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Labor Supply Responses to Income Tax Free and Bracket Expansions

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Abstract

This paper contributes to the labour supply literature by focusing on how middle earners respond to financial incentives and whether the responses are different between men and women. We exploit substantial expansions in the level of individual income exempt from taxation and taxed at a lower marginal tax rate while the schedule of marginal tax rates remained the same. These tax revisions improved the financial incentives to work, in particular for individuals in the middle of the income distribution. We find robust evidence that the tax reforms increased significantly the wages of medium and high educated married males and females. They also had a positive impact on work participation that was more substantial for married women, especially the medium educated. We estimate significant positive own wage labor supply elasticities that are about the same for men and women when we condition on the labor outcome effects of inflows of EU and non-EU foreign workers, which changed the skill distribution of the economy and had a more significant impact on female labor outcomes.
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1 Introduction

Understanding the responsiveness of labor supply to after-tax wages is crucial in assessing the efficiency costs of taxation and designing labor income taxation. Robust labor supply responses to financial incentives have been difficult to robustly identify since the hourly wage may be correlated with the error term due to the effect of unobservables (i.e. individual's preferences or ability). An important contribution in this area is Blundell, Duncan and Meghir (1998) who showed that changes in tax rules provide exogenous variation that can be used to robustly identify labor supply responses to financial incentives and wage elasticities. Many studies investigated how the work decision of females responds to financial incentives because a lot of tax and benefit reforms affected women's financial incentives to work. Other studies examined how the labor supply of high earners reacts to changes in the top marginal income tax rates because a number of tax reforms involved changes in the top marginal income tax rates.[1]

This paper contributes to this literature by focusing more on how middle earners respond to financial incentives and whether the responses differ across men and women. We exploit distinctive income tax reforms that improved the financial incentives to work, especially for individuals in the middle of the income distribution. They concern revisions to the individual and progressive personal income tax system of Cyprus that aimed to harmonize its tax system with the European acquis. Between 2003-2009, there was a substantial increase in the level of individual taxable income exempt from taxation and an expansion in the range of taxable income applicable to each one of the other income tax brackets. There was no change in the marginal income tax rate that applied to each income tax bracket.

Existing research mostly investigated revisions to the schedule of marginal income tax rates (i.e. Eissa, 1995 for the US; Gelber, 2014 for Sweden). Investigations of the

[1] Other research focused on the effect of other margins such as taxable income. Surveys of this literature include Blundell and MaCurdy (1999), Meghir and Phillips (2010), Keane (2011), Saez et al. (2012) and Bargain and Peichl (2016). Earlier surveys include Killingsworth (1983), Hausman (1985), Pencavel (1986), Killingsworth and Heckman (1986).

labor supply responses of both men and women to a given policy change have been identified mostly by exploiting changes in joint income taxation and marginal tax rates. Studies include LaLumia (2008), Kaliskova (2014), Selin (2014), Gelber (2014) and Jantti, Pirttila and Selin (2015). The exogenous variation in wages due to the reform also enables us to identify men's and women's labor supply wage elasticities that are fundamental in the design of optimal taxation and can affect the distribution of family earnings. In general, the literature has found that married females' labor supply is more sensitive to changes in net wages than that of married males'.[2] However, recent evidence suggests that women's labor supply wage elasticities have been decreasing over time both on the extensive and the intensive margin (Blau and Kahn, 2007; Heim, 2007).

We adopt an empirical framework that is similar to that of Bosch and van der Klaauw (2012) and condition on the effects of other factors, besides the tax reforms. Cyprus became full member of the EU in 2004 that let to an increase in the employment of EU workers. There was also an increase in the employment of non-EU workers employed in the domestic household sector. These migration inflows changed the composition of the workforce and skill distribution of the economy and may have affected natives' labor outcomes. We use individual data on married men and women that constitute the bulk of the observations and conduct other sensitivity analysis. We find robust evidence that the tax reforms increased the wages of medium and high educated married males and females and had a positive impact on work participation that was more substantial for married females, in particular, the medium educated.

We estimate significant positive and relatively small own wage labor supply elasticities that are about the same for men and women when we condition on the labor effects of the inflows of EU and non-EU foreign workers. In contrast to men's, women's wage labor supply elasticity is double when we do not condition on the labor effects of the inflows of foreign workers. This result can be explained by the change in the skill structure

[2] Studies include Killingsworth (1983), Ashenfelter and Heckman (1974), Pencavel (1986), MaCurdy, Green and Paarsch (1990), Flood and T. MaCurdy (1992), Blundell, Duncan and Meghir (1998), Moffitt (2002), Meghir and Phillips (2008), Blomquist and Newey (2002) and Bargain, Orsini and Peichl (2014).

between foreign and native workers that enabled women to move into sectors with more stable hours and made their working hours less responsive to changes in wages. Smaller wage labor supply elasticities indicate lower disincentive effects and deadweight losses from the imposition of taxes and have implications on the design of optimal taxation of men and women. The evidence presented in this paper can be useful to other countries as many of them are revising their income tax systems to tackle various problems.

Section 2 describes the tax reforms studied in this paper and institutional setting. Section 3 presents the descriptive statistics of the individual data used to conduct the empirical analysis and preliminary evidence about the impact of the tax reforms. Section 4 describes the empirical model and identification strategy. Section 5 presents the empirical results and conducts sensitivity analysis. Finally, section 6 concludes.

2 The Tax Reforms and Institutional Setting

The personal income tax system of Cyprus is progressive and individual with the spouses being assessed independently. The 2002 Income Tax Law aimed to make the tax system simpler and harmonize it with the European acquis.[3] It became effective starting 1st January 2003. Personal deductions (such as spouse and old age allowances) were abolished. Child allowances were also abolished and replaced with a cash child benefit that varied with the number of children and household income. Overall the tax system became more individualistic and, hence, expected to treat more favorably secondary earnings (Gustafsson and Bruyn-Hundt, 1991). Personal income for tax purposes included various income components (employment income, self-employed income, pensions and rents) and was derived by considering the following allowances and deductions: contributions to trade unions or professional bodies, 20% of rental income; donations to approved charities with receipts; expenditure incurred for the maintenance of a building in respect of which there was in force a preservation. Contributions to social insurance,

[3]Details are provided in the following web sites:
http://www.cylaw.org/nomoi/enop/ind/2002_1_118/section-sca5096950-5752-1798-08d7-b632dc2a4686.html; https://www.euromod.ac.uk/using-euromod/country-reports (last accessed February 2021).

provident fund, medical fund, pension fund and life insurance premiums (up to 7% of the insured amount) were deductible up to 1/6 chargeable income.

Table 1 shows the statutory income tax brackets and schedule of marginal tax rates in 2002-2009. In 2003, the top marginal income tax rate of 40% was abolished and two additional marginal tax rates were introduced. Between 2003 and 2009, there was no change in the number of income tax brackets and marginal tax rates that applied to each bracket. However, there were substantial expansions in the range of taxable income that applied to each bracket including the tax free income. In 2003, there were four income tax brackets and tax free income was €15,377. The corresponding marginal tax rates that applied to each income tax band were: 0%, 20%, 25% and 30%. The changes that occurred are the following. First, in 2004, the level of tax free income was raised to €17,086 and, by 2008, it was raised to €19,500. In addition, all taxable income ranges were extended and the marginal tax rates that applied to each bracket remained the same. Therefore, the tax free income increased by 27% between 2003 and 2009. Second, in 2009, taxable income between €25,630 and €36,301 was taxed at 25% whereas in 2003 was subject to 30%. Third, in 2009, income earned above €20,503 and below €25,630 was taxed at 20% whereas in 2003 was taxed at 25%. As a consequence, compared to 2003, in 2009 each euro earned below the threshold of €36,300 was taxed at about 5% lower marginal tax rate. Also, each euro earned between €25,629 and €28,000 was taxed at about 10% lower marginal tax rate. Income above €36,300 was taxed at the same rate in 2003 and 2009. The available individual survey data are in 2003 and 2009. Thus, in our empirical analysis, we take 2003 to be the before and 2009 to be the post reform period.

In order to measure the extent of the tax variation of the reforms, we adjust the bracket thresholds to the inflation rate. Figure 1 plots the marginal tax rates that applied at different levels of real taxable income in 2003 and 2009. There was about a 10% increase in the level of real taxable income exempt from taxation. Also, real taxable income between 20,504 and 24,226 and 25,630 and 31,408 was taxed with a marginal tax rate that was about 5% lower in 2009 than in 2003. We also compute the average

tax rates at different levels of income taking into consideration contributions to social security. The computations indicate that the reforms reduced the effective tax rates and the reduction was greater for individuals in the middle of the income distribution. For income levels between 25,000 and 45,000, the reduction in the average tax rate was between 4.0% - 4.5%. For income levels greater than 45,000, the reduction was less than 3.5% and decreased with the level of income. Hence, the net labor income of all working individuals increased and more so for individuals in the middle of the income distribution. Thus, it is expected that the labor supply decision on the extensive margin (i.e. participation) and intensive margin (i.e. hours), was positively affected by the reform, especially for individuals in the middle of the income distribution. Economic theory predicts that individual labor supply would increase provided that the substitution effect is larger than the income effect. The income effects could be limited since the reduced marginal tax rates apply to only part of the income.

Institutional Setting

Cyprus became member of the EU in May 2004. The complete removal of barriers let to a substantial increase in EU foreign workers. Also, non-EU foreign workers employed in the domestic household sector increased. Tables 1A-2A in Appendix A.1 report macro employment statistics by nationality and sector of employment in 2003 and 2009 for males and females. Total employment increased. The increase in female employment was larger. The percentage increase in Cypriot, EU and non-EU male workers was 2.43%, 140.48% and 12.91% respectively. The corresponding statistics for female workers were 13.31%, 133.25% and 44.31%. The percentage increase in EU male and female workers was about the same whereas the percentage increase in non-EU female workers was much larger than that of non-EU male foreign workers. The same applies for native male and female workers. As a percentage of total or male employment, EU male workers doubled and non-EU male workers increased marginally. In contrast, the share of Cypriot male workers decreased. Similar trends are observed for female foreign workers. In each cross section, however, the share of non-EU female workers was more than double that of non-EU male workers.

There were also changes in the composition (origin) of the workforce in different sectors of economic activity over this period. For example, in key sectors of the economy, like accommodation and food service activities, employment decreased marginally but the composition of the workforce changed substantially and the changes were different across males and females. There was a substantial decrease in native female workers (30%) and a smaller decrease in native male workers (11%). In contrast, employment of EU male and female foreign workers increased substantially (383% and 149% respectively). In sectors that employ mostly low skilled workers, like construction and private households, there was an increase in the employment of non-EU workers.

These changes had an impact on the distribution of skill (education level) of the economy that may have affected the potential for employment and growth of wages in various sectors of the economy and, consequently, the labor outcomes of natives (Borjas, Freeman, Katz, DiNardo and Abowd, 1997). Table 3A in Appendix A.1 reports statistics provided by the last two Population Censuses; one before and the other after the tax reforms.[4] By 2011, more than 20% of the population age 15 and older was foreign born. Both Cypriot men and women constituted a smaller share of the population. In contrast, the share of citizens from EU countries more than doubled for both men and women. The population with non-EU citizenship more than doubled as well, especially among those with low secondary education. However, the share of the male non-EU population increased marginally. For Cypriot (nationals), the education level shifted from lower secondary to tertiary and the change was more significant for females. For the EU migrant adult population, the education level shifted from tertiary to upper secondary. In contrast, the education level of the non-EU migrant adult population shifted to lower secondary and the change was stronger among non-EU females. Thus, non-EU migrants were less skilled than EU migrants. By 2011, the contribution to each education (skill) group of Cypriots was smaller, EU migrants was substantially larger, in particular for upper secondary, and non-EU migrants was larger for lower secondary,

[4] The Population Census is conducted every ten years by the Statistical Service of Cyprus and provides information about the population age 15 and older by citizenship, sex and education level.

especially for females. In both years, non-EU migrants tended to be less educated compared to EU migrants but the gap between them became larger by 2011. In the estimations we conduct below, we take into consideration the changes in the composition of the workforce.

3 Data

The empirical analysis uses individual survey data from the Cyprus Family Expenditure Survey, which is drawn in the same way, provides the same information and is as representative of the population as the FES surveys of other developed countries. This survey data is collected by the Department of Statistics and Research of the Republic of Cyprus and contains information about the employment status, level and sources of income and any useful information about the living standards of the population. Each survey has a twelve month duration.[5] There are two cross sections that we can use to conduct the estimations. The first survey took place in the beginning of the reform in 2003 and the second one at the end of the reform in 2009.

We conduct the estimations using the observations on married men and women, which constitute the biggest part of the observations. We concentrate on native individuals age 20-65 who are employees or inactive and can be either the head or spouse. Although it would be interesting to study the labour supply behavior of the self-employed, we drop them from the sample as they have been found to have different preferences than employees and also self employment income is expected to be measured with an error (Lyssiotou et al. 2004). We also exclude domestic workers (helpers) who are reported to be members of the household. But, in the empirical estimation, we condition on the presence of a domestic worker living within the household. We complement the data with the percentages of EU and non-EU workers from the EU-LFS data that we presented in section 2 in order to condition on the effects of other factors correlated with the composition of the workforce and skill distribution of the economy. For a very

[5]Published papers that used earlier surveys include Christofides and Pashardes (2002), Lyssiotou (1997, 2008, 2017, 2021).

small number of female housewives who did not (i) participate in the labor market, we assign the percentage of total foreign workers in the total workforce and (ii) report their sector of economic activity, although they were employed and received positive wages, we assign the percentage of foreign workers in the total employment of the sector of activities of household as they are expected to have provided household services, such as caring for children in their home or doing domestic work in other houses.

The total sample is composed of 2474 married men and 3221 married women. The individual's education can be either one of the following: primary education (low), secondary education (medium) and with some or completed university education (high).[6] Adult individuals who received payment as employees in any kind of job in the last twelve months are asked to report their working time over the last twelve months in number of weeks or months and their weekly or monthly gross earnings and deductions (such as income tax, social security and other deductions). We use this information to compute the annual net earnings and working hours and net hourly wage of each employee. All nominal variables are adjusted for inflation.

Table 2 reports descriptive statistics of key variables for married men and women before and after the reforms. More than 99 percent of married males (females) are head (spouse) of household. The husband is the main earner in 85% of the male sample and 80% of the females sample. Non-labor income that includes the partner's labor income increased for both males and females but, as it is expected, was higher for females. The level of education of the working population was higher in 2009. Married males' labor force participation rate was very high and remained more or less stable over this period. Married females' labor force participation was much lower than that of married men but, on average, increased by about 3.3%. On average, households had fewer children in 2009.

Employment among married individuals living in rural areas increased, in particular

[6]Low education includes no school, not completed or completed primary (elementary) school. Medium education includes completed gymnasium or completed gymnasium and lyceum. High education includes not completed or completed first degree in the univesity or higher university education.

among females. The employment share of married male workers with low education declined by 6 ppts and high education increased by 3 ppts between 2003 and 2009. The employment share of married female workers with low education declined by 8 ppts and high education increased by 7 ppts between 2003 and 2009. These trends are also reflected in the partner's level of education. Public sector employment increased significantly among married females and remained stable among married males. The net hourly wage of married working men was higher than that of married working females but increased greatly for both genders between 2003 and 2009. The mean annual working hours of married females increased whereas they remained about the same for married males.

In Appendix A.2, Table 4A presents some characteristics of the distribution of the working hours of married males and females by education level before and after the reforms. Tables 5A-6A examine whether there are differences between those living in urban and rural areas. In 2009 there was an increase in non-participation among all married men that was more substantial among the low educated living in urban areas. Overall, the percentage of men who worked full time (more than 1560 hours annually) remained stable. Nevertheless, there are differences across education groups and living in urban/rural areas. In 2009, non-participation decreased among medium educated married women and more substantially among those in rural areas. Overall, non-participation remained stable among the low and high educated married women. However, non-participation among the low educated married females increased in rural areas and decreased in urban areas. In contrast, non-participation among the high educated decreased in rural areas and remained stable in urban areas. Moreover, there was an increase in the percentage of married women who worked full time that was more substantial among the medium educated living in rural areas. Tables 4A-6A also report the distribution of real taxable income before and after the reforms and indicate that the changes are in line with what is expected to have been the impact of the tax reforms. In line with the macro statistics we presented earlier, Table 7A in Appendix A.2 indicates that there was a change in the distribution of natives across the different sectors of

economic activity. Over this period, women moved into high skilled employment sectors with more stable working conditions. This change was facilitated by the higher level of education that women achieved over this period and the increase in the employment of low skilled foreign workers in the household services sector.

4 Empirical Model and Identification

In this section, we present the empirical framework to identify the labor supply responses to the tax reforms and wage elasticities. The framework is more similar to the empirical model of Bosch and van der Klaauw (2012), which is more appropriate than Blundell et al. (1998) in our context since we exploit reforms that are substantial and took place over a shorter period.

We estimate the traditional labor supply model (Heckman, 1974). We focus on how the net hourly wage w_{it} of individual i at time t affects his/her working hours h_{it},

$$\ln h_{it} = \gamma_0 + \gamma_1 \ln w_{it} + \gamma_2 X_{it} + \varepsilon_{it}. \tag{1}$$

Vector X_{it} includes various individual and household characteristics to control for heterogeneity in working preferences. These include the number of children in different age groups, number of additional adults, whether the individual is the spouse, the partner's level of education, working partner, regional dummies, interactions of the individual's education dummies with the rural area dummy, interactions of the individual's education dummies with the dummy that denotes the presence of a (foreign) domestic worker in the household.[7] Vector X_{it} also includes interactions of the individual's education dummies with cohort dummies. We define four cohort groups based on the individual's date of birth with about a ten year interval between them. The four cohorts consist of individuals born 1938-1949, 1950-1959, 1960-1969, and 1970-1978 respectively. In

[7] The employment of a low skilled foreign domestic worker by the household, who is a close substitutes to household production, is expected to lower the prices of services and affect the labour supply of women (Cortes, 2008; Cortes and Tessada, 2011). We allow the effect to vary with the education level of the individual.

total, we define 12 cohort-education groups with each one having an adequate number of observations in each cell. Thus, the reference group is the low educated males in the model of males and the 1970-1978 low educated females in the model of females. In addition, vector X_{it} includes the individual's non-labor income, which includes the labor income of the spouse.

The key parameter γ_1 denotes the uncompensated labor supply wage elasticity, which includes both the substitution and the income effect. A positive value of γ_1 implies that the substitution effect dominates the income effect. An OLS estimate of γ_1 is expected to be inconsistent since the net hourly wage may be correlated with the error term ε_{it} because vector X_{it} may not be capturing all relevant heterogeneity in individual preferences. For example, if ability is not observed and more able individuals earn higher wages and have a stronger preference for work then there will be a correlation between $\ln w_{it}$ and ε_{it}. Also, there may be reverse causality. Working more hours increases a person's annual taxable income. Thus, in a progressive tax system, the individual will enter a income bracket with a higher marginal tax rate.

We deal with the issue of endogeneity by exploiting the exogenous variation in individual after tax marginal wage due to the increase in the level of income exempt from taxation and the expansion in the rest of the brackets. Our identification strategy relies on distinguishing between the period before and after the reforms. Specifically, we use as instrumental variables the post reform indicator $I(t = 2009)$, which describes the period after the tax reforms, interacted with the individual's education dummies and interacted with the individual's education dummies and rural dummy. We estimate the following $\ln w_{it}$ equation,

$$\ln w_{it} = \beta_0 + \beta_1 I(t = 2009) + \beta_2 X_{it} + \varepsilon_{it}^w, \tag{2}$$

where the effect of the tax reform on wages (β_1) varies with the level of education and living in urban/rural area.

The post reform indicator $I(t = 2009)$ is a relevant instrumental variable if it is not correlated with ε_{it} in equation (1). As other changes may have affected labor outcomes

besides the reform, we control for the effect of other factors that are highly correlated with the composition of the workforce by including in vector X_{it} interactions of the post reform indicator with the percentages of EU and non-EU foreign workers (in the total employment of individual $i's$ sector of economic activity). We also include the interactions and squares of these variables as the literature has found this type of effects to be non-linear. We note that these time effects capture changes in labor outcomes in the post reform period that are not related to the tax reforms but are highly correlated to the macroeconomic impact of changes in the size and origin of (EU and non-EU) foreign workers. If more cross sections of the individual data were available, a linear trend could also be included.

We also control for changes in the distribution of skill between natives and EU foreign workers and natives and non-EU foreign workers that may have also affected differently the labor outcomes of natives belonging to different cohort and education groups by including in X_{it} interactions of the cohort-education group dummies with the percentages of EU and non-EU workers.

Our empirical framework also recognizes that the decision to work might be directly related to unobserved preferences and ability. So, self selection into work is most likely not random and cannot be ignored. To control for selective labor force participation, we estimate the probability of individual i at time t to participate in the labor market,

$$Pr(P_{it} = 1) = \Phi(a_0 + a_1 I(t = 2009) + a_2 X_{it}), \tag{3}$$

where $P_{it} = 1$ denotes participation of individual i in the labor market and $\Phi(.)$ is the distribution function for the standard normal. We allow the effect of the tax reforms on wages (a_1) to vary with the level of education and living in urban/ rural area.

We follow the estimation approach of Bosch and van der Klaauw (2012). We first estimate the participation probit equation (3) using maximum likelihood estimation on the full sample of married men and married women (separately) to obtain the inverse Mill's ratio. We also estimate the wage equation (2) using OLS on the sample of employed married men and women (separately) to obtain the residual ε_{it}^{w} that we add

together with the inverse Mills ratio λ_{it} among the regressors in the hours equation (1) to obtain the second stage equation,

$$\ln h_{it} = \gamma_0 + \gamma_1 \ln w_{it} + \gamma_2 X_{it} + \gamma_3 \varepsilon_{it}^{w} + \gamma_4 \lambda_{it} + \widetilde{\varepsilon}_{it}. \tag{4}$$

Estimating the above equation using OLS gives consistent estimates for γ_1. **T**he OLS estimates from equation (4) are control function estimates.

Because in equation (4) there are two additional terms to control for endogenous wages and selectivity in labor market participation, at least two exclusion restrictions are required. As we mentioned above, our key identifying (i.e. excluded) instruments are the interactions of the post reform dummy with the education group dummies and post reform dummy with the education dummies and rural area dummy. We present the test for the relevance and validity of these additional instruments and other testable hypotheses below.

5 Empirical Results

Table 3 presents key labor supply estimates of equations $(2-4)$ for two alternative specifications; without (Specification 1) and with controls (Specification 2) for the post reform and cohort-education group effects related to EU and non-EU workers. It also reports the statistics of the fit of each equation and p-value of various testable hypotheses are reported at the bottom of this table. The rest of the estimates are presented in Tables 8A-9A in Appendix A.3. We also conduct sensitivity analysis.

5.1 Married Males

Table 3 indicates that the fit of all the equations improves in specification 2. In particular, there is a substantial improvement in the fit of the participation equation of both married men as we reject the hypothesis that the post reform estimates related to the percentages of EU and non-EU foreign workers and their interaction and squares are jointly insignificant. We cannot reject this hypothesis for the wage and hours equations.

We reject the null hypothesis that jointly the instrumental variables are insignificant in the wage and participation equations of married males. We also reject that the tax reforms had a similar effect on the wages and work participation of married men with a different level of education. Specifically, the tax revisions increased significantly the wages and work participation of medium and high educated married men regardless where they lived. Based on specification 2, there was a 23% increase in the wages of the medium educated and 19% increase in the wages of the high educated. The positive effect on the work participation of the medium and high educated men is relatively small. In specification 1, the estimated effect of the tax reforms on the work participation of low and medium educated men is negative but becomes significantly positive (but small) in specification 2 that includes controls related to the inflows of foreign workers. The discrepancy in the estimated effect of the reforms under the two specification can be explained by the significant negative post reform effect of the inflows of foreign workers on work participation

We estimate a positive and relatively small own wage labor supply elasticity of married men (around 0.08) that is similar to that found by other studies and not sensitive to controls related to EU and non-EU foreign workers. We also find that men's working hours respond negatively to changes in non-labor income and the response falls in absolute value when controls related to the inflows of foreign workers are included among the regressors. In the hours equation, the mills ratio is positive but not statistically significant and the coefficient of the wage residuals is negative and significant. Therefore, we reject that the net wage is exogenous. The estimated effects of various demographic and household characteristics are reported in Table 8A in Appendix A.3 are similar across the two specifications. Low educated married males living in rural areas had higher wages than those living in urban areas. Married males with a medium or high educated partner had higher wages than those with a low educated partner. Also, married males with children had higher wages than those without children. The work participation of married males is related negatively with the presence of a for-

eign domestic worker in the household.[8] Males living in all other districts worked more hours than those living in the Famagusta area. The cohort-education group parameter estimates show that the net hourly wage of married men varied positively with their age and education level. Men's working probability does not respond to changes in non-labor income. Their working hours do not respond to changes in non-labor income. **In Table 9A in Appendix A.3**, the cohort-education group estimates related to EU and non-EU foreign workers are overall relatively small. The wages of married males correlate negatively with the percentage of non-EU foreign workers, with the exception of the youngest medium educated cohort. Although the estimates are very small, we observe a positive (negative) relationship between the employment of males and the percentage of EU (non-EU) workers.

5.2 Married Females

Similar to married males, Table 3 indicate that the fit of the wage, hours and participation equations of married females improves in specification 2. In the case of married women, there is a large improvement in the fit of the participation and hours equations as we reject that the post reform estimates of the percentages of EU and non-EU foreign workers and their interaction and squares are jointly insignificant in the participation and wage equations.

We reject the null hypothesis that the instrumental variables are jointly insignificant in the wage and participation equations of married women. We also reject that the tax reforms had a similar effect on the wages and work participation of married women with a different level of education. However, we cannot reject that the impact of the reform was similar for those living in urban and rural areas. Similar to married males, the tax reforms increased significantly the wages of medium and high educated married females; about 10% increase in the wages of the medium educated and 16% increase in the wages of the high educated. The increases are smaller than those of men as women's

[8] This estimate suggests that the income effect caused by the lower lower cost of household services (due to the employment of a foreign domestic worker) is larger than the substitution effect.

labor earnings are, on average, lower and so the expansions in the income tax bands, on average, increased their net wages to a smaller extent.

The tax reforms had a more significant impact on the work participation of married females than married men. The same applies for the post reform effects related to the inflows of foreign workers. Conditioning on the effects related to the inflows of foreign workers, we find that the tax reforms increased the working probability of all married women by $30\% - 55\%$, with the highest increase being among the medium educated women. As it is expected, women's working probability is related negatively with the level of non-labor income. We estimate a positive own wage labor supply elasticity for women that is about equal to that of married men when we control for the effects related to the inflows of foreign workers. Married women's working hours are found to be more sensitive to a change in net wage than married men's when we do not condition on the effects of the changes in migration inflows. This result tends to support that the change in the skill structure between EU and non-EU foreign workers and native workers enabled native women to move into sectors with more stable hours and made their working hours less responsive to changes in wages. Recent studies have found a long-term decline in US married women's labor supply elasticities with respect to wages (Blau and Kahn, 2007; Heim, 2007). For example, Heim (2007) estimated that the hours wage elasticity decreased substantially by 60 percent (from 0.36 to 0.14) over 1978-2002. Thenuwara and Morgan (2016) also estimated small wage labor supply elasticies for married women in Toronto similar to those found for all of Canada.

The non-labor income elasticity in the participation and hours equations is significantly negative, as expected. In the hours equation, the mills ratio is positive but not statistically significant. The coefficient of the wage residuals is negative but insignificant in specification 2. Married women with very young children age $1-2$ worked fewer hours. Low and high educated females worked more hours if there was a domestic worker present in the household. Similar to men, females living in all other districts worked more hours than those living in the Famagusta area. Females working in the public sector had higher net wages than those in the private sector with the same level of edu-

cation. The presence of a domestic worker in the household is associated positively with the wages of medium and high educated women and negatively with the wages of the low educated. The wages of married females living in the Larnaca and Limassol districts were lower compared to those living in the other regions of the country. The probability to work varied with their region of residence. In contrast to men, women living in Larnaca and Limassol had about an 8.5% lower probability to work than those living in the other regions of the country. As it is expected, high educated married women with a domestic helper in the household had a higher probability to work. The cohort-education group estimates show that high educated women had higher wages than the younger low educated cohort. Table 4 indicates that there is a positive association between the wages of the low educated women and the percentage of EU foreign workers. Also, the work participation of native medium and high educated women is negatively correlated with the percentage of EU foreign workers, suggesting their substitutability.

5.3 Sensitivity Analysis

Next, we examine the robustness of our estimates. First, we apply the grouping estimator proposed by Blundell et al. (1998), which uses many instrumental variables and may be less appropriate in our setting since we exploit reforms that took place over a short period of time. Nevertheless, the grouping estimator gives the same estimation results. As instruments we use the education dummies interacted with cohort and year dummies. In total the instrumental variables are 7 for married males and 11 for married females. Table 10A in Appendix A.3 reports key estimates. The fit of all the equations is similar to that in Table 3 and improves under specification 2. We reject that the instruments are jointly insignificant in the reduced form equations of married males and females. The same applies for the p-value of the various testable hypotheses. The labor supply wage and non-labor income estimates are about the same as those presented in Table 3. The rest of the estimates are the same and consistent with those we presented in Tables 8A-9A and can be made available. As a further robustness check, we conduct the estimations using the sample of single and married males and females without children

(childless) to examine whether the estimated responses to the reforms are confounded by the abolition of child allowances and the introduction of child benefits to families with children that occurred between 2002-2003. Again the estimates are very similar to those in Table 3 and can be made available.

6 Conclusion

An important concern of economic policy analysis is how income taxes affect individual labor supply. Research focused mainly on the responses of high earners and women and mostly investigated revisions to the schedule of marginal income tax rates. In this paper, we contribute to this literature by focusing more on how middle earners respond to financial incentives and whether there are gender differences in the responses.

We exploit distinctive reforms to the progressive individual income tax system of a European country that involved substantial increases in the level of income exempt from taxation and taxed at a lower marginal tax rate compared to before the reforms. There was no change in the marginal income tax rates applicable to each bracket. We assess the impact of these tax revisions on men's and women's wages and their decisions to work and how many hours to work. Our empirical estimation exploits the variation in wages provided by the tax reforms to deal with the issue of endogeneity and corrects for selection into work. It also controls for the effects related to changes in the skill distribution of the workforce due to inflows of (EU and non-EU) foreign workers and the presence of a foreign domestic worker in the household.

We find robust evidence that the tax reforms increased the wages of the medium educated married men and women increased by 23% and 11% respectively whereas the wages of high educated men and women increased by 19% and 16% respectively. The reforms had a positive but small effect on the work participation of married men. In contrast, they increased substantially the work participation of all married women, in particular of the medium educated. The post reform and cohort-education group estimates related to migration inflows are very small for males and larger for females.

They indicate a positive association between the wages of low educated women and the percentage of EU foreign workers. There is also a negative association between the work participation of native medium and high educated women and the percentage of EU foreign workers, suggesting their substitutability.

We estimate significant positive and relatively small own wage labor supply elasticities that are about the same for men and women. The smaller and converging gender wage elasticities indicate lower disincentive effects and deadweight losses from the imposition of taxes and have implications on the design of optimal taxation of men and women. Our findings also show that even statutory tax revisions that apply similarly to men and women can lead to greater gender equality.

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Table 1: Main Statutory Characteristics of the Income Tax System 2002-2010

%	Taxable Year				
	2002	**2003**	2004-2006	2007	**2008-2010**
0%	0-15377	**0-15377**	0-17086	0-18368	**0-19500**
20%	-	**15378-20503**	17087-25629	18369-26910	**19501-28000**
25%	-	**20504-25629**	25630-34172	26911-35197	**28001-36300**
30%	15378-20503	**Over 25630**	Over 34173	Over 35198	**Over 36301**
40%	Over 20503	-	-	-	-

Note: Annual taxable income is in euro. The econometric analysis exploits the reforms between 2003 and 2009.

Figure 1: Real Income Tax Brackets and Marginal Tax Rates in 2003 and 2009

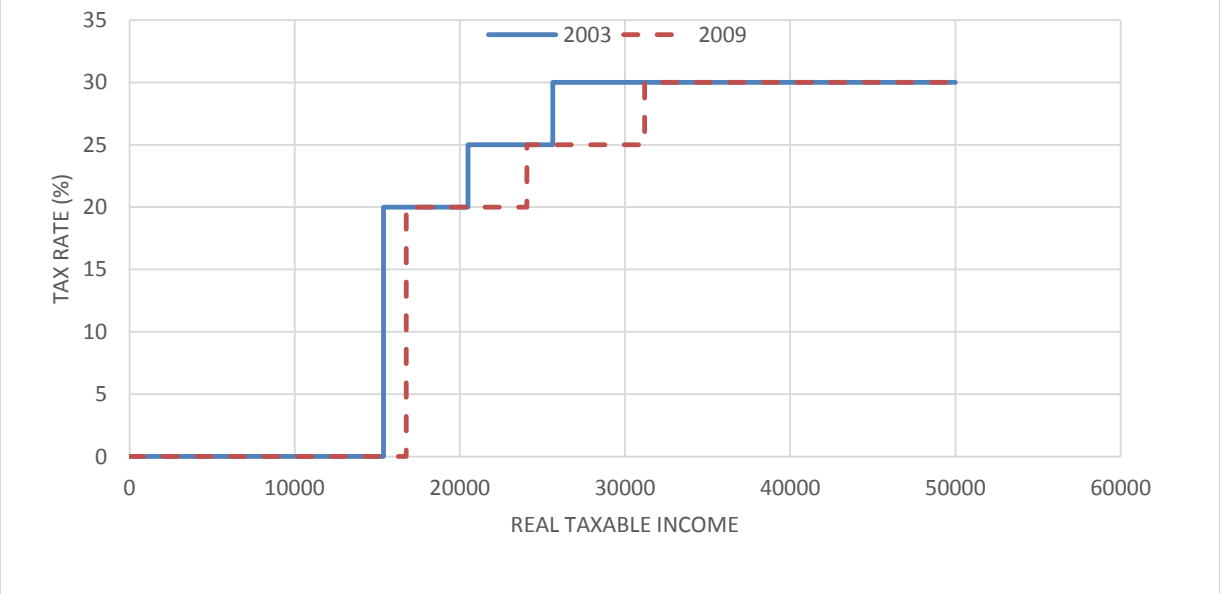

Table 2: Data Summary Statistics - Married Males and Females

	MARRIED MALES								MARRIED FEMALES							
	ALL				WORKING				ALL				WORKING			
	2003		2009		2003		2009		2003		2009		2003		2009	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Participation	0.99	0.1	0.97	0.16	1	0	1	0	0.62	0.49	0.65	0.48	1	0	1	0
Working Hours (annual)	2009	306.83	1973.44	401.43	2030	229.17	2027.8	235.05	1190.8	987.01	1273.48	977.21	1934	379.19	1956.3	360.99
Ln hours	7.6	0.2	7.6	0.2	7.6	0.2	7.6	0.2	7.53	0.31	7.54	0.32	7.53	0.31	7.54	0.32
Net hourly wage rate	9.9	5.02	11.95	6.22	9.9	5.02	11.95	6.22	6.56	3.92	8.74	5.25	6.56	3.92	8.74	5.25
Ln net hourly wage rate	2.19	0.43	2.38	0.46	2.19	0.43	2.38	0.46	1.73	0.56	2.01	0.57	1.73	0.56	2.01	0.57
Non-labor income (annual)	1112.3	3660.64	1218.93	4540.8	955.86	2661.6	1158.8	4215.73	528.69	1886.3	1519.25	5591.35	542.4	2084.79	1427.9	5535.71
Number of children 1-3	0.33	0.61	0.16	0.41	0.33	0.61	0.16	0.41	0.29	0.59	0.12	0.37	0.32	0.6	0.14	0.39
Number of children 4-6	0.27	0.53	0.15	0.4	0.27	0.53	0.15	0.4	0.24	0.51	0.13	0.38	0.28	0.55	0.16	0.41
Number of children 7-12	0.62	0.89	0.37	0.66	0.62	0.89	0.38	0.66	0.57	0.86	0.34	0.63	0.61	0.85	0.38	0.66
Number of cildren 13-18	0.57	0.85	0.47	0.76	0.58	0.85	0.48	0.76	0.55	0.85	0.42	0.73	0.59	0.86	0.46	0.73
Number of children	1.79	1.56	1.15	1.14	1.8	1.55	1.17	1.15	1.66	1.58	1.02	1.13	1.79	1.5	1.13	1.1
Number of Additional Adults	2.28	1.44	1.62	0.93	2.28	1.44	1.63	0.93	2.26	1.46	1.63	0.92	2.25	1.44	1.63	0.93
Low education	0.2	0.4	0.14	0.35	0.2	0.4	0.14	0.35	0.28	0.45	0.2	0.4	0.19	0.39	0.12	0.33
Medium education	0.49	0.5	0.51	0.5	0.49	0.5	0.51	0.5	0.46	0.5	0.47	0.5	0.46	0.5	0.46	0.5
High education	0.32	0.47	0.35	0.48	0.32	0.47	0.35	0.48	0.26	0.44	0.33	0.47	0.35	0.48	0.41	0.49
Age	44.49	9.79	46.67	9.5	44.4	9.76	46.55	9.45	43.47	10.92	45.54	10.46	0.12	0.33	0.05	0.22
Partner with low education	0.22	0.41	0.16	0.37	0.22	0.41	0.16	0.36	0.24	0.43	0.16	0.37	0.47	0.5	0.5	0.5
Partner with medium education	0.47	0.5	0.46	0.5	0.47	0.5	0.47	0.5	0.45	0.5	0.48	0.5	0.32	0.47	0.36	0.48
Partner with high education	0.31	0.46	0.37	0.48	0.31	0.46	0.37	0.48	0.27	0.44	0.3	0.46	0.01	0.09	0.02	0.13
Head	0.99	0.08	0.99	0.11	0.99	0.07	0.99	0.1	0.01	0.08	0.01	0.12	0.99	0.09	0.98	0.13
Spouse	0.01	0.08	0.01	0.11	0.01	0.07	0.01	0.1	0.99	0.08	0.99	0.12	0.26	0.44	0.3	0.46
Public sector	0.31	0.46	0.3	0.46	0.31	0.46	0.31	0.46	0.16	0.37	0.2	0.4	0.27	0.45	0.31	0.46
Living in rural area	0.29	0.46	0.31	0.46	0.29	0.45	0.31	0.46	0.31	0.46	0.33	0.47	0.15	0.36	0.19	0.39
Larnaca region	0.16	0.37	0.2	0.4	0.16	0.37	0.2	0.4	0.17	0.38	0.19	0.39	0.27	0.44	0.25	0.44
Limassol region	0.28	0.45	0.28	0.45	0.28	0.45	0.28	0.45	0.28	0.45	0.28	0.45	0.43	0.49	0.41	0.49
Nicosia region	0.42	0.49	0.38	0.49	0.42	0.49	0.38	0.49	0.4	0.49	0.37	0.48	0.1	0.3	0.08	0.28
Paphos region	0.09	0.29	0.09	0.29	0.09	0.29	0.09	0.29	0.1	0.3	0.1	0.3	0.23	0.42	0.29	0.45
Number of Observation	1359		1122		1345		1092		1786		1447		1103		943	

Note: Based on the individual data of the Cyprus Family Expenditure Surveys. 2003 is the sample before the reforms and 2009 the sample after the reforms. Non-labor income includes the labor income of the spouse.

Table 3: Selected Estimation Results - Married Males and Females

	MARRIED MALES						MARRIED FEMALES					
	SPECIFICATION 1			SPECIFICATION 2			SPECIFICATION 1			SPECIFICATION 2		
VARIABLES	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participation
Selected Regressors												
Ln net hourly wage		0.0808***			0.0833***			0.154***			0.0547**	
		(3.590)			(3.818)			(5.251)			(2.048)	
Non-labor Income		3.24e-07	-3.82e-07***		2.89e-07	-1.12e-07***		-2.01e-06**	-3.68e-06***		-1.84e-06**	-3.41e-06***
		(0.766)	(-2.997)		(0.679)	(-3.162)		(-2.208)	(-3.455)		(-2.427)	(-3.514)
Post reform*% EU workers				-0.00525	-0.000558	-0.000266				0.0204	-0.0270**	0.133***
				(-0.390)	(-0.0776)	(-0.676)				(1.157)	(-2.320)	(2.781)
Post reform*% non-EU workers				-0.00461	-0.00646	-0.00511***			t	-0.0381	0.0762***	-0.688***
				(-0.125)	(-0.296)	(-2.977)				(-0.922)	(2.598)	(-4.719)
Post reform*% EU workers*%non-EU workers				0.00464	-0.000274	0.000475***				0.00181	-0.00597**	0.0367***
				(1.181)	(-0.0933)	(3.402)				(0.506)	(-2.507)	(2.892)
Post Reform*% EU workers Squared				-0.000751	3.46e-06	-9.15e-05***				-0.00139	0.00206***	-0.00862***
				(-0.723)	(0.00463)	(-3.138)				(-1.280)	(2.743)	(-3.193)
Post reform*% non-EU workers Squared				-0.00642	0.00133	1.54e-06				0.000316	-0.000611**	0.00608***
				(-1.189)	(0.384)	(0.00696)				(0.973)	(-2.561)	(5.348)
Mills Ratio		-0.148			-0.129			0.0371			0.000967	
		(-1.525)			(-1.343)			(0.355)			(0.0251)	
Residual of wage equation		-0.0799***			-0.0835***			-0.135***			-0.0307	
		(-2.718)			(-2.803)			(-3.514)			(-0.965)	
Instrumental Variables												
Post Reform*Low Educ	0.0805		-0.0314***	0.131		0.00759	0.0700		0.00345	-0.000246		0.301**
	(0.996)		(-3.333)	(1.125)		(0.964)	(0.937)		(0.0639)	(-0.00247)		(2.079)
Post Reform*Med Educ	0.117***		-0.0192***	0.230***		0.0152**	0.0884**		-0.0479	0.107		0.556***
	(2.894)		(-2.577)	(3.503)		(2.269)	(2.509)		(-1.490)	(1.481)		(2.841)
Post Reform*High Educ	0.0999**		-0.0128	0.191***		0.0120*	0.144***		-0.0275	0.161***		0.400**
	(2.072)		(-1.509)	(3.198)		(1.781)	(4.414)		(-0.634)	(2.886)		(2.358)
Post Reform*Low Educ*Rural	-0.0913		0.00717	-0.0629		0.00183*	-0.0300		-0.118	-0.0365		0.0400
	(-1.178)		(1.319)	(-0.807)		(1.912)	(-0.275)		(-1.546)	(-0.350)		(0.473)
Post Reform*Med Educ*Rural	-0.0594		0.00869**	-0.0716		0.00206**	0.0724		0.122**	0.0834		0.0660*
	(-1.308)		(2.339)	(-1.574)		(2.439)	(1.241)		(2.376)	(1.419)		(1.649)
Post Reform*High Educ*Rural	0.0662		-0.00982	0.0560		-0.00941	0.0438		0.0510	0.0366		0.0278
	(0.959)		(-0.621)	(0.804)		(-1.014)	(0.565)		(0.596)	(0.469)		(0.266)
Cohort-Education Group Effects of Foreign Workers	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
R-squared	0.366	0.052		0.384	0.063		0.503	0.107		0.525	0.202	
Pseudo R2			0.198			0.296			0.152			0.376
Testable Hypotheses (p-value)												
Instruments	0.00834		0.000401	0.000807		0.000654	1.09E-06		0.0989	0.0116		1.11E-05
Reform effects same across education groups	0.0340		0.00325	0.00135		0.0107	0.286		0.0679	0.1		1.38E-05
Reform effects same in rural and urban areas	0.256		0.0582	0.282		0.0131	0.584		0.0380	0.498		0.394
Time effects related to foreign workers				0.244	0.855	0.00102				0.0565	0.116	0
Observations	2,428	2,428	2,474	2,428	2,428	2,474	2,034	2,034	3,221	2,034	2,034	3,221

Note : Robust t-statistics in parentheses. Specification 1 and Specification 2 are without and with controls for the effects related to the inflows of foreign workers. The cohort-education group estimates related to the inflows of foreign workers are reported in Table 4. Non-labor income includes the labor income of the spouse. For married males, the reference group is the low educated. For married females, the reference group is the 1970-1978 low educated females. The rest of the estimates are reported in Table 8A and Table 9A. *** p<0.01, ** p<0.05, * p<0.1

Appendix

A.1: Macro Employment Statistics

Table 1A: Male Employment by Nationality and Sector of Economic Activity

	% IN MALE SECTOR EMPLOYMENT						PERCENTAGE CHANGE BETWEEN 2009 AND 2003			
	2003			2009						
Sector of Economic Activity	**EU**	**NON-EU**	**CY**	**EU**	**NON-EU**	**CY**	**EU**	**NON-EU**	**CY**	**TOTAL**
Agriculture, Forestry, Fishing and Mining	0.50	9.97	89.53	0.82	2.77	96.41	-	-76.10	-7.41	-14.02
Manufacturing	4.63	5.56	89.82	11.57	3.06	85.37	154.34	-44.05	-3.29	1.74
Electricity, Gas, Steam and Air Conditioning Supply	0.00	0.00	100.00	3.53	0.00	96.47	-	-	-29.21	-26.62
Water Supply, Sewerage, Waste Management & Remediation Activities	0.00	0.00	100.00	0.00	0.00	100.00	-	-	-67.51	-67.51
Construction	10.87	3.23	85.90	18.25	5.87	75.88	97.78	113.75	4.04	17.77
Wholesale and Retail Trade, Repair of Motor Vehicles & Motorcycles	3.34	3.90	92.76	9.57	2.06	88.38	261.07	-33.52	20.20	26.15
Transportation & Storage	1.85	2.45	95.69	8.54	3.58	87.88	588.24	117.78	37.06	49.26
Accomodation and Food Service Activities	3.65	3.70	92.65	16.02	9.15	74.83	383.05	172.59	-11.12	10.06
Financial & Insurance Activities	0.00	2.94	97.06	3.28	2.94	93.78	-	14.07	10.22	14.07
Property Management and Business	4.86	4.89	90.25	7.27	2.93	89.80	76.17	-29.44	17.22	17.81
Public Administration and Defence	2.63	0.00	97.37	1.83	0.00	98.17	-25.74	-	7.63	6.75
Education	6.22	0.00	93.78	6.46	2.70	90.84	-5.41	-	-11.74	-8.89
Human Health & Social Work Activities	1.09	1.46	97.45	14.03	3.28	82.69	1628.89	203.33	14.34	34.74
Arts, Entertainment and Recreation	4.49	0.66	94.85	4.22	2.03	93.74	-61.24	27.87	-59.26	-58.78
Activities of Households	0.00	100.00	0.00	0.00	100.00	0.00	-	253.52	-	253.52
Activities of Extra-territorial Organizations & Bodies	12.57	0.00	87.43	0.00	0.00	100.00	-100.00	-	49.85	31.01
Total Male Workers	4.56	3.48	91.96	10.05	3.60	86.35	140.48	12.91	2.43	9.08
Total Workers	2.55	1.94	51.40	5.34	1.91	45.85				

Note: The numbers are in %. *Source*: Cyprus Statistical Service (last accessed February 2021): http://www.mof.gov.cy/Mof/cystaT/STATisTiCS.nsF/labour_31main_en/labour_31main_en?OpenForm&sub=1&sel=1#.

Table 2A: Female Employment by Nationality and Sector of Economic Activity

Sector of Economic Activity	% IN FEMALE SECTOR EMPLOYMENT						PERCENTAGE CHANGE BETWEEN 2009 AND 2003			
	2003			2009						
	EU	NON-EU	CY	EU	NON-EU	CY	EU	NON-EU	CY	TOTAL
Agriculture, Forestry, Fishing and Mining	0.00	2.62	97.38	1.27	2.09	96.64	-	-23.61	-4.77	-4.04
Manufacturing	4.32	0.92	94.76	13.15	1.28	85.57	170.33	24.19	-19.80	-11.18
Electricity, Gas, Steam and Air Conditioning Supply	0.00	0.00	100.00	0.00	0.00	100.00	-	-	133.84	133.84
Water Supply, Sewerage, Waste Management and Remediation Activities	0.00	0.00	100.00	0.00	0.00	100.00	-	-	-43.51	-43.51
Construction	2.85	9.94	87.20	9.70	6.00	84.30	394.44	-12.35	40.53	45.36
Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles	5.18	3.13	91.69	15.03	2.34	82.63	238.87	-12.90	5.17	16.70
Transportation and Storage	5.15	2.00	92.85	2.06	2.18	95.76	-50.46	34.92	27.72	23.84
Accomodation and Food Service Activities	11.99	9.41	78.60	32.57	7.52	59.92	149.03	-26.72	-30.09	-8.29
Financial and Insurance Activities	1.49	1.36	97.15	2.84	1.25	95.90	112.50	2.27	9.74	11.17
Property Management and Business	8.70	2.54	88.76	8.92	6.39	84.68	93.04	373.67	79.66	88.29
Public Administration and Defence	1.17	0.00	98.83	0.56	0.00	99.44	-35.85	-	35.61	34.77
Education	2.99	0.47	96.54	1.59	0.38	98.02	-27.13	11.76	38.84	36.75
Human Health and Social Work Activities	2.10	5.59	92.31	7.62	1.17	91.22	595.35	-60.03	89.27	91.54
Arts, Entertainment and Recreation	6.70	2.66	90.64	17.95	8.98	73.07	-48.58	-35.24	-84.53	-80.81
Activities of Households	2.54	89.96	7.50	2.81	95.48	1.71	68.98	62.45	-65.02	53.05
Activities of Extra-territorial Organizations and Bodies	14.56	8.74	76.70	13.21	16.77	70.02	-44.17	18.06	-43.83	-38.47
% in total Female Workers	4.86	9.63	85.51	9.28	11.38	79.34	133.25	44.31	13.31	22.12
% in Total Workers	2.14	4.25	37.72	5.34	4.35	44.11				

Note: The numbers are in %. *Source*: Cyprus Statistical Service (last accessed February 2021): http://www.mof.gov.cy/Mof/cystaT/STATisTiCS.nsF/labour_31main_en/labour_31main_en?OpenForm&sub=1&sel=1#.

Table 3A: Distribution of the Population Age 15 and Above by Citizenship, Education and Sex in 2001 and 2011

	2001								2011							
	DISTRIBUTION				CONTRIBUTION TO SKILL GROUP				DISTRIBUTION				CONTRIBUTION TO SKILL GROUP			
EDUCATION	**CY**	**EU25**	**Non-EU**	**Not Stated**	**CY**	**EU25**	**Non-EU**	**Not Stated**	**CY**	**EU25**	**Non-EU**	**Not Stated**	**CY**	**EU25**	**Non-EU**	**Not Stated**
ALL																
Lower Secondary	0.442	0.198	0.257	0.056	0.946	0.023	0.031	0.000	0.332	0.201	0.316	0.004	0.831	0.085	0.084	0.000
Upper Secondary	0.349	0.394	0.389	0.054	0.889	0.054	0.057	0.000	0.348	0.474	0.356	0.008	0.748	0.171	0.081	0.000
Tertiary	0.206	0.404	0.346	0.048	0.832	0.088	0.080	0.000	0.311	0.296	0.276	0.004	0.798	0.127	0.075	0.000
Not Stated Education	0.003	0.005	0.009	0.842	0.517	0.064	0.131	0.287	0.009	0.029	0.052	0.984	0.396	0.204	0.233	0.166
TOTAL	1.000	1.000	1.000	1.000	0.899	0.048	0.051	0.001	1.000	1.000	1.000	1.000	0.783	0.131	0.083	0.003
MALES																
Lower Secondary	0.413	0.215	0.247	0.057	0.949	0.027	0.024	0.000	0.308	0.214	0.253	0.005	0.847	0.101	0.051	0.000
Upper Secondary	0.376	0.391	0.382	0.042	0.909	0.052	0.038	0.000	0.393	0.485	0.377	0.010	0.779	0.165	0.055	0.000
Tertiary	0.209	0.390	0.359	0.051	0.852	0.087	0.061	0.000	0.289	0.269	0.298	0.002	0.809	0.129	0.062	0.000
Not Stated Education	0.002	0.004	0.012	0.849	0.530	0.060	0.120	0.291	0.010	0.032	0.072	0.983	0.409	0.216	0.210	0.166
TOTAL	1.000	1.000	1.000	1.000	0.911	0.050	0.038	0.001	1.000	1.000	1.000	1.000	0.800	0.137	0.059	0.003
FEMALES																
Lower Secondary	0.471	0.181	0.262	0.054	0.943	0.019	0.038	0.000	0.354	0.188	0.350	0.003	0.819	0.071	0.110	0.000
Upper Secondary	0.323	0.397	0.392	0.068	0.868	0.056	0.076	0.000	0.306	0.463	0.344	0.006	0.713	0.177	0.110	0.000
Tertiary	0.204	0.418	0.339	0.044	0.814	0.088	0.098	0.000	0.332	0.323	0.264	0.006	0.788	0.126	0.086	0.000
Not Stated Education	0.002	0.005	0.007	0.833	0.503	0.069	0.144	0.284	0.008	0.026	0.042	0.986	0.382	0.192	0.259	0.167
TOTAL	1.000	1.000	1.000	1.000	0.888	0.047	0.064	0.001	1.000	1.000	1.000	1.000	0.767	0.126	0.105	0.003

Source: Cyprus Statistical Service (CYSTAT): http://www.mof.gov.cy/Mof/cystaT/STATisTiCS.nsF/populationcondition_22main_en/populationcondition_22main_en?OpenForm&sub=2&sel=1.

Appendix A.2: Further Descriptive Statistics of the Individual Data

Table 4A: Distribution of Mean Hours and Real Taxable Income by Education Level - Married Males and Females

	MARRIED MALES								MARRIED FEMALES							
	ALL		LOW		MEDIUM		HIGH		ALL		LOW		MEDIUM		HIGH	
	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009
Working Hours (annual)	2009.029***	1973.435***	1975.602***	1857.839***	2016.188***	1975.254***	2018.735***	2018.508***	1190.747***	1273.478***	745.548***	720.655***	1202.813***	1242.949***	1642.561***	1648.034***
	(241.02)	(164.45)	(93.12)	(43.13)	(175.93)	(122.60)	(139.88)	(116.14)	(50.86)	(49.52)	(17.56)	(12.93)	(34.75)	(33.10)	(44.16)	(44.16)
hours=0 (non-participation)	0.010***	0.027***	0.011*	0.050***	0.009**	0.023***	0.012**	0.023***	0.384***	0.349***	0.589***	0.606***	0.380***	0.361***	0.176***	0.179***
	(3.76)	(5.55)	(1.74)	(2.89)	(2.46)	(3.64)	(2.25)	(3.03)	(33.30)	(27.82)	(26.62)	(20.85)	(22.30)	(19.64)	(9.96)	(10.16)
hours>0 & hours<1041	0.013***	0.015***	0.019**	0.043***	0.015***	0.016***	0.007*	0.003	0.021***	0.026***	0.022***	0.028***	0.025***	0.029***	0.015***	0.021***
	(4.27)	(4.15)	(2.25)	(2.70)	(3.18)	(3.02)	(1.74)	(1.00)	(6.23)	(6.24)	(3.35)	(2.86)	(4.53)	(4.54)	(2.66)	(3.19)
hours> 1040 & hours<1561	0.032***	0.028***	0.053***	0.056***	0.027***	0.028***	0.028***	0.015**	0.056***	0.039***	0.077***	0.049***	0.048***	0.041***	0.047***	0.029***
	(6.74)	(5.64)	(3.84)	(3.08)	(4.30)	(4.05)	(3.51)	(2.47)	(10.24)	(7.63)	(6.41)	(3.83)	(6.40)	(5.40)	(4.80)	(3.79)
hours>1560	0.944***	0.930***	0.917***	0.851***	0.948***	0.933***	0.953***	0.959***	0.539***	0.586***	0.313***	0.317***	0.548***	0.569***	0.762***	0.771***
	(150.95)	(122.15)	(54.21)	(30.22)	(109.98)	(88.93)	(93.78)	(95.36)	(45.53)	(45.18)	(15.00)	(11.46)	(31.39)	(30.07)	(38.66)	(39.89)
TaxableIncome<=15377	0.289***	0.186***	0.481***	0.348***	0.314***	0.204***	0.130***	0.092***	0.808***	0.678***	0.966***	0.933***	0.873***	0.758***	0.525***	0.411***
	(23.43)	(15.98)	(15.68)	(9.24)	(17.36)	(12.06)	(8.01)	(6.29)	(86.32)	(55.12)	(118.10)	(62.83)	(74.91)	(46.24)	(22.68)	(18.17)
15377<TaxableIncome <=19500	0.246***	0.151***	0.316***	0.236***	0.282***	0.167***	0.147***	0.092***	0.055***	0.098***	0.032***	0.035***	0.045***	0.105***	0.096***	0.124***
	(21.00)	(14.10)	(11.06)	(7.03)	(16.09)	(10.67)	(8.58)	(6.29)	(10.18)	(12.50)	(4.06)	(3.21)	(6.22)	(8.96)	(7.05)	(8.20)
19501<TaxableIncome <=36300	0.349***	0.469***	0.195***	0.398***	0.337***	0.523***	0.463***	0.421***	0.108***	0.143***	0.002	0.032***	0.068***	0.107***	0.291***	0.263***
	(26.95)	(31.43)	(8.02)	(10.27)	(18.28)	(24.93)	(19.22)	(16.80)	(14.67)	(15.54)	(1.00)	(3.04)	(7.68)	(9.03)	(13.84)	(13.01)
TaxableIncome>36300	0.117***	0.194***	0.008	0.019*	0.067***	0.106***	0.260***	0.395***	0.029***	0.081***	0.000	0.000	0.014***	0.031***	0.088***	0.202***
	(13.37)	(16.40)	(1.42)	(1.74)	(6.86)	(8.18)	(12.29)	(15.93)	(7.32)	(11.28)	(.)	(.)	(3.34)	(4.65)	(6.70)	(10.96)

Note: Based on the individual data of the Cyprus Family Expenditure Surveys. The data in 2003 are in the beginning of the reform and the data in 2009 are in the end of the reforms. *** p<0.01, ** p<0.05, * p<0.1.

Table 5A: Distribution of Mean Hours and Real Taxable Income by Education Level and Rural/Urban Area - Married Males

	RURAL								URBAN							
	ALL		LOW		MEDIUM		HIGH		ALL		LOW		MEDIUM		HIGH	
	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009
Working Hours (annual)	1972.799***	1951.020***	1958.407***	1896.894***	1975.962***	1980.021***	1987.408***	1938.857***	2024.096***	1983.343***	1989.311***	1814.158***	2034.871***	1972.895***	2024.930***	2035.931***
	(110.76)	(89.55)	(57.49)	(37.63)	(81.22)	(84.38)	(48.53)	(31.97)	(221.20)	(137.99)	(74.19)	(25.27)	(165.01)	(93.42)	(132.53)	(123.99)
Hours=0 (non-participation)	0.013**	0.017**	0.008	0.012	0.014*	0.005	0.014	0.057**	0.009***	0.031***	0.014	0.092***	0.007*	0.032***	0.011**	0.016**
	(2.25)	(2.47)	(1.00)	(1.00)	(1.74)	(1.00)	(1.00)	(2.04)	(3.01)	(4.97)	(1.42)	(2.76)	(1.74)	(3.52)	(2.01)	(2.25)
hours>0 & hours<1041	0.015**	0.029***	0.025*	0.071**	0.010	0.021**	0.014	0.000	0.013***	0.009***	0.014	0.013	0.018***	0.013**	0.006	0.003
	(2.47)	(3.20)	(1.75)	(2.53)	(1.42)	(2.02)	(1.00)		(3.48)	(2.66)	(1.42)	(1.00)	(2.85)	(2.25)	(1.42)	(1.00)
hours> 1040 & hours<1561	0.065***	0.047***	0.068***	0.059**	0.067***	0.048***	0.056**	0.029	0.019***	0.019***	0.041**	0.053**	0.009**	0.018***	0.022***	0.013**
	(5.27)	(4.09)	(2.92)	(2.29)	(3.86)	(3.07)	(2.04)	(1.42)	(4.28)	(3.91)	(2.49)	(2.04)	(2.01)	(2.67)	(2.86)	(2.01)
hours>1560	0.907***	0.907***	0.898***	0.859***	0.909***	0.926***	0.915***	0.914***	0.959***	0.941***	0.932***	0.842***	0.967***	0.937***	0.961***	0.969***
	(62.24)	(57.65)	(32.15)	(22.61)	(45.61)	(48.21)	(27.54)	(27.13)	(150.01)	(110.90)	(45.04)	(20.00)	(114.11)	(74.98)	(93.93)	(99.44)
TaxableIncome<=15377	0.342***	0.248***	0.458***	0.341***	0.330***	0.229***	0.183***	0.186***	0.266***	0.159***	0.500***	0.355***	0.307***	0.192***	0.120***	0.072***
	(14.36)	(10.61)	(9.94)	(6.60)	(10.12)	(7.45)	(3.96)	(3.97)	(18.64)	(12.08)	(12.12)	(6.43)	(14.09)	(9.49)	(6.98)	(4.97)
15377<TaxableInc <=19500	0.302***	0.152***	0.356***	0.200***	0.321***	0.165***	0.155***	0.057**	0.223***	0.151***	0.284***	0.276***	0.264***	0.168***	0.145***	0.100***
	(13.09)	(7.82)	(8.04)	(4.58)	(9.91)	(6.08)	(3.58)	(2.04)	(16.54)	(11.73)	(7.63)	(5.35)	(12.71)	(8.76)	(7.79)	(5.95)
19501<TaxableInc <=36300	0.302***	0.478***	0.178***	0.435***	0.301***	0.532***	0.507***	0.386***	0.369***	0.465***	0.209***	0.355***	0.353***	0.518***	0.454***	0.428***
	(13.09)	(17.70)	(5.03)	(8.05)	(9.47)	(14.58)	(8.49)	(6.58)	(23.64)	(25.96)	(6.24)	(6.43)	(15.66)	(20.20)	(17.25)	(15.45)
TaxableIncome>36300	0.055***	0.122***	0.008	0.024	0.048***	0.074***	0.155***	0.371***	0.142***	0.226***	0.007	0.013	0.076***	0.121***	0.281***	0.400***
	(4.82)	(6.91)	(1.00)	(1.42)	(3.23)	(3.88)	(3.58)	(6.39)	(12.58)	(15.02)	(1.00)	(1.00)	(6.06)	(7.22)	(11.84)	(14.58)

Note: Based on the individual data of the Cyprus Family Expenditure Surveys. 2003 is the year before the reforms and 2009 the year after the reforms. *** p<0.01, ** p<0.05, * p<0.1.

Table 6A: Distribution of Mean Hours and Real Taxable Income by Education Level and Rural/Urban Area - Married Females

	RURAL								URBAN							
	ALL		LOW		MEDIUM		HIGH		ALL		LOW		MEDIUM		HIGH	
	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009	2003	2009
Working Hours (annual)	984.641***	1144.761***	733.460***	642.662***	1061.148***	1319.824***	1477.976***	1520.600***	1283.621***	1337.769***	756.610***	813.046***	1258.606***	1204.847***	1679.183***	1682.016***
	(23.94)	(25.56)	(12.54)	(8.92)	(16.54)	(20.90)	(15.01)	(17.34)	(45.72)	(42.85)	(12.35)	(9.41)	(30.77)	(25.87)	(42.33)	(41.06)
Hours=0 (non-participatio	0.457***	0.395***	0.557***	0.630***	0.426***	0.308***	0.259***	0.230***	0.352***	0.326***	0.618***	0.577***	0.361***	0.386***	0.157***	0.165***
	(21.51)	(17.70)	(17.22)	(16.14)	(13.04)	(10.04)	(5.42)	(5.44)	(25.78)	(21.57)	(20.42)	(13.26)	(18.16)	(16.97)	(8.43)	(8.61)
hours>0 & hours<1041	0.027***	0.031***	0.034***	0.026**	0.030***	0.040***	0.000	0.020	0.019***	0.024***	0.012*	0.031**	0.022***	0.024***	0.018***	0.021***
	(3.92)	(3.93)	(2.87)	(2.02)	(2.68)	(3.05)		(1.42)	(4.84)	(4.85)	(1.74)	(2.02)	(3.64)	(3.35)	(2.67)	(2.86)
hours> 1040 & hours<1561	0.101***	0.067***	0.139***	0.078***	0.078***	0.062***	0.059**	0.060**	0.035***	0.025***	0.019**	0.015	0.036***	0.031***	0.045***	0.021***
	(7.89)	(5.85)	(6.18)	(3.60)	(4.41)	(3.85)	(2.29)	(2.51)	(6.67)	(4.96)	(2.25)	(1.42)	(4.66)	(3.80)	(4.21)	(2.86)
hours>1560	0.415***	0.507***	0.270***	0.266***	0.465***	0.590***	0.682***	0.690***	0.594***	0.625***	0.351***	0.377***	0.580***	0.559***	0.780***	0.792***
	(19.76)	(22.23)	(9.34)	(7.45)	(14.11)	(18.05)	(13.43)	(14.84)	(42.34)	(40.05)	(11.82)	(8.83)	(28.40)	(24.07)	(36.76)	(37.74)
TaxableIncome<=15377	0.906***	0.775***	0.970***	0.942***	0.943***	0.775***	0.624***	0.520***	0.763***	0.629***	0.961***	0.923***	0.846***	0.749***	0.503***	0.381***
	(72.79)	(40.72)	(88.06)	(49.65)	(61.83)	(27.93)	(11.80)	(10.36)	(62.82)	(40.41)	(80.15)	(39.34)	(56.57)	(36.92)	(19.62)	(15.18)
15377<TaxableInc <=19500	0.036***	0.089***	0.030***	0.019*	0.030***	0.119***	0.071**	0.130***	0.064***	0.102***	0.035***	0.054***	0.051***	0.098***	0.102***	0.123***
	(4.55)	(6.86)	(2.68)	(1.74)	(2.68)	(5.52)	(2.53)	(3.85)	(9.12)	(10.44)	(3.05)	(2.71)	(5.62)	(7.06)	(6.58)	(7.23)
19501<TaxableInc <=36300	0.049***	0.102***	0.000	0.039**	0.022**	0.097***	0.259***	0.210***	0.135***	0.164***	0.004	0.023*	0.086***	0.111***	0.298***	0.277***
	(5.32)	(7.38)		(2.49)	(2.26)	(4.92)	(5.42)	(5.13)	(13.80)	(13.74)	(1.00)	(1.75)	(7.39)	(7.57)	(12.73)	(11.98)
TaxableIncome>36300	0.009**	0.033***	0.000	0.000	0.004	0.009	0.047**	0.140***	0.038***	0.105***	0.000	0.000	0.017***	0.041***	0.097***	0.219***
	(2.24)	(4.06)			(1.00)	(1.42)	(2.04)	(4.01)	(6.99)	(10.62)			(3.19)	(4.45)	(6.39)	(10.23)

Note: Based on the individual data of the Cyprus Family Expenditure Surveys. 2003 is the year before the reforms and 2009 the year after the reforms. *** p<0.01, ** p<0.05, * p<0.1.

Table 7A: Work Participation by Sector of Economic Activity - Married Males and Females

	MARRIED MALES		MARRIED FEMALES		DIFFERENCE BETWEEN FEMALES AND MALES	
Sector of Economic Activity	**2003**	**2009**	**2003**	**2009**	**2003**	**2009**
Agriculture, Forestry, Fishing and Mining	0.007	0.019	0.001	0.004	-0.006	-0.015
Manufacturing	0.118	0.119	0.070	0.049	-0.048	-0.070
Electricity&Water	0.016	0.019	0.001	0.005	-0.016	-0.014
Construction	0.206	0.221	0.015	0.028	-0.191	-0.193
Wholesale and Retail Trade, Repair of Motor Vehicles	0.163	0.140	0.117	0.136	-0.046	-0.004
Transportation & Storage	0.085	0.091	0.032	0.030	-0.053	-0.061
Accomodation and Food Service Activities	0.060	0.055	0.087	0.056	0.027	0.001
Financial & Insurance Activities	0.060	0.050	0.046	0.050	-0.014	0.001
Property Management and Business	0.029	0.042	0.036	0.059	0.008	0.018
Public Administration and Defence	0.119	0.143	0.060	0.065	-0.059	-0.078
Education	0.043	0.038	0.064	0.089	0.022	0.051
Human Health & Social Work Activities	0.030	0.020	0.041	0.048	0.011	0.029
Arts, Entertainment and Recreation	0.040	0.027	0.035	0.026	-0.005	0.000
Activities of Households	0.000	0.000	0.001	0.004	0.001	0.004
Activities of Extra-territorial Organizations & Bodies	0.012	0.017	0.003	0.006	-0.008	-0.011
Housewife	0.001	0.001	0.389	0.337	0.388	0.336

Note: Based on the individual data of the Cyprus Family Expenditure Surveys. The data in 2003 are in the beginning of the reform and the data in 2009 are in the end of the reforms.

A.3 Additional Estimates and Sensitivity Analysis

Table 8A: Additional Estimation Results - Married Males and Females

	MARRIED MALES						MARRIED FEMALES					
	SPECIFICATION 1			SPECIFICATION 2			SPECIFICATION 1			SPECIFICATION 2		
VARIABLES	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participation
Number of children 3-6	0.0819***	0.0174***	-0.000469	0.0861***	0.0173***	-0.000274	-0.00206	0.00908	0.0441	0.000830	0.00947	0.0283
	(3.172)	(2.909)	(-0.170)	(3.298)	(3.025)	(-0.359)	(-0.108)	(0.577)	(1.224)	(0.0432)	(0.604)	(0.924)
Number of children 7 -12	0.0727***	-0.00512	0.000342	0.0722***	-0.00476	3.09e-05	-0.00292	0.00593	0.0137	-0.00157	0.00606	0.00352
	(3.020)	(-0.981)	(0.165)	(2.959)	(-0.886)	(0.0518)	(-0.236)	(0.540)	(0.428)	(-0.127)	(0.618)	(0.126)
Number of children 13-18	0.0663***	-0.00654	0.00257	0.0639***	-0.00608	0.00111*	-0.0300**	0.0139	0.0416	-0.0360**	0.00846	0.0354
	(2.906)	(-1.058)	(1.194)	(2.779)	(-0.958)	(1.808)	(-2.120)	(1.430)	(1.457)	(-2.572)	(0.902)	(1.429)
Rural low educ	0.0734*	-0.0449*	0.00395	0.0663*	-0.0434*	0.00107	-0.00862	-0.110***	0.0393	-0.0207	-0.0908**	0.0242
	(1.886)	(-1.784)	(0.583)	(1.707)	(-1.756)	(0.639)	(-0.133)	(-2.784)	(0.882)	(-0.329)	(-2.425)	(0.705)
Rural medium educ	0.0138	-0.0122	-0.00625	0.0112	-0.0102	-0.00146	-0.0679	0.0532**	-0.154**	-0.0613	0.0421**	-0.122**
	(0.430)	(-0.953)	(-0.820)	(0.354)	(-0.815)	(-0.705)	(-1.073)	(2.113)	(-2.251)	(-0.964)	(2.054)	(-2.131)
Rural high educ	-0.0716	0.0151	-0.000586	-0.0759	0.0137	0.000555	-0.0876**	-0.0155	-0.105***	-0.0847**	-0.0315	-0.0739**
	(-1.544)	(1.258)	(-0.0630)	(-1.632)	(1.144)	(0.234)	(-2.054)	(-0.553)	(-2.621)	(-1.973)	(-1.245)	(-2.309)
Partner medium educ	0.0795***	-0.00779	0.0103***	0.0868***	-0.0106	0.00288***	-0.0303	0.0116	0.0233	-0.0213	0.0196	0.00776
	(3.211)	(-0.524)	(2.904)	(3.441)	(-0.733)	(2.933)	(-0.907)	(0.377)	(0.924)	(-0.646)	(0.683)	(0.348)
Parner high educ	0.113***	-0.00592	0.00971***	0.123***	-0.00709	0.00226**	0.0145	0.00261	0.0251	0.0353	0.0142	0.00268
	(3.885)	(-0.376)	(2.595)	(4.154)	(-0.453)	(2.200)	(0.380)	(0.0790)	(0.773)	(0.924)	(0.453)	(0.0896)
Larnaca region	-0.0123	0.0801**	0.00481	-0.0222	0.0853***	0.00128	-0.106**	0.150***	-0.102**	-0.101**	0.128***	-0.0854**
	(-0.252)	(2.439)	(1.010)	(-0.454)	(2.610)	(1.046)	(-2.259)	(3.041)	(-2.205)	(-2.301)	(2.882)	(-2.118)
Limassol region	0.0174	0.0847***	0.00374	0.00854	0.0886***	0.00124	-0.0863*	0.171***	-0.127***	-0.0728	0.139***	-0.0842**
	(0.481)	(2.661)	(0.666)	(0.233)	(2.815)	(0.841)	(-1.822)	(3.398)	(-2.732)	(-1.626)	(3.109)	(-2.111)
Nicosia region	0.00130	0.0835**	0.0121**	-0.00501	0.0877***	0.00300*	-0.0221	0.201***	-0.0229	-0.0120	0.175***	-0.0341
	(0.0350)	(2.551)	(2.089)	(-0.134)	(2.738)	(1.834)	(-0.489)	(4.431)	(-0.518)	(-0.282)	(3.979)	(-0.907)
Paphos region	-0.00364	0.0723**	0.00605	-0.00451	0.0737**	0.00168	-0.0239	0.192***	-0.0873*	-0.0156	0.170***	-0.0294
	(-0.0884)	(2.040)	(1.373)	(-0.108)	(2.117)	(1.641)	(-0.485)	(3.896)	(-1.690)	(-0.329)	(3.716)	(-0.687)
Public sector*low education	0.139***	0.0378		0.160***	0.0328		0.244***	0.0762*		0.285***	0.0489	
	(2.942)	(1.612)		(3.332)	(1.349)		(2.986)	(1.806)		(3.310)	(1.090)	
Public sector*medium education	0.178***	0.0139		0.168***	0.00175		0.420***	-0.0238		0.413***	0.0130	
	(7.778)	(1.194)		(6.485)	(0.125)		(11.63)	(-1.086)		(10.27)	(0.589)	
Public sector*high education	0.189***	0.00341		0.159***	0.0175*		0.393***	0.0145		0.390***	0.0326	
	(6.690)	(0.382)		(4.658)	(1.721)		(9.519)	(0.728)		(7.973)	(1.305)	
Domestic worker*low education	0.0114	0.0966***	-0.189***	-0.0633	0.0694**	-0.223***	-0.438**	0.451***	-0.0230	-0.621***	0.365***	-0.00548
	(0.251)	(3.112)	(-2.651)	(-1.217)	(2.251)	(-3.187)	(-2.557)	(3.381)	(-0.0857)	(-4.241)	(3.339)	(-0.0245)

Table 8A: Additional Estimation Results - Married Males and Females (continued)

	MARRIED MALES						MARRIED FEMALES					
	SPECIFICATION 1			SPECIFICATION 2			SPECIFICATION 1			SPECIFICATION 2		
VARIABLES	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participation
Domestic worker*med education	0.129	-0.000628	-0.0264*	0.117	-0.00343	-0.0105*	0.370***	-0.0810	0.118	0.369***	-0.0636	0.0909
	(1.583)	(-0.0318)	(-1.679)	(1.366)	(-0.162)	(-1.952)	(3.589)	(-0.719)	(1.378)	(3.612)	(-0.571)	(1.457)
Domestic worker*high education	0.0978*	-0.00471	-0.0131	0.0991*	-0.00524	-0.00703	0.159***	0.0373	0.185***	0.160***	0.0432**	0.170***
	(1.881)	(-0.421)	(-1.222)	(1.864)	(-0.483)	(-1.626)	(3.371)	(1.332)	(2.733)	(3.384)	(2.058)	(3.481)
Cohort 1938-1949*low education							0.0825	0.161	-0.258***	0.481	0.237	-0.307
							(0.441)	(1.121)	(-2.695)	(1.271)	(0.899)	(-1.211)
Cohort 1938-1949*med education	-0.00141	-0.00981	-0.00945	0.199*	0.0134	-0.0104	0.0583	0.118	-0.170	0.469	0.208	0.127
	(-0.0227)	(-0.376)	(-0.859)	(1.915)	(0.341)	(-1.492)	(0.321)	(0.884)	(-1.632)	(1.303)	(0.842)	(0.751)
Cohort 1938-1949*high education	0.310***	-0.0157	-0.0697***	0.510***	-0.0540*	-0.0193*	0.426**	-0.00970	0.0718	0.975***	0.242	0.0807
	(4.915)	(-0.636)	(-2.807)	(6.187)	(-1.699)	(-1.649)	(2.332)	(-0.0603)	(0.650)	(2.770)	(0.935)	(0.400)
Cohort 1950-1959*low education	0.0427	-0.000498	-0.00998	-0.0525	0.00219	-0.00135	0.0935	0.125	-0.0952	0.395	0.195	-0.142
	(1.219)	(-0.0189)	(-1.206)	(-0.747)	(0.0485)	(-0.268)	(0.524)	(0.917)	(-1.034)	(1.084)	(0.753)	(-0.635)
Cohort 1950-1959*med education	0.136***	-0.00395	-0.00597	0.181***	0.00105	-0.00372	0.128	0.114	0.0635	0.525	0.197	0.151
	(3.081)	(-0.187)	(-0.621)	(3.825)	(0.0416)	(-0.984)	(0.759)	(0.874)	(0.689)	(1.534)	(0.818)	(0.974)
Cohort 1950-1959*high education	0.250***	-0.0125	-0.00470	0.366***	-0.0572*	0.000612	0.301*	0.0758	0.207**	0.806**	0.190	0.190
	(4.902)	(-0.523)	(-0.438)	(5.516)	(-1.874)	(0.156)	(1.761)	(0.547)	(2.397)	(2.355)	(0.785)	(1.504)
Cohort 1960-1969*low education							0.0480	0.0484	-0.000687	0.244	0.247	-0.225
							(0.270)	(0.351)	(-0.00732)	(0.665)	(0.961)	(-0.834)
Cohort 1960-1969*med education	0.0818*	0.00829	-0.00259	0.0295	-0.00337	-0.000803	0.0872	0.0745	0.135	0.461	0.145	0.163
	(1.904)	(0.404)	(-0.292)	(0.573)	(-0.125)	(-0.160)	(0.521)	(0.561)	(1.538)	(1.358)	(0.599)	(1.028)
Cohort 1970-1978*high education	0.208***	-0.0194	0.00173	0.215***	-0.0295	0.00299**	0.123	0.127	0.271***	0.468	0.198	0.203
	(4.024)	(-0.798)	(0.212)	(3.453)	(-1.153)	(2.418)	(0.726)	(0.902)	(3.448)	(1.366)	(0.822)	(1.525)
Cohort 1970-1978*med education	-0.0405	0.00214	-0.00783	-0.0833	0.0354	-0.0118	-0.00288	0.0974	0.173**	0.277	0.169	0.138
	(-0.895)	(0.0904)	(-0.725)	(-1.498)	(1.228)	(-1.420)	(-0.0172)	(0.722)	(2.030)	(0.813)	(0.699)	(0.845)
Cohort 1970-1978*high education	0.0264	-0.00640	0.00365	-0.0194	-0.0423	0.00194	0.0261	0.100	0.317***	0.307	0.160	0.239*
	(0.502)	(-0.298)	(0.466)	(-0.303)	(-1.524)	(0.785)	(0.154)	(0.699)	(4.182)	(0.900)	(0.659)	(1.945)
Constant	1.808***	7.366***		1.773***	7.360***		1.238***	6.938***		0.847**	7.119***	
	(33.88)	(121.4)		(31.11)	(111.0)		-6.99	-40.67		-2.375	-28.12	
Cohort-Education Group Effects of Foreign Workers	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES

Note : Robust t-statistics in parentheses. Specification 1 and Specification 2 are without and with controls for the effects related to the inflows of foreign workers. The cohort-education group estimates related to the inflows of foreign workers are reported in Table 4. Non-labor income includes the labor income of the spouse. For married males, the reference group is the low educated. For married females, the reference group is the 1970-1978 low educated females. *** p<0.01, ** p<0.05, * p<0.1

Table 9A: Cohort -Education Group Marginal Estimates Related Foreign Workers - Married Males and Females (Specification 2)

	MARRIED MALES			MARRIED FEMALES		
	SPECIFICATION 2			SPECIFICATION 2		
	lnwages	lnhours	participation	lnwages	lnhours	participation
Cohort 1938-1949*low educ*%EU workers	0.0138**	0.00537*	0.000960***	0.00250	0.00349	-0.00194
	(2.539)	(1.728)	(2.748)	(0.166)	(0.551)	(-0.111)
Cohort 1938-1949*med educ*%EU workers	-0.0220	0.00974*	0.000301	-0.00943	-0.00369	-0.0437**
	(-1.462)	(1.927)	(0.843)	(-0.494)	(-0.403)	(-2.542)
Cohort 1938-1949*high educ*%EU workers	-0.0120	0.00153	0.000509	-0.0308**	-0.0150	-0.0204
	(-1.022)	(0.330)	(1.368)	(-2.378)	(-0.579)	(-0.968)
Cohort 1950-1959*low educ*%EU workers	0.00675	0.00397	0.000523**	0.0215*	0.000942	0.0141
	(1.104)	(0.716)	(2.259)	(1.913)	(0.159)	(0.893)
Cohort 1950-1959*med educ*%EU workers				-0.00763	0.00794	-0.0299***
				(-0.687)	(1.556)	(-3.697)
Cohort 1950-1959*high educ*%EU workers	0.00449	0.00324	0.00192***	-0.0222*	0.00263	-0.0326***
	(0.626)	(1.102)	(5.016)	(-1.883)	(0.398)	(-2.885)
Cohort 1960-1969*low educ*%EU workers				0.0312**	-0.00585	0.0251
				(2.353)	(-0.921)	(1.146)
Cohort 1960-1969*med educ*%EU migrants	0.0113**	0.00443*	-0.000191	0.00108	0.00724	-0.0270***
	(2.429)	(1.715)	(-0.701)	(0.106)	(1.253)	(-3.627)
Cohort 1960-1969*high educ*%EU migrants	7.22e-05	0.00361	-0.000207	0.00923	-0.000268	-0.0147
	(0.0105)	(1.293)	(-0.678)	(0.888)	(-0.0536)	(-1.435)
Cohort 1970-1978*low educ*%EU workers				0.0528*	0.00700	0.000132
				(1.729)	(0.366)	(0.00512)
Cohort 1970-1978*med educ*%EU workers	-0.00360	0.00561	0.000111	0.0144	0.00319	-0.0197***
	(-0.616)	(1.196)	(0.475)	(1.361)	(0.541)	(-2.632)
Cohort 1970-1978*high educ*%EU workers	0.0197**	2.43e-05	0.000535*	0.0127	0.00159	-0.0323***
	(2.131)	(0.00897)	(1.798)	(1.210)	(0.301)	(-2.781)
Cohort 1938-1949*low educ*%non-EU workers	-0.00743	-0.00952*	-0.00130***	-0.000669	-0.00568	0.00305
	(-0.673)	(-1.731)	(-3.778)	(-0.184)	(-1.367)	(1.269)
Cohort 1938-1949*med educ*%non-EU workers	-0.00225	-0.0262	-0.000343	0.00399	0.000669	-0.0241***
	(-0.0698)	(-1.563)	(-0.419)	(1.500)	(0.260)	(-2.582)
Cohort 1938-1949*high educ*%non-EU workers	-0.0227	0.00633	-0.00102**	0.00172	-0.00487	-3.92e-05
	(-1.064)	(1.111)	(-2.262)	(0.442)	(-1.306)	(-0.0124)
Cohort 1950-1959*low educ*%non-EU workers	0.0220	-0.00939	-0.00118	-0.00535	-0.00389	-0.0115
	(1.152)	(-0.489)	(-1.434)	(-0.993)	(-0.886)	(-1.272)
Cohort 1950-1959*med educ*%non-EU workers	-0.0291*	0.00554	-0.00308***	0.00775*	-0.0110**	-0.00625
	(-1.740)	(0.964)	(-3.320)	(1.763)	(-2.154)	(-0.868)
Cohort 1950-1959*high educ*%non-EU workers				-0.00190	-0.00806	-0.00328
				(-0.253)	(-1.343)	(-0.869)
Cohort 1960-1969*low educ*%non-EU workers				-0.00170	-0.0126***	-0.00280
				(-0.341)	(-8.351)	(-0.649)
Cohort 1960-1969*med educ*%non-EU workers	-0.000217	-0.00482	0.000325	0.00330*	-0.0106***	-0.00518
	(-0.0208)	(-1.338)	(0.727)	(1.914)	(-2.906)	(-1.257)
Cohort 1960-1969*high educ*%non-EU workers	0.0119	-0.00604	-0.00101***	-0.00187	0.000189	-0.00871*
	(0.859)	(-1.003)	(-2.824)	(-1.200)	(0.245)	(-1.769)
Cohort 1970-1978*low educ*%non-EU workers				0.00878**	-0.00304	0.000883
				(2.390)	(-1.196)	(0.332)
Cohort 1970-1978*med educ*%non-EU workers	0.0292**	-0.0201	0.000143	0.000295	-0.00584***	0.000399
	(2.067)	(-1.445)	(0.193)	(0.229)	(-3.003)	(0.306)
Cohort 1970-1978*high educ*%non-EU workers	-0.0124	0.0114*	-0.00125	0.00588***	-0.00146*	0.00102
	(-0.670)	(1.940)	(-1.165)	(6.214)	(-1.860)	(0.481)

Note: For married males, the reference is the low educated males. For married females, the reference is the cohort 1970-1978 low educated females. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10A: Estimates using the Group Estimator - Married Males and Females

	MARRIED MALES						MARRIED FEMALES					
	SPECIFICATION 1			SPECIFICATION 2			SPECIFICATION 1			SPECIFICATION 2		
	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participatio	lnwages	lnhours	participation
Selected Regressors												
Ln hourly wage		0.0678***			0.0698***			0.142***			0.0526**	
		(2.672)			(2.902)			(5.001)			(2.040)	
Non-labour income		3.82e-07	-3.66e-07***		2.66e-07	-5.95e-08***		-2.06e-06**	-3.69e-06**		-1.85e-06**	-3.36e-06***
		(0.908)	(-2.798)		(0.617)	(-3.004)		(-2.225)	(-3.412)		(-2.449)	(-3.461)
Post reform*%EU workers				0.00237	-0.000260	-0.000238				0.0202	-0.0263**	0.144***
				(0.189)	(-0.0361)	(-1.109)				(1.155)	(-2.310)	(2.978)
Post reform*% non-EU workers				0.00199	-0.00770	-0.00247**				-0.0393	0.0733**	-0.652***
				(0.0540)	(-0.353)	(-2.390)				(-0.944)	(2.518)	(-5.487)
Post reform*% EU*% non-EU workers				0.00488	5.56e-05	0.000264***				0.00176	-0.00587**	0.0330***
				(1.251)	(0.0190)	(3.339)				(0.490)	(-2.479)	(3.272)
Post Reform*Square % EU workers				-0.00102	-7.63e-05	-4.77e-05***				-0.00142	0.00202**	-0.00794***
				(-1.010)	(-0.103)	(-2.816)				(-1.288)	(2.712)	(-2.762)
Post reform*Square % non-EU workers				-0.00762	0.00106	-3.74e-05				0.000334	0.000583*	0.00584***
				(-1.417)	(0.307)	(-0.322)				(1.019)	(-2.462)	(6.140)
Mills Ratio		-0.195*			-0.0904			0.0561			0.00831	
		(-1.669)			(-0.975)			(0.555)			(0.214)	
Residual of wage equation		-0.0668**			-0.0692**			-0.121***			-0.0270	
		(-2.048)			(-2.109)			(-3.301)			(-0.895)	
Instrumental Variables												
Post Reform*Cohort 1938-1949*low educ							-0.224*		0.0434	-0.219		0.227**
							(-1.690)		(0.581)	(-1.416)		(2.403)
Post Reform*Cohort 1938-1949*med educ	-0.305**		-0.0101	-0.224		0.000889*	-0.203		0.0232	-0.233		0.237***
	(-2.334)		(-0.605)	(-1.347)		(1.950)	(-1.264)		(0.300)	(-1.068)		(4.449)
Post Reform*Cohort 1938-1949*high educ	-0.129		0.000134	-0.00829		0.000888**	-0.0166		0.0817	0.0996		0.211***
	(-1.099)		(0.0126)	(-0.0626)		(2.440)	(-0.115)		(0.590)	(0.647)		(2.663)
Post Reform*Cohort 1950-1959*low educ	0.175***		-0.0190	0.170**		0.000950*	0.0753		-0.00469	0.0506		0.242***
	(2.847)		(-1.227)	(2.372)		(1.803)	(0.824)		(-0.0711)	(0.455)		(2.649)

Table 10A: Estimates using the Group Estimator - Married Males and Females (continued)

	MARRIED MALES						MARRIED FEMALES					
	SPECIFICATION 1			SPECIFICATION 2			SPECIFICATION 1			SPECIFICATION 2		
	lnwages	lnhours	participation	lnwages	lnhours	participation	lnwages	lnhours	participatio	lnwages	lnhours	participation
Post Reform*Cohort 1950-1959*med educ	0.0254		-0.0248	0.0558		0.00130**	0.0960		-0.117**	0.146		0.268***
	(0.635)		(-1.573)	(1.135)		(2.204)	(1.435)		(-2.087)	(1.497)		(3.311)
Post Reform*Cohort 1950-1959*high educ	0.0580		-0.00817	0.0970*		0.000939	0.0995		-0.0486	0.168**		0.231**
	(1.171)		(-0.633)	(1.731)		(0.939)	(1.434)		(-0.593)	(2.094)		(2.566)
Post Reform*Cohort 1960-1969*low educ							0.172		0.0189	-0.0168		0.219*
							(1.439)		(0.203)	(-0.116)		(1.914)
Post Reform*Cohort 1960-1969 *med educ	0.180***		-0.0356	0.182***		0.00155**	0.124**		-0.0574	0.165**		0.300***
	(5.462)		(-1.612)	(4.220)		(2.407)	(2.512)		(-1.169)	(2.063)		(3.314)
Post Reform*Cohort 1970-1978*high educ							0.184***		-0.0108	0.181***		0.256***
							(3.459)		(-0.163)	(2.650)		(2.834)
Post Reform*Cohort 1970-1978*med educ	0.116***		-0.0232	0.159***		0.00111*	0.106**		-0.00436	0.0536		0.284***
	(2.798)		(-1.517)	(3.070)		(1.859)	(2.237)		(-0.0804)	(0.662)		(3.329)
Post Reform*Cohort 1970-1978*high educ							0.149***		-0.0566	0.141**		0.275**
							(3.274)		(-0.786)	(2.209)		(2.483)
Post Reform*Rural low educ	-0.111*		0.00227	-0.0907		0.000931*	0.00374		-0.131*	-0.0197		0.0752
	(-1.662)		(0.186)	(-1.279)		(1.729)	(0.0355)		(-1.798)	(-0.197)		(0.940)
Post Reform*Rural med educ	-0.0688		0.00932**	-0.0702		0.00108**	0.0636		0.121**	0.0766		0.0786**
	(-1.530)		(2.369)	(-1.557)		(2.490)	(1.096)		(2.309)	(1.317)		(1.992)
Post Reform*Rural high educ	0.118*		-0.0260	0.102		-0.00554	0.0379		0.0547	0.0355		0.0319
	(1.778)		(-1.243)	(1.516)		(-1.058)	(0.481)		(0.637)	(0.452)		(0.316)
Cohort-Education Group Effects of Foreign Workers	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
R-squared	0.378	0.052		0.389	0.062		0.506	0.105		0.528	0.202	
Pseudo R2			0.182			0.306			0.153			0.378
Testable Hypotheses (p-value)												
Instruments	1.65e-07		0.261	0.000352		0.0248	2.17e-06		0.370	0.0232		2.23e-05
Reform effects same across education groups	0.000561		0.268	0.00763		0.0845	0.130		0.318	0.142		6.17e-05
Reform effects same in rural and urban areas	0.0391		0.0576	0.0916		0.0152	0.698		0.0291	0.574		0.176
Time effects related to foreign workers				0.532	0.806	0.000970				0.0325	0.151	6.17e-05
Observations	2,428	2,428	2,474	2,428	2,428	2,474	2,034	2,034	3,221	2,034	2,034	3,221

Note: Robust t-statistics in parentheses. For married males, the reference group is the low educated males. For married females, the reference group is the 1970-1978 low educated females. The rest of the estimates can be made available. *** p<0.01, ** p<0.05, * p<0.1