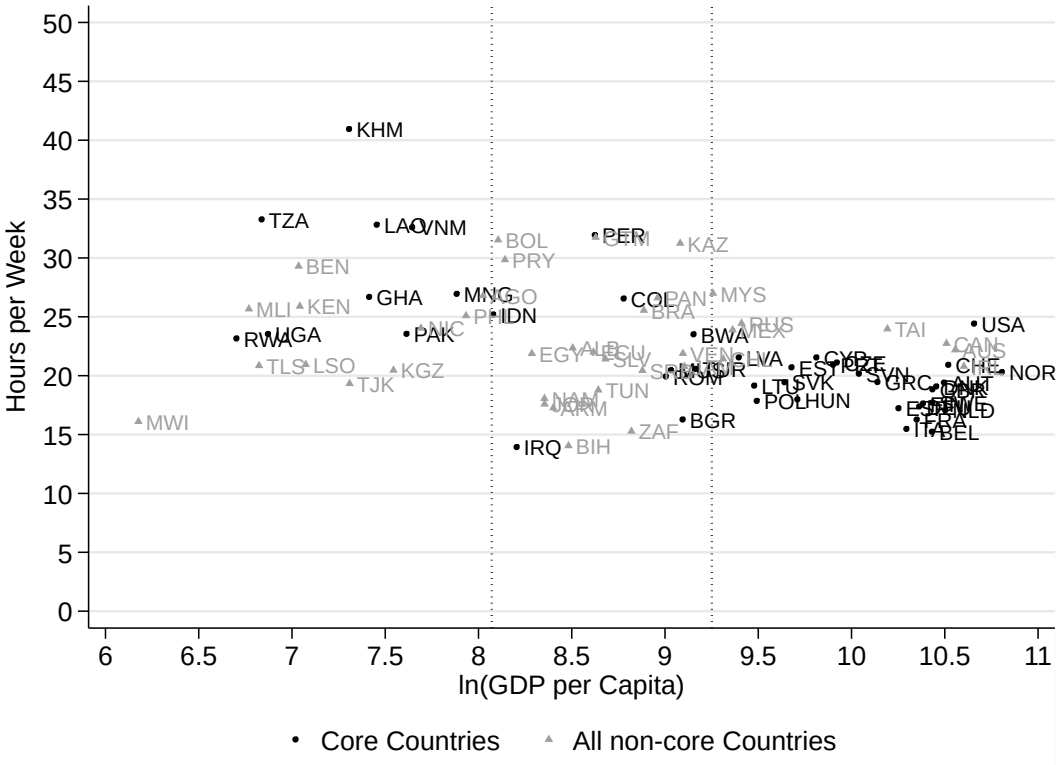
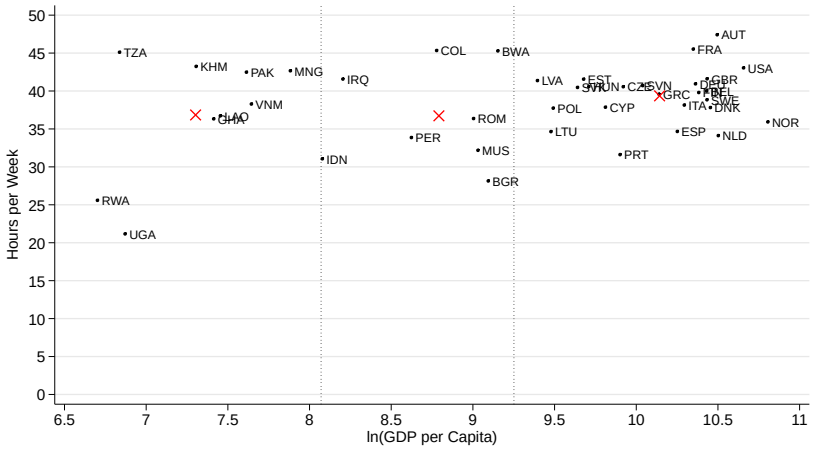
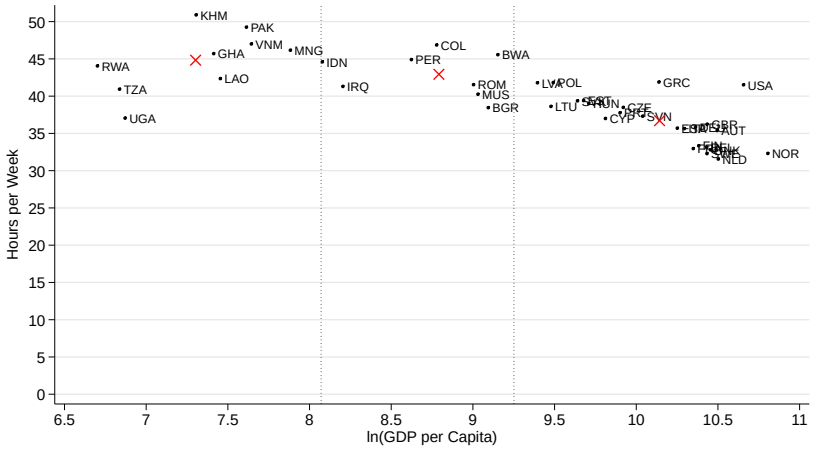


Figure A.4: Average Hours per Adult by Sector

(a) Agriculture



(b) Manufacturing



(c) Services

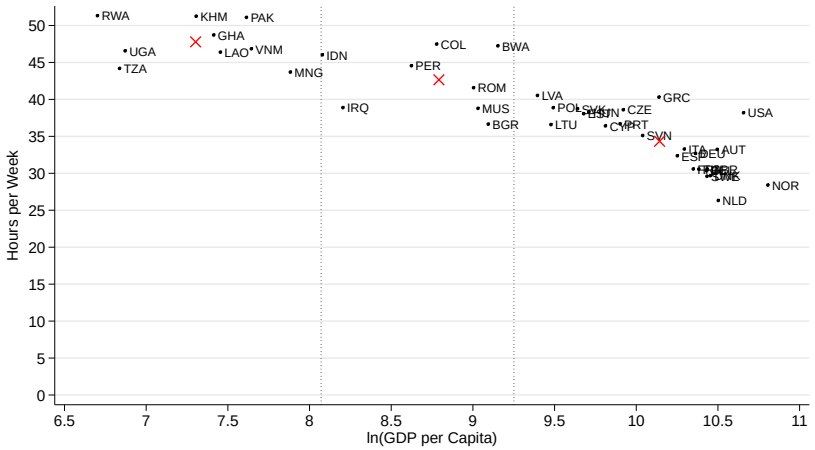


Figure A.5: Country-specific $\frac{c}{y} - \frac{\bar{c}}{y}$

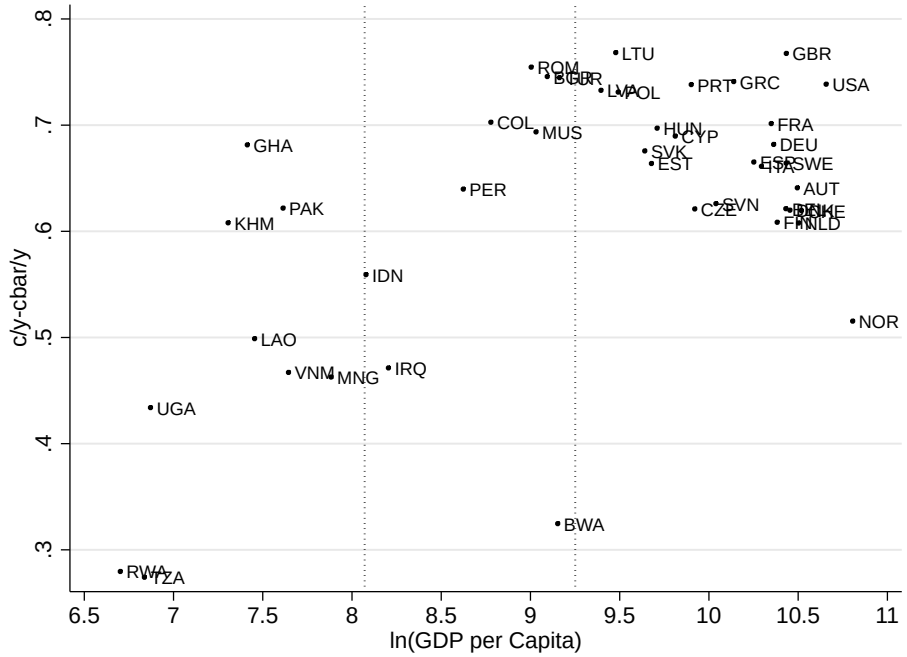


Figure A.6: Welfare vs. Consumption