



# Joint Economic Committee

Representative Kevin Brady • Chairman

## Taxes vs. Jobs

### *What New OECD Data Tell Us About The Supply Of Labor*

December 11, 2014

#### Introduction

Some economists believe the supply of labor is essentially unaffected by changes in tax policy. Thus, Congress can do little to improve or impair the rate of economic growth by either increasing or decreasing taxes. Other economists believe the supply of labor is highly responsive to changes in tax policy. Thus, Congress cannot afford to ignore the economic effects of any significant tax change.

This analysis utilizes newly available data from the Organization for Economic Cooperation and Development (OECD) to determine whether either of these assumptions is justified. It concludes that the empirical evidence strongly supports the view that the supply of labor is moderately responsive to a change in taxes.

Specifically, the elasticity of labor with respect to its after-tax return is 0.3. That means a ten percent increase in after-tax wages results in a three percent increase in hours worked.

This analysis is the first in a series to examine how taxes affect the economy.

#### Why Labor Supply Matters

Economic growth, defined as increasing levels of real output per capita, is primarily a function of labor and capital.<sup>1</sup>

Additional output can result from an increase in the *quantity* of inputs, such as more hours worked or more machines. Or, additional output can result from an increase in the *quality* of inputs, such as better skills and better machines.<sup>2</sup>

Thus, more labor means more goods and services for everyone to enjoy.

*Most economists agree that taxes can affect the economy.*

*New OECD data provide empirical evidence to support this conclusion.*

*A 10% increase in after-tax wages results in a 3% increase in hours worked.*

## Labor vs. Leisure

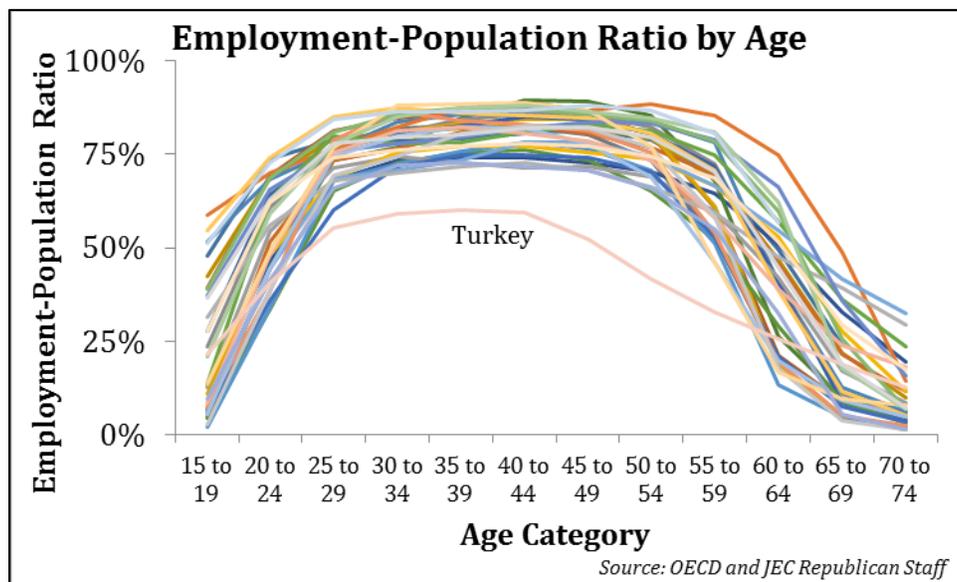
Labor refers to the amount of time spent in paid employment (market production) and leisure refers to all other time including sleeping, eating and recreation, as well as unpaid work for which there are market substitutes such as childcare, cooking and cleaning (home production).

At any point in time, individuals must choose between two competing goals: (1) increase the output of goods and services available for consumption by supplying more labor; or (2) devote additional hours to leisure by supplying less labor.

In the absence of government taxes and transfers, the price at which individuals allocate time between labor and leisure is their gross wage rate. The price of time allocated to labor is equal to the wages earned and the price of time allocated to leisure is equal to the wages forgone.

Individuals allocate time between labor and leisure in a manner consistent with an inverted U-shaped pattern. Younger adults typically delay entry into the workforce while they attend school and acquire human capital, thereby improving their ability to earn higher wages in the future. Older adults usually exit the workforce as they depreciate human capital and accumulate assets to sustain their consumption in retirement. Women are less likely to be employed than men due to social and cultural differences in the allocation of time between market and home production.<sup>3</sup>

The chart below shows the employment-population ratio by age for the thirty-four OECD countries.<sup>4</sup>



The table below shows the *average* OECD employment-population ratio by age for men and women.<sup>5</sup>

Employment-Population Ratio by Age and Gender									
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
<b>Men</b>	56%	79%	87%	88%	88%	86%	83%	73%	48%
<b>Women</b>	50%	67%	69%	71%	74%	74%	70%	57%	32%

Source: OECD and JEC Republican Staff

### Labor Supply Theories

The supply of labor can be characterized by the portion of one’s lifetime spent in employment and the number of hours worked while employed. Due to age-varying productivity and preference for leisure, people tend to work less when young, more when middle-age, and not at all when old.<sup>6</sup>

More formally, the supply of labor can be divided along two dimensions: (1) the margin of response, and (2) the timing of response. These two dimensions can also be divided along two dimensions: (1) the short-term response, and (2) the long-term response.

The margin of response reflects the decision to work or not to work (extensive margin) and the number of hours worked if employed (intensive margin). The timing of response reflects short-term changes over the business-cycle and long-term changes over the life-cycle.<sup>7</sup> The combined effect equals the total number of hours worked.

<b>Four Dimensions of Labor Supply</b>			
<b>Timing of Response</b>	<b>Margin of Response</b>		<b>Total Hours Worked</b>
	<b>Work / Not Work (Extensive Margin)</b>	<b>Full-Time / Part-Time (Intensive Margin)</b>	
Short-Term (Business-Cycle)	A	B	A + B + C + D
Long-Term (Life-Cycle)	C	D	

Economists have devised various theories to explain how the labor supply might respond to changes in tax policy. These responses may vary over time depending on whether the change was anticipated or unanticipated, and whether the change was perceived to be temporary or permanent.<sup>8</sup>

### Targeted Income Hypothesis

According to the targeted income hypothesis, workers respond to higher taxes by working more, and to lower taxes by working less, in order to maintain the same after-tax income. The table below shows how a hypothetical worker might respond to an increase in taxes by working more hours, or a decrease in taxes by working fewer hours, in order to achieve the same \$300 in after-tax wages.

<b>Targeted Income Hypothesis</b>				
<b>Hourly Wage</b>	<b>Weekly Hours</b>	<b>Weekly Wages Pre-Tax</b>	<b>Tax Rate</b>	<b>Weekly Wages After-Tax</b>
\$10	37.5	\$375	20%	\$300
\$10	40.0	\$400	25%	\$300
\$10	42.9	\$429	30%	\$300

Previous studies of New York and Singapore taxi drivers are often cited as evidence of income targeting. But subsequent analysis suggests this is not the case. A more recent study finds the likelihood of taxi drivers ending their workday is related to the number of hours already worked, not the amount of fares already collected.<sup>9</sup> Moreover, most people are not free to set their own hours of employment; thus the behavior of taxi drivers is not generally applicable to the entire economy.

## Income and Substitution Effects

According to the income and substitution effects, workers respond in offsetting ways to a change in taxes. The income effect holds that higher taxes will increase hours worked and lower taxes will decrease hours worked, while the substitution effect holds that higher taxes will decrease hours worked and lower taxes will increase hours worked.

<b>Income and Substitution Effects</b>		
	<b>Higher Taxes</b>	<b>Lower Taxes</b>
<b>Income Effect</b>	Work More	Work Less
<b>Substitution Effect</b>	Work Less	Work More

The income effect occurs when after-tax wages go up and people have more income to buy goods and services. Since leisure is a good, people “buy” more of it by working less. However, the income effect of a tax change can be offset by a change in government spending (see “Taxes and Transfers” below).<sup>10</sup>

The substitution effect occurs when after-tax wages go up and leisure becomes more expensive in terms of forgone after-tax wages. Higher after-tax wages increase the price of leisure, so people “buy” less leisure by working more.

The income effect of a tax cut only applies to workers. Those who do not work cannot respond to an increase in their after-tax wages, which they don’t have, by working less than they already do, which is not at all. But the substitution effect applies to both workers and non-workers. Even those without a job would have an increase in the opportunity cost of not working, which is the after-tax wage they would earn if they worked.

## Taxes and Transfers

In a hypothetical world where the government imposed a tax on labor and used all of the revenue to fund a lump-sum transfer to each identical household, the supply of labor would be determined solely by the tax. There would be no income effect because the loss of income from the tax would be offset by the gain in income from the transfer. But there would be a substitution effect because the tax would reduce after-tax wages, but not total household income.<sup>11</sup>

In the real world, government spending varies as much as the households that fund it and receive it. According to one study, government spending typically falls into one of four categories:<sup>12</sup>

- (1) The amount received by the individual is independent of how much they work, but it provides something people would otherwise buy for themselves, such as education and health care.
- (2) The amount received by the individual is independent of how much they work, but it provides no direct or immediate value to consumers, such as foreign aid and national defense.
- (3) The amount received by the individual is positively affected by how much they work, such as child care and work-related tax credits.
- (4) The amount received by the individual is negatively affected by how much they work, such as unemployment, disability and retirement.

To accurately assess the effect of taxes on labor, it is necessary to consider how the taxes are spent.<sup>13</sup> Different types of spending have different effects. Government spending on child care increases the labor

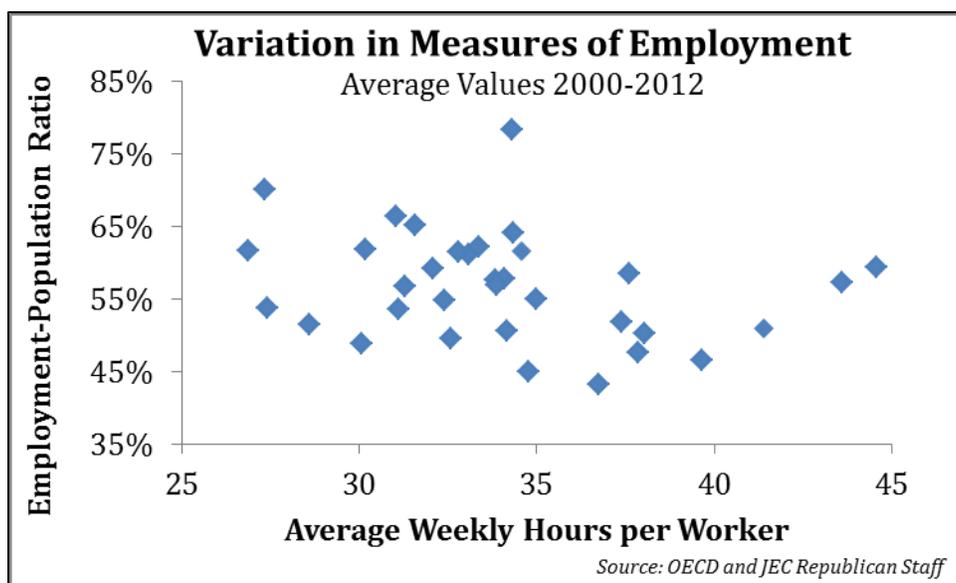
supply of parents,<sup>14</sup> while government spending on retirement decreases the labor supply of the elderly.<sup>15</sup>

Each category of spending is likely to affect a different aspect of the labor supply, with potentially offsetting effects. For example, education spending delays entry into the labor force among the young due to the higher levels of school enrollment, while delaying exit from the labor force among the middle-aged and elderly due to the higher wages of those with more education.

Ultimately, the impact of taxes and transfers on labor depends on the exact details of each program and the various interactions between them.<sup>16</sup>

### Cross-Country Comparison

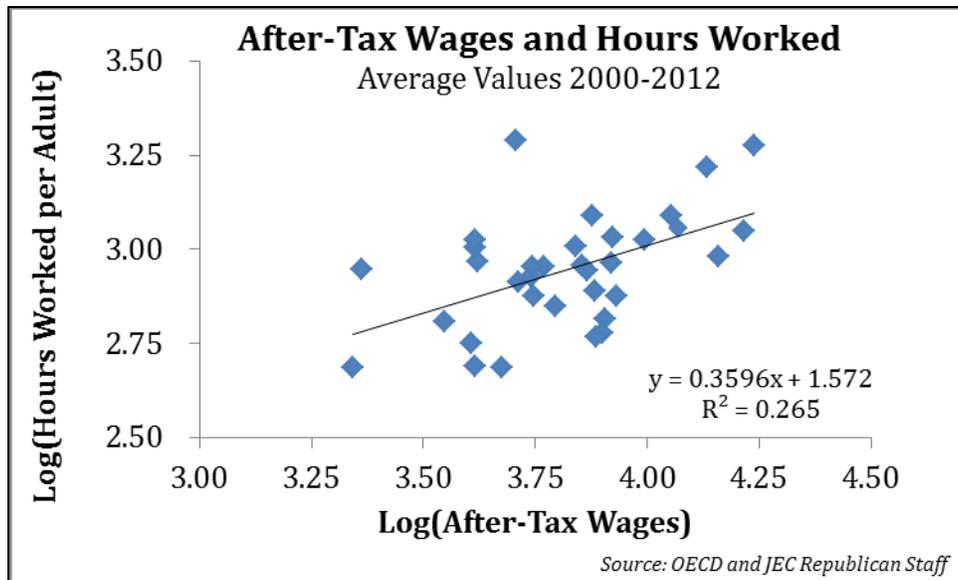
According to data compiled by the Organization for Economic Cooperation and Development (OECD), there is substantial variation in employment-population ratios and average hours worked among the thirty-four member countries.<sup>17</sup> The chart below shows the average values for each country.



Although numerous factors account for this variation, a significant portion is related to the different level of taxes in each country.

The OECD has developed a methodology to calculate marginal tax rates for various hypothetical workers.<sup>18</sup> These marginal tax rates include individual income taxes and social security taxes.<sup>19</sup> These taxes can be combined with data on consumption taxes and non-tax compulsory payments to determine the after-tax return to labor in each country.<sup>20</sup>

As the chart on the next page shows, countries with the highest after-tax wages typically have the highest hours worked per adult.<sup>21</sup> Ignoring all other factors, taxes account for roughly one-quarter of the observed variation in hours worked among OECD countries. To obtain a more complete explanation, additional factors must be considered.



**Variable #1**—The OECD provides marginal tax rates for various hypothetical workers.<sup>22</sup> These values are used as a proxy because actual data on the earnings distribution and filing status of taxpayers in each country are unavailable.<sup>23</sup> One shortcoming of this variable can be seen in the tax treatment of married couples.

**Variable #2**—In most countries, married couples are taxed separately as individuals, rather than jointly as a couple. This treatment typically reduces the marginal tax rate on married couples with more than one wage-earner.<sup>24</sup> Adding a variable to indicate this distinction significantly improves the correlation between after-tax wages and hours worked.<sup>25</sup>

**Variable #3 and #4**—The effect of taxes on labor also depends on how the revenue is spent. As previously noted, spending on child care increases the labor supply of parents, and spending on retirement decreases the labor supply of the elderly. This result can be seen by adding variables to reflect government spending on child care and potential retirement benefits.<sup>26</sup>

**Variable #5, #6 and #7**—The supply of labor is also affected by various economic and demographic factors. Hours worked are lower during a recession than during an expansion. Hours worked are higher in countries with lower birth rates and more years of education. Variables that reflect unemployment, fertility and education are also significant.<sup>27</sup>

**Variable #8**—Absent government taxes and transfers, the only way to sustain consumption in retirement is to accumulate financial or non-financial assets.<sup>28</sup> Thus, a higher level of savings corresponds to more hours of leisure and fewer hours of labor. Adding a variable to reflect national savings indicates this result.<sup>29</sup>

As shown in the table on the next page, combining all of these variables produces a result that accounts for 82 percent of the observed variation in hours worked among OECD countries.<sup>30</sup> The coefficient on the tax variable is 0.327. That means a 10 percent increase in after-tax wages results in a 3 percent increase in hours worked.

**Conclusion**

While most economists agree taxes can affect the economy, there is no consensus on the direction or magnitude of this effect. Various theories suggest the effects can range from large to small and from positive to negative.

This analysis utilizes newly available OECD data to examine the impact of taxes on labor. It concludes that the empirical evidence strongly supports the view that the supply of labor is moderately responsive to a change in after-tax wages. Specifically, a 10 percent increase in after-tax wages results in a 3 percent increase in hours worked.

This finding has important economic implications. Higher taxes result in fewer hours worked and fewer goods and services produced, while lower taxes result in more hours worked and more goods and services for everyone to enjoy.

**Summary of Regression Results (2000-2012)**

<b>Dependent Variable: Average Hours Worked per Adult</b>					
<b>#</b>	<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>T-Statistic</b>	<b>P-Value</b>
1	Taxes	0.327	0.016	20.334	0.000
2	Married	-0.042	0.012	-3.428	0.001
3	Child Care	0.025	0.003	8.094	0.000
4	Retirement	-0.378	0.015	-24.778	0.000
5	Unemployment	-0.149	0.008	-18.819	0.000
6	Fertility	-0.318	0.020	-16.163	0.000
7	Education	0.081	0.010	8.536	0.000
8	Savings	-0.232	0.014	-17.136	0.000
9	Year	-0.002	0.005	-0.386	0.699
10	Country	-0.037	0.004	-8.562	0.000
	Adjusted R <sup>2</sup>	0.819	-	-	-
	Observations	442	-	-	-

## Endnotes:

- <sup>1</sup> Labor and capital are the physical embodiment of ideas and innovations. The willingness and ability to acquire and improve skills and technology depend on entrepreneurship, private property, and the rule of law. These organizational and legal structures create the institutional framework in which an economy operates.
- <sup>2</sup> The ability to produce more output with less input is the result of increased productivity. Additional investment in human and physical capital will generally lead to an increase in productivity due to faster dissemination and adoption of new skills and technology.
- <sup>3</sup> According to the OECD, “Across the world, persisting gender gaps in education, employment and entrepreneurship are related to discriminatory social institutions, defined as laws, social norms and practices which restrict the economic and social roles of girls and women.” Gender Equality in Education, Employment and Entrepreneurship: Final Report to the MCM 2012, Organization for Economic Cooperation and Development, <http://www.oecd.org/els/family/50423364.pdf>.
- <sup>4</sup> OECD.StatExtracts, [http://stats.oecd.org/Index.aspx?DatasetCode=LFS\\_D](http://stats.oecd.org/Index.aspx?DatasetCode=LFS_D). Turkey is a statistical outlier due to the extremely low labor force participation rate among women. For additional information, see “Recent Trends in Female Labor Force Participation in Turkey,” State Planning Organization of the Republic of Turkey and World Bank, Working Paper No. 2, March 2010, <http://siteresources.worldbank.org/INTTURKEY/147254-1268836253913/22537996/RecentTrendsInFemaleLaborForceParticipationInTurkey.pdf>.
- <sup>5</sup> Organization for Economic Cooperation and Development, LMF1.4 Employment profiles over the life-course, <http://www.oecd.org/els/family/oecdfamilydatabase.htm>.
- <sup>6</sup> Anna Ruzik-Sierdzinska, Maciej Lis, Monika Potoczna, Michele Belloni, Claudia Villosio, “Age and Productivity: Human capital accumulation and depreciation,” CASE Network Reports, No. 114, 2013, <http://www.case-research.eu/en/node/58334>.
- <sup>7</sup> Long-term changes would include shifts in labor force participation among younger workers due to the transition from school-to-work, and among older workers due to the transition from work-to-retirement.
- <sup>8</sup> Raj Chetty, Adam Guren, Dayanand S. Manoli, Andrea Weber, “Does Indivisible Labor Explain the Difference Between Micro and Macro Elasticities? A Meta-Analysis of Extensive Margin Elasticities,” National Bureau of Economic Research, Working Paper 16729, January 2011, <http://www.nber.org/papers/w16729>.
- <sup>9</sup> Henry Farber, “Is Tomorrow Another Day? The Labor Supply of New York Cab Drivers,” National Bureau of Economic Research, Working Paper 9706, May 2003, <http://www.nber.org/papers/w9706>.
- <sup>10</sup> The income effect can also be offset by a change in leisure. If everyone responded to a tax cut by working less, there would be fewer goods produced and less income available to “buy” more leisure. Stephen J. Entin, “Tax Incidence, Tax Burden, and Tax Shifting: Who Really Pays the Tax?,” IRET Policy Bulletin, No. 88, September 2004, Appendix B, pp. 47-50, <http://iret.org/pub/BLTN-88.PDF>.
- <sup>11</sup> Household income is  $w*(1-t)+T$ , where  $w$ =wage,  $t$ =tax and  $T$ =transfer. If  $t_1 < t_2$ , then  $w*(1-t_1) > w*(1-t_2)$ , but  $w*(1-t_1)+T_1 = w*(1-t_2)+T_2$ .
- <sup>12</sup> Richard Rogerson, “Taxation and Market Work: Is Scandinavia an Outlier?,” National Bureau of Economic Research, Working Paper 12890, February 2007, <http://www.nber.org/papers/w12890>.
- <sup>13</sup> Bas Jacobs, “Is Prescott right? Welfare state policies and the incentives to work, learn, and retire,” CESifo Working Paper Series No. 2277, 2008, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1118286](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1118286).
- <sup>14</sup> Kelly S. Ragan, “Taxes and Time Use: Fiscal Policy in a Household Production Model,” American Economic Journal, Macro Volume 5, Issue 1, 2013, <http://www.aeaweb.org/articles.php?doi=10.1257/mac.5.1.168&fnd=s>.
- <sup>15</sup> Romain Duval, “Retirement Behaviour in OECD Countries: Impact of Old-Age Pension Schemes and Other Social Transfer Programmes,” OECD Economic Studies, No. 37, 2003/2, <https://www1.oecd.org/eco/growth/34561950.pdf>
- <sup>16</sup> The supply of labor is also affected by the taxation of transfer payments.
- <sup>17</sup> Average weekly hours per worker is equal to average annual hours actually worked per worker divided by 52. Employment-Population ratio is equal to the number of persons employed divided by the population age 15 and above. [http://stats.oecd.org/Index.aspx?DatasetCode=LFS\\_D](http://stats.oecd.org/Index.aspx?DatasetCode=LFS_D).
- <sup>18</sup> OECD, Taxing Wages 2014, <http://www.oecd.org/ctp/tax-policy/taxing-wages.htm>.

<sup>19</sup> The total marginal tax wedge is defined as “The combined central and sub-central government income tax plus employee and employer social security contribution taxes, as a percentage of labour costs defined as gross wage earnings plus employer social security contributions. The tax wedge includes cash transfers.”

<http://stats.oecd.org/index.aspx?DataSetCode=AWCOMP>

<sup>20</sup> The after-tax return to labor is  $w*(1-ti-ss-ntcp)*[1-tc/(1-tc)]$ , where  $w$ =average hourly wage,  $ti$ =income tax,  $ss$ =social security tax,  $ntcp$ =non-tax compulsory payment, and  $tc$ = consumption tax. The average hourly wage in each country is equal to  $[(\text{Labor compensation}/\text{Gross Value Added})/(1-\text{self-employment rate})] / [(\text{average annual hours worked per worker})/(40 \text{ hours} * 52 \text{ weeks}) * (\text{employment}/\text{population})]$ . This calculation assumes self-employed workers earn the same compensation as other employees. For additional information on non-tax compulsory payments and consumption taxes, see Bert Brys, “Non-Tax Compulsory Payments as an Additional Burden on Labour Income,” OECD Taxation Working Papers, No. 8, 2011, <http://dx.doi.org/10.1787/5kg3h0sn2g6k-en>; and Fidel Picos-Sanchez, “Consumption Taxation as an Additional Burden on Labour Income,” OECD Taxation Working Papers, No. 7, 2011, <http://dx.doi.org/10.1787/5kg3h0t4xlq4-en>.

<sup>21</sup> Hours worked per adult equals average annual hours actually worked per worker multiplied by the employment-population ratio.

<sup>22</sup> Hypothetical workers include: single persons earning 67%, 100%, 133% and 167% of the average wage; single persons with two children earning 67% of the average wage; one-earner married couples with two children earning 100% of the average wage; two-earner married couples with two children, earning 100%/33%, 100%/67% of the average wage; and two-earner married couples with no children earning 100%/33% of the average wage.

OECD.StatExtracts, Taxing Wages, Comparative tables and Tax Database, Table I.4,

<http://stats.oecd.org/Index.aspx?DataSetCode=AWCOMP>.

<sup>23</sup> All regressions use the arithmetic average of the marginal tax rates for the nine hypothetical workers cited above.

<sup>24</sup> Alexander Bick and Nicola Fuchs-Schundeln, “Taxation and Labor Supply of Married Couples across Countries: A Macroeconomic Analysis, March 2014, [http://www.public.asu.edu/~abick/bfs\\_hours.pdf](http://www.public.asu.edu/~abick/bfs_hours.pdf).

<sup>25</sup> Countries with individual taxation of married couples include: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Iceland, Israel, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Slovak Republic, Slovenia, Sweden, Turkey, and United Kingdom. Countries with joint taxation of married couples include: France, Germany, Ireland, Luxemburg, Poland, Portugal, Spain, Switzerland, and United States. OECD, Taxing Wages 2014, pp. 192-545. <http://www.oecd.org/ctp/tax-policy/taxing-wages.htm>.

<sup>26</sup> Child care expenditures as a percentage of gross domestic product, and population age 65 and over divided by population age 15 and over. [http://stats.oecd.org/Index.aspx?DataSetCode=SOCX\\_AGG](http://stats.oecd.org/Index.aspx?DataSetCode=SOCX_AGG) and [http://stats.oecd.org/Index.aspx?DataSetCode=LFS\\_D](http://stats.oecd.org/Index.aspx?DataSetCode=LFS_D).

<sup>27</sup> Unemployment rate, fertility rate, and percentage of population age 25 to 64 with tertiary education degree. [http://stats.oecd.org/Index.aspx?DataSetCode=LFS\\_D](http://stats.oecd.org/Index.aspx?DataSetCode=LFS_D), <http://stats.oecd.org/Index.aspx?DataSetCode=RENRLAGE#>, <http://www.oecd.org/social/family/oecdfamilydatabase.htm>.

<sup>28</sup> Such assets include stocks and bonds or land and buildings.

<sup>29</sup> National savings is equal to Gross Domestic Product minus private and public consumption expenditures.

<http://www.oecd.org/std/na/nationalaccountsataglance.htm> and <http://www.oecd.org/trade/its/>.

<sup>30</sup> Regression results also include year ( $y$ ) and country ( $c$ ) variables to reflect unidentified factors that may vary with time and location, where  $y$  = year 2000 to 2012 and  $c$  = country 1 to 34.