EARNINGS DETERMINATION AND TAXES: EVIDENCE FROM A COHORT BASED PAYROLL TAX REFORM IN GREECE*

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Abstract

This paper analyzes the response of earnings to payroll tax rates using a cohort-based reform in Greece. Individuals who started working on or after 1993 face permanently a much higher earnings cap for payroll taxes, creating a large and permanent discontinuity in marginal payroll tax rates by date of entry in the labor force for upper earnings workers. Using full population administrative Social Security data and a Regression Discontinuity Design, we estimate the long-term labor supply effects and incidence of payroll tax rates on earnings. Standard theory predicts that, in the long run, new regime workers should bear the entire burden of the payroll tax increase (relative to old regime workers). In contrast, we find that employers compensate new regime workers for the extra employer payroll taxes but not for the extra employee payroll taxes. We do not find any evidence of labor supply responses along the extensive or intensive margins around the discontinuity, suggesting low efficiency costs of payroll taxes. We discuss various possible explanations for those results.

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I Introduction

Most OECD countries fund social insurance programs, such as retirement, health, disability, and unemployment benefits, with substantial social security contributions on employment earnings. Payroll taxes collect about 25% of total revenue on average in OECD countries (OECD, 2008), about the same as personal income taxes. Payroll taxes are much simpler than individual income taxes and share some key characteristics: (1) The base is in general restricted to employment earnings, (2) tax rates are flat,[1] (3) the tax often applies only to earnings below a given cap, (4) taxes are nominally shared by employers and employees. In a standard model, this nominal sharing does not matter for incidence and behavioral responses and only the combined tax is relevant. To assess the efficiency and welfare consequences of such large payroll taxes, it is critical to estimate how labor supply and labor demand respond to them.

There is an extensive literature on behavioral responses of reported income to the individual income tax (see Saez, Slemrod, and Giertz [2011] for a recent survey).[2] Those studies use individual income tax changes to estimate the elasticity of reported income with respect to marginal tax rates. There are two main issues with such elasticity estimates. First, non-tax related changes in the income distribution might be improperly attributed to changes in taxes when one compares a group affected by a tax change (such as high-income earners) to a comparison group not affected by a tax change (such as lower income earners). Second, tax changes can only credibly estimate short-term behavioral responses although long-term behavioral responses are of most interest for policy.

In contrast, there is relatively little work on how payroll taxes affect labor supply. The literature on payroll taxes has focused primarily on incidence. In principle, as we expect labor demand to be substantially more elastic than labor supply, the incidence should be borne primarily by workers (Hamermesh, 1993). This has been the standard assumption in most analysis of the distributional effects of taxes (see e.g., Fullerton and Metcalf 2002 for a survey).[3] Indeed, the most compelling macro-economic argument suggesting that the incidence is borne

[1] Tax rates sometimes vary by occupation but tend to be flat for a given employee in a given occupation.

[2] Relative to the classic labor supply literature analyzing hours of work (see Blundell and MaCurdy [1999] for a survey), the tax literature focuses on total reported income and hence captures all potential dimensions of responses such as unmeasured effort on the job, career choices, tax avoidance, and tax evasion.

[3] This incidence assumption is also implicitly made in income tax reform studies. A few studies have shown that this assumption does not necessarily hold in reality and that employers may share part of the burden. See Bingley and Lanot (2002) and Kubik (2004) for the income tax and Leigh (2010) and Rothstein (2010) for the US Earned Income Tax Credit.

primarily by workers is the fact that the labor income share (which includes all payroll taxes) in GDP is fairly stable overtime and across countries (see e.g., OECD, 1990). A number of studies have used micro-data (either individual or at the industry level) and exploited payroll tax changes to analyze incidence effects and have found mixed results (Hamermesh 1979, Neubig 1981, Holmlund 1983, Gruber 1997, Anderson and Meyer, 1997, 2000, Lang 2003). Some studies have also tried to test whether the sharing of payroll taxes between employees and employers is irrelevant but have not reached a consensus on this question (Poterba et al. 1986, Mulligan, Gil, and Sala-i-Martin 2010). Importantly, those studies use standard payroll tax changes and hence suffer from the same two criticisms as the taxable income elasticity literature: identification is not fully compelling and the studies estimate short-run effects.

In this paper, we exploit an unusual payroll tax reform in Greece to estimate the long-run incidence and effects of taxes on earnings which overcomes identification difficulties that have plagued previous work. Greece has very high payroll tax rates on private sector workers with an employer tax rate of 28% and employee tax rate of 16% (on average), creating a combined marginal tax wedge of about 34% as a proportion of labor costs (gross earnings). Those payroll taxes apply up to a monthly earnings cap above which no marginal tax is charged. In October 1992, Greece enacted a reform in its payroll tax system that applied only to new entrants, i.e., workers starting to work and pay payroll taxes on or after January 1st, 1993. Individuals who started to work before 1993 continue to pay a combined employee and employer payroll tax up to a monthly cap equal to €2432 as of 2009. In contrast, employees who started to work on or after 1993, pay the same payroll tax rates but up to a much higher cap, equal to 2.28 times the old cap (€5543 of monthly earnings as of 2009). As a result, in 2009, about 12% of workers who entered shortly before 1993 are above the cap and face no payroll taxes at the margin. In contrast, only about 1.5% of workers who entered shortly after 1993 are above the new higher cap. Thus, the reform has effectively created two permanent groups of workers who currently co-exist in the same labor market but face sharply different tax rates when they reach €2432 of monthly earnings (as of 2009).

Comparing pre-reform entrants to post-reform entrants using a regression discontinuity design (RDD) based on exact date of entry offers a unique opportunity to estimate the long-term impact of marginal tax rates on earnings and labor supply, as well as evaluate the long-run incidence of employee and employer payroll taxes on earnings. We use administrative data from

IKA, the social insurance agency in Greece, which manages payroll taxes and benefits for most private sector employees. The data include all individual workers in Greece who first entered the IKA system in any of the 10 years from 1988 to 1997. The data include the year of birth, gender, nationality, the exact day of entry in IKA (i.e., the first day with covered IKA earnings), and detailed job level and earnings variables for each month of March of years 2004 to 2009. In each of those March datasets, and for each job, we have occupation, monthly earnings broken down into various types: regular earnings, overtime earnings, bonuses, and other forms of earnings. Besides overtime earnings, the data also include other measures of labor supply: monthly days of work, indicators for full day and full week work, which can be used to construct a standard measure of hours of work.

Three main results are presented in our analysis. First, we show that there is no discontinuity in the number and composition of entrants around the cut-off date showing that individuals did not have time to game the law by rushing into the labor market in the last weeks of 1992 after the law was enacted to take advantage of the old regime. This finding is crucial for the validity of the subsequent RDD analysis.

Second, we find no evidence of labor supply effects of the tax change both along the extensive and intensive margins. Along the extensive margin, the reform should have induced highly skilled workers to shift to sectors not covered by IKA (such as the public sector, or specific professions such as the self-employed not covered by IKA, or emigration to foreign countries). However, we do not find any evidence of a significant discontinuity in the number of currently highly paid workers in the IKA system by date of entry around the entry cut-off date. Along the intensive margin, we find no evidence of a discontinuity in labor supply measures (such as monthly hours of work, overtime, or number of jobs) among highly paid workers by date of entry around the entry cut-off date. Those two results combined imply no labor supply responses along either the extensive and intensive margins and hence low efficiency costs of payroll taxes for upper earners.

Third, we obtain non-standard tax incidence results. In principle, individuals entering shortly before 1993 and shortly after 1993 should be identical to employers and hence should receive the same gross earnings–as they are equally productive and supply the same amount of labor based on our earlier findings. However, we find that employers compensate new regime employees for their higher *employer* payroll taxes but not for their higher *employee* payroll taxes.

As a result, new regime employees above the cap have (a) higher labor costs, i.e., gross earnings including all payroll taxes than old regime employers, (b) same posted earnings (the official measure of earnings which excludes employer payroll taxes but includes employee payroll taxes), (c) lower net earnings (when deducting all payroll taxes). Importantly, this non-standard result might be due to the inability of employers to pay similar workers differently when they are subject to different taxes. We discuss in Section IV potential explanations for such constraints, including pay fairness norms, bargaining models, or seniority based pay, that have been presented in the literature. Therefore, tax incidence for an across the board payroll tax change might well be different than what we obtain here. Our study therefore complements a growing literature showing that the institutional and informational contexts that are ignored in standard models actually play a crucial role in behavioral responses to taxation.[4]

Our paper is organized as follows. Section II presents the institutional details, the administrative data we use for the analysis, and the standard conceptual framework. Section III presents our empirical results. Section IV discusses potential explanations, and discussed policy implications. Additional results are presented in appendix. All such appendix material is in an on-line appendix.

II Institutional Setting, Data, and Conceptual Framework

II.A The Greek Payroll Tax System and the 1992 Reform

Social insurance in Greece is fragmented along occupational lines. IKA, the social insurance scheme for private sector employees, covers about 2.0 million contributors, or 45% of all active workers. The rest are divided among OAEE, the own-account workers' scheme for the self-employed with over 800,000 contributors,[5] the farmers' scheme with 700,000 contributors, the civil servants' scheme with 450,000 contributors, as well as a number of small special schemes covering specific professions such as doctor, lawyers, or engineers. This paper focuses exclusively on IKA earnings and will discuss in detail the possibility of leaving IKA for another scheme,

[4]For example, see Chetty et al. (2009) and Finkelstein (2009) on tax salience and Chetty and Saez (2009) on tax information.

[5]This group includes employees in the informal sector who should in principle be classified as IKA employees but are presented as self-employed contractors by employers for tax evasion reasons.

which is part of the extensive labor supply response.[6]

As shown in Table I Panel A, in the most common case, the total employer tax rate is 28.06% of earnings and the total employee tax rate is 16% of earnings for workers insured under the IKA scheme.[7] In our analysis, we always use the actual tax rates faced by each worker. Employer contributions are calculated on top of posted earnings, while employee contributions are deducted from posted earnings. The same contribution rates apply to all earnings irrespective of type (e.g. regular pay, overtime, bonus, etc.) or contract (e.g. full-time or part-time). Social insurance contributions are payable from the first euro earned and are always deducted at source by employers.

Importantly and as shown in Panel B of Table I, contributions are based on monthly earnings and apply only up to a cap, above which no payroll taxes apply. In 2009, for employees under the old regime (i.e., those employees who have IKA covered earnings before January 1st, 1993), the cap was set at €2,432 of monthly earnings. For employees under the new regime (i.e., those employees who do not have IKA covered earnings before January 1st, 1993), the cap was set at €5,543.[8] Both caps increase slightly each year, and by the same proportion, to reflect nominal increases in pay. There is no formal indexation and increases are legislated each year.

The contributions cap applies to all earnings irrespective of type, i.e., it is calculated by adding together earnings from regular pay, overtime, bonus, etc. earned in a given month. In the case of employees working for multiple employers, the cap for *employer* payroll taxes is based on monthly earnings within a given employer while the cap for *employee* payroll taxes is based on the sum of earnings across all employers. In practice, employers withhold both employee and employer taxes from paychecks up to the monthly cap. Multi-employer workers can apply to IKA for a refund of their employee contributions (but not the corresponding employer contributions) paid in excess of the cap.

Interactions with the Income Tax. Income taxes are based on annual income net of all social security contributions and follow a progressive schedule, with marginal rates ranging from 15%

[6]There are significant differences in social insurance arrangements across schemes, in terms of contribution rates and benefits. Typically, the special and public sector schemes are more generous than IKA, itself more generous and the self-employed and the farmers' schemes.

[7]Those contributions cover health, retirement, unemployment, and various other smaller benefits. Workers in occupations classified as hazardous (about 40% of IKA contributors fall into that category) pay even higher rates.

[8]Note that new regime workers had no cap at all from 1993 to 2003. A new regime cap equal to 2.28 times the old regime cap was introduced in 2004.

to 40% in 2009. Income taxes are also withheld at source, final income taxes due are determined after the end of the financial year, when income returns are assessed taking into consideration tax relief and income from other sources. Importantly, the income tax schedule is the same for old and new regime workers. As a result, the income tax does not add to the tax wedge between old and new regime and hence does not need to be incorporated in our analysis (see below).

The 1992 Pension Reform Act.

On October 7th 1992, Greece enacted the Pension Reform Act of 1992 (Law 2084/1992) to restore financial balance of the public retirement system. The reform was debated in Parliament in September 1992. It was approved in late September. It was signed by the President of the Republic on October 1st, and became officially law on October 7th. Although reforming pensions had been discussed for a long time, implementing a cohort based payroll tax reform was not proposed until late in the parliamentary debate. This timing left little time to game the reform, as we shall discuss and analyze empirically in detail. On the contribution side, as mentioned above, new insurees, defined as individuals who did not have any covered earnings before January 1st, 1993, face a higher upper earnings ceiling (or, until 2003, no upper ceiling at all) for payroll taxes. Social insurance contribution rates are always the same for new and old insurees.

The law also changed the retirement benefits computation for new insurees. Pension benefits (at the normal retirement age) are equal to number of years with covered earnings times the accrual rate times reference earnings. Since 2002, the accrual rate is 2% for both new and old regime workers. Reference earnings in the new regime no longer include holiday allowances, leading to a reduction of about 14% of projected benefits on average. Since 2002, reference earnings are computed as average earnings up to the payroll tax cap of the best five years among the last ten (before retirement). Because the cap for new regime workers is 2.28 times higher, reference earnings for highly paid new regime workers can be substantially higher than for old regime workers. Partly offsetting this effect, there is a maximum pension cap equal to 50% of the new payroll tax cap that applies to both new and old regime employees but that typically binds only for new regime workers with long careers and high earnings. Therefore, in net, new regime workers with end-of-career earnings substantially above the old cap get somewhat more generous pensions than old regime workers with the same earnings, creating a positive lifetime wealth effect for new regime workers (relative to old regime workers). In contrast, new

regime workers with end of career earnings below or only slightly above the cap get somewhat less generous pensions than old regime workers creating a negative lifetime wealth effect. In principle, such wealth effects could lead to labor supply responses through wealth effects. For the relatively young workers we study in this paper, it is unlikely that this effect would be very large as pension benefits are far into the future and benefits are still highly uncertain, both because of potential future reforms and because of uncertainty in end of career earnings.[9]

Most important for our present analysis, retirement contributions can be considered as a pure tax for workers far from retirement both in the old and new regime.[10] All the other contributions which finance sickness, unemployment, and other benefits, create virtually no linkage between the levels of contributions and benefits and can also be considered as pure taxes. Therefore, in this study, we will always consider all payroll taxes as pure taxes.

II.B Administrative IKA Database

The data we use are extracted from the IKA administrative database and include all individual workers in Greece who first entered the IKA system in any of the 10 calendar years from 1988 to 1997. Hence our data spans 10 cohorts, 5 before the reform and 5 after the reform. The core data include the year of birth, gender, nationality, the exact day of entry in IKA (i.e., the first day with covered IKA earnings), insurance regime (old vs. new), and (scrambled) individual identifiers. Importantly, the core data contain all 1988-1997 entrants, including all those who have subsequently stopped working in the IKA covered sector.

We also have detailed job level and earnings variables for each of the March months from year 2004 to year 2009 for all the 1988-1997 entrants with IKA covered earnings in any of those months.[11] In each of those March datasets, and for each job, we have the number of days of work, occupation, monthly earnings, as well as full day and full week indicators of labor supply. Individuals with more than one job during the month will have more than one job record. The monthly earnings are broken down into various types: regular earnings, overtime earnings,

[9]For example, a reform in 2002 narrowed the difference in benefits between new and old regime workers. The discontinuity across cohorts in benefits could also affect retirement age and individual savings. Hence, the sharp cohort based discontinuity created by the Greek reform could also be a useful "natural experiment" to analyze retirement and savings decisions to changes in social security benefits down the road.

[10]Since 2002, as mentioned above, pensions are based on the highest five years of earnings (up to the cap) among the last ten. Prior to 2002, pensions were based only on the last five years. These rules apply to both old and new regime workers.

[11]An individual who entered in the period 1988-1997 but did not have any IKA earnings in any of the March months of 2004-2009 would be present in the core data but not in the earnings data.

bonuses, and other forms of earnings. Earnings are reported in full with no cap. The data also include the exact employer and employee tax rates (which depend on the insurance code), as well as the exact amount of employer and employee payroll taxes paid out for the corresponding job. Finally, the data include several employer level variables: industrial sector, geographical location, total number of employees in the firm, as well as an employer (scrambled) identifier. The longitudinal structure of the database allow us to link both individuals and employers across time periods. For most of our analysis, we create data at the individual level. For individuals with multiple employers, we define the main employer as the employer for which *regular* earnings are highest.

For simplicity of exposition, all our main text results involving earnings are based solely on March 2009 earnings. As shown in the on-line appendix, results using the full set of waves are extremely close and only marginally more precise than results using only March 2009 data. This is due to the fact that the fraction of workers above the cap grows over time (with seniority) and the fact that clustering standard errors at the individual level sharply reduces the gain in precision from combining waves.

Table II reports summary statistics, as of March 2009, for four groups of workers with positive IKA earnings in March 2009: (1) Those entering IKA from 1988 to 1992, i.e., old regime workers, (2) those entering IKA from 1993 to 1997, i.e., new regime workers, (3) those entering IKA from 1988 to 1992 with March 2009 posted earnings above €2432 (the old regime cap), (4) those entering IKA from 1993 to 1997 with March 2009 posted earnings above €2432 (the old regime cap). Four points are worth noting.[12]

First, virtually all the old entrants are in the old regime as expected. About 95% of new entrants are in the new regime. The number is not 100% because individuals who had covered earnings in any insurance scheme (not necessarily IKA) before 1993 qualify for the old regime. As we shall see, this does not invalidate the analysis as entering IKA after 1992 is still a very strong predictor of regime status. Second, about 12% of all workers have earnings above the old cap (€2432), while only about 1-2% of all workers have earnings above the new cap (€5543). As shown in the table, the fraction of workers above the old cap is higher for old entrants because old entrants are older and have longer work experience, and hence higher earnings. The same is

[12]We show in the on-line appendix that comparing workers closer to the cut-off date (1991-1992 entrants vs. 1993-1994 entrants) generates qualitatively similar differences across all those variables. Quantitatively, the differences are smaller as those two alternative groups are closer.

true for the fraction of workers above the new cap. Third, workers above the old cap are more likely to have bonuses, more likely to be male, more likely to work in larger companies, and less likely to have changed employers from March 2008 to March 2009. Finally, the bottom rows of Table II show that new entrants face higher marginal and average payroll tax rates on average. The difference becomes especially large when looking at workers above the old cap. This is not surprising as old entrants above the old cap by definition should face no marginal payroll tax[13] while most new entrants above the old cap are still below the new cap and hence face the full marginal payroll tax rates. As shown in the table, the difference in the total combined marginal tax rate between old and new entrants above the old cap is almost 25 percentage points.

II.C Conceptual Framework

We will use three definitions of monthly earnings. First, gross earnings z are defined as earnings inclusive of employee and employer payroll taxes. Gross earnings can be interpreted as the total labor cost that employers pay for a given worker.[14] Second, posted earnings w are defined as gross earnings net of employer payroll taxes. Earnings include not only the regular wages and salaries but also overtime pay, bonuses, as well as pay in arrears. It is therefore a broad definition of cash employment income which is used as the reference for computing payroll taxes and is also the standard reference for employer-employee compensation negotiations and decisions. Third, net earnings c are defined as earnings net of employee payroll taxes. This is the amount of disposable income (before individual income taxes however) that the worker actually receives.[15]

We denote by τ_R and τ_E the employer and employee (respectively) marginal payroll tax rates. As described above, those marginal tax rates apply up to a threshold of earnings $\bar{w}$, which we call the cap. We denote by $\bar{w}_O$ the cap in the old regime (for pre-1993 entrants) and by $\bar{w}_N$ the cap in the new regime (for those entering after January 1st, 1993). As of 2009 and as shown in Table I, recall that $\bar{w}_O = €2432$ and $\bar{w}_N = 2.28 \cdot \bar{w}_O = €5543$.

As $c = (1-\tau_E)w = [(1-\tau_E)/(1+\tau_R)]z = [1-(\tau_R+\tau_E)/(1+\tau_R)]z$, the sum of employer

[13] The rates are not exactly zero because of workers with multiple employers.

[14] The total exact labor cost might be slightly higher if employers offer additional fringe benefits. However, because the social security system is generous, such fringe benefits are rare in Greece.

[15] As mentioned above, individual income taxes are withheld at source as well so that take-home pay is $c' = c - T(c)$ where $T(.)$ represents the withholding schedule for the income tax. Because the individual income tax applies uniformly across cohorts with no differentiation between old and new entrants, we do not need to incorporate the individual income tax in our analysis.

and employee payroll taxes is equivalent to a combined tax rate $\tau = (\tau_R + \tau_E)/(1 + \tau_R)$ up to a threshold of gross earnings $\bar{z} = \bar{w} \cdot (1 + \tau_R)$. In Greece, the most common rates are $\tau_R = 28\%$ and $\tau_E = 16\%$ for a combined rate $\tau = 34.4\%$ (Table I). We denote by $\bar{z}_O$ and $\bar{z}_N$ the old and new cap in terms of gross earnings. Similarly, we denote by $\bar{c}_O$ and $\bar{c}_N$ the old and new cap in terms of net earnings.

Standard tax incidence prediction. Barring any gaming at the time of the reform, workers who entered shortly before January 1st, 1993 versus shortly after January 1st, 1993 should be very close substitutes in the labor market as they should have very similar characteristics in terms of age, gender, education, and work experience. Therefore, in a frictionless labor market, an employer maximizing profits should not be willing to pay more for a new regime worker than for an old regime worker with identical characteristics and hence identical marginal productivity. This implies that the tax differential between new regime and old regime workers should be borne entirely by workers: gross wages should be the same for both types of workers. Hence, posted wages should be lower for new regime workers above the old cap by the amount of the extra employer payroll tax rate. Similarly, net wages for new regime workers above the old cap should be lower by the amount of extra employer plus employee payroll tax rate. Therefore, when comparing workers just below and just above the entry cut-off date, tax incidence should be completely independent of both the labor supply and the labor demand elasticities, providing a powerful test of the standard model. As we shall see, this standard model prediction is starkly rejected by the data and we will discuss in Section IV potential explanations for our results.

Importantly, note that the standard prediction applies to wages and not necessarily to earnings if labor supply is affected by the tax differential, hence the necessity to examine labor supply responses first.

Labor supply responses. If the tax reform affects the net reward from work of new regime workers relative to old regime workers, we should expect labor supply responses both along the extensive and intensive margins, especially in the long-run after the reform has been in place for many years. Labor supply affects earnings and hence can potentially impact the incidence test described above.

Figure I depicts the effect of the tax change on the individual budget constraint set and utility maximizing choices in the (z, c) diagram where z is gross earnings and c is disposable income. Utility increases with disposable income c (as disposable income funds consumption)

and decreases with z (as labor supply is costly).[16]

On the extensive margin, the reform reduces the net-rewards from work in the IKA sector of highly paid workers–those with gross earnings above $\bar{z}_O$ absent the reform, i.e., about the top decile earners. Such workers might decide to stop working entirely, migrate to other sectors (such as the public sector, the self-employed sector, or professions covered by special schemes), or to a foreign country. Hence, the extensive margin response should reduce the number of new regime workers above the old cap relative to old regime workers. Under the standard assumption that the cost of shifting sectors is proportional to earnings, we should expect the response to be proportional to the difference in *average* tax rates between old and new regime workers, and hence should be maximum at earnings level $\bar{z}_N$. The empirical literature suggests that extensive labor supply responses are more important than intensive labor supply responses (see e.g., Heckman, 1993). In the case of the Greek reform however, as individuals affected are skilled workers with high earnings potential, dropping out of the labor force entirely is unlikely. The other sectors not covered by IKA are also imperfect substitutes for IKA jobs limiting potential behavioral responses. Finally, language and cultural barriers might limit international mobility. Indeed, our empirical analysis finds no significant effect of the reform along the extensive margin.

On the intensive margin, new regime workers with gross earnings between $\bar{z}_O$ and $\bar{z}_N$ experience an increase in marginal payroll tax rates from 0 to τ so that their net-of-tax rate decreases from one to $1-\tau$. This will create primarily a substitution effect which will reduce hours of work and hence gross earnings. New regime workers with gross earnings above $\bar{z}_N$ experience a pure income effect with no change in net-of-tax rates (Figure I). This income effect should lead to an increase in hours of work and earnings, under the standard assumption that leisure is a normal good. As we shall see, we do not find any effect of the reform on hours of work implying no intensive labor supply response.[17]

[16]The figure implicitly assumes standard incidence as described above. We discuss below how this is affected under other incidence assumptions.

[17]In principle, labor supply responses should also generate a gap in the earnings distribution around the cap as it is sub-optimal for workers to locate very close to the cap. Consistent with our finding of no labor supply responses, there is no evidence of such a gap in the empirical earnings density distribution (Liebman and Saez, 2006 also fail to find a gap in the earnings distribution at the US Social Security cap).

III Empirical Analysis

III.A Estimation Design

As the 1992 reform is based on date of entry in the insurance system, our empirical analysis compares current labor market outcomes based on date of entry into the IKA system. The reform creates a sharp discontinuity by date of entry with January 1st, 1993 being the dividing line. Because earnings and other characteristics vary by date of entry, for example older entrants have higher earnings because of experience and seniority (Table II), we cannot directly compare old and new entrants. However, absent the 1992 reform, we should expect differences between old and new entrants to shrink as we compare entrants just before and just after the cut-off line. This feature leads naturally to a Regression Discontinuity Design (RDD). Therefore, we will identify tax effects by running regressions of the form:

$$Y_i = \alpha_0 + \beta_0 \cdot 1(t_i \geq 0) + \sum_{k=1}^{K} \alpha_k \cdot t_i^k + \sum_{k=1}^{K} \beta_k \cdot t_i^k \cdot 1(t_i \geq 0) + X_i\gamma + \varepsilon_i, \tag{1}$$

where t_i is the entry date of individual i normalized so that $t = 0$ at the cut-off line of January 1st, 1993 and X_i denotes a vector of additional control variables. The coefficient of interest capturing the effect of the discontinuity at $t = 0$ is β_0 (as the polynomials in t^k are zero at $t = 0$). Polynomials in t are included to control in a flexible way for the effect of date of entry t on outcome Y. There are two main ways to assess robustness of the RDD results to the specification: (1) restrict the sample to a narrower window around the cut-off date, which we will do by limiting the sample to 1991-1994 entrants (instead of 1988-1997 entrants), (2) include higher order polynomials (the parameter K in equation (1)) in the regression specification. A simple way to illustrate the RDD is to plot average outcome Y by date of entry month bins and draw the quadratic fit below and above the cut-off line.

III.B Identification Checks

As mentioned above, a key requirement for identification is that the workers entering just before and just after the cut-off dates are comparable. This identification requirement could be invalidated if some workers had strategically selected their date of entry in response to the reform which was enacted in October 1992. Therefore, Figure II plots the number of workers by date of entry. Importantly, we use the sample of all entrants, regardless of presence of IKA

earnings in 2004-2009. Therefore, this analysis captures behavioral responses solely due to entry date selection and is not affected by subsequent extensive labor supply responses, i.e., workers leaving the IKA sector after entry.

Panel A focuses on all 1988-1997 entrants and plots the number of entrants at a monthly frequency. Panel A shows large month to month variations in the number of entrants due in part to seasonality effects. Importantly, as confirmed by the quadratic fit curves, there is no visible discontinuity in the number of entrants around the cut-off date. Specifically, we observe no spike in the number of entrants just before the cut-off date. Panel B narrows the sample to males aged 22 to 30 at entry, a sub-sample with higher expected earnings, and hence more likely to be affected by the reform. The series are slightly smoother for that sub-sample and display no discontinuity at all at the cut-off.[18]

Those identification checks are formally estimated in a regression framework and presented in Table III, Panel A. The table displays the coefficients (with robust standard errors in parentheses) from regressing the number of monthly entrants, and the number of male entrants aged 22-30 at entry (listed in the left-hand-side column) on a dummy for entering IKA on or after 1/1/1993. Each column corresponds to variations in the RDD specification. Column (1) estimates includes a linear entry date (normalized to 0 at 1/1/1993) and a linear entry date interacted with the dummy for entering IKA after 1/1/1993. Column (2) uses the same controls as column (1) but limits the sample to those entering IKA from 1991 to 1994. Column (3-5) use all 1988-1997 entrants but add successively Monthly dummies in column (3), quadratic date trends in column (4) (quadratic term and quadratic term interacted with the dummy for entering IKA after 1/1/1993), cubic date trends in column (5) (cubic term and cubic term interacted with the dummy for entering IKA after 1/1/1993). Consistent with the graphical analysis, the identification checks variables do not display robust significant results. The coefficient is significant when only linear trends are included but this result is not robust to narrowing the window around the reform or adding nonlinear trends.

The combination of the graphical and regression results shows that individuals did not try to game the system by rushing into IKA covered jobs just after the law was passed in October 1992

[18]We show in the on-line appendix that there is no discontinuity at the daily level at the cut-off entry date in a narrow 6 month window around the reform (Figure A1) nor any discontinuity in the age and gender composition of entrants at the reform cut-off date (Figure A2). We also show that, although unemployment was trending up during the period 1988-1997, there was no discontinuity in unemployment rates at the time of the reform especially for young workers (Figure A3).

and before January 1st, 1993 to benefit from the more advantageous old regime. There are three possible explanations for the absence of gaming effects. First, there was very little time between the time the law was enacted on October 7th, 1992 and January 1st, 1993. Second, formal IKA covered jobs cannot easily be found or created.[19] Third, the difference between the two regimes might not have loomed large for young workers as they are very far from retirement to care about changes in retirement benefits and, at the very start of their career, their earnings are almost always below the old cap making the difference in caps irrelevant for a number of years. The absence of gaming is critical for our subsequent analysis as gaming could have created a discontinuity in the composition of workers just below and just above the cut-off, which would have invalidated the RDD estimation.

III.C First Stage

Panel A on Figure III plots the fraction of entrants in the new regime by month of entry in the IKA insurance scheme among workers with positive earnings in March 2009. Unsurprisingly, there is an enormous discontinuity as hardly any worker entering IKA before 1/1/1993 is in the new regime and about 95% of workers entering IKA on or after 1/1/1993 are in the new regime. As mentioned above, the number is not 100% because post reform IKA entrants may have made contributions to another insurance scheme before 1993, in which case they qualify for the old regime. Panel B in Figure III plots the fraction of workers (among entrants with positive earnings as of March 2009) above the earnings cap (€2432 for old regime workers and €5543 for new regime workers). The graph shows indeed a sharp discontinuity at the cut-off date showing that the fraction above the cap drops from about 12% down to 2% at the discontinuity, reflecting the fact that most post reform entrants are in the new regime with the much higher cap. The fraction above the cap decreases smoothly by date of entry both among the old and new entrants because average earnings increase with age and experience. Hence, Figure III demonstrates that the cohort based reform does create a very strong first stage effect on the probability of facing payroll taxes at the margin.

Those first stage effects are formally estimated in a regression framework and presented in Table III, Panel B. Total Marginal Tax Rate (Average Tax Rate) is the combined marginal (average) payroll tax rate adding employee and employer payroll tax rates. The marginal tax

[19] In contrast to the United States, most part-time and low paid jobs for young workers in Greece are not in the formal covered sector and hence do not qualify workers for the old regime status.

rate is zero when the individual worker is above the cap. The first stage results in terms of (a) percent in new regime, (b) percent reaching the cap (of their respective regime), (c) average marginal tax rate, (d) average tax rate all display a very significant discontinuity that is very robust for the various specifications such as restricting the sample to 1991-1994 or the number of polynomials date of entry controls included in the regression. Those results confirm the graphical results from Figure III showing that the Greek payroll tax reform did generate a very strong first stage effect.

III.D Labor Supply

As discussed above, the reform can generate labor supply responses along both the extensive and intensive margins. As extensive margin responses affect the composition of workers, it can bias intensive margin estimates. Hence, we focus first on extensive margin responses.

Extensive Responses. Our discussion above showed that extensive margin responses should create a deficit of highly paid workers among new entrants as some of those workers leave the IKA sector (for other sectors, non-work, or foreign countries). This deficit will translate into a discontinuity in the fraction of workers paid above the old cap at the entry cut-off date. Therefore, Figure IV, Panel A plots the fraction of workers with posted earnings above the old cap (€2432) by month of entry among workers with positive earnings in March 2009. There is a downward trend because earnings increase with seniority but, importantly, the figure shows no evidence of a discontinuity at the cut-off date.[20] Panel A in Table IV presents the corresponding regression results (using the same set of specifications as in Table III). Consistent with the graphical analysis, the percent of workers with earnings above the old cap does not display any robust significant discontinuity at the cut-off date. The coefficient is significant–and actually of the wrong sign relative to the theoretical prediction–when only linear trends are included but this result is not robust to narrowing the window around the reform nor adding nonlinear trends. This represents compelling evidence that the reform did not generate a labor supply response along the extensive margin. As a caveat, we should note that the standard errors around the estimates are relatively large so that we cannot rule out moderate behavioral responses along the extensive margin, a point we come back to in Section IV.

Intensive Responses. Our data allow us to study intensive labor supply decisions along several

[20]Note however that the slope of the fitted curves seems to be changing around the cut-off date.

dimensions: hours of work, days of work per month, overtime, and multiple jobs. Although hours of work are not directly recorded, the administrative data have such rich labor supply variables that we can construct monthly hours of work as follows. In Greece, a full day implies eight hours of work. Part day would be anything below eight hours. As the most common part day is half day, we assume that part day corresponds to four hours of work. We assume that overtime corresponds to additional hours of work over and above the regular hours. We compute the hours of work corresponding to overtime by assuming that the hourly wage rate in overtime is the same as in regular time. Finally, we cap monthly hours of work at 300 per month (less than one percent of the sample hits this cap). Our measure of hours of work certainly has some measurement error but significant measurement error in hours is also present in self-reported survey data. More importantly, our measure of marginal tax rates which is relevant for labor supply estimation is not affected by the measurement error in hours as marginal tax rates are based on total earnings which have very little measurement error.

We select our sample as follows to analyze intensive responses. First, we compute the daily regular earnings by dividing regular monthly earnings by the number of days of work in the month. Recall that regular earnings include only base pay and do not include bonuses, overtime, and other special payments. Second, we select workers with daily regular earnings above €2500/25 = 100. We select this cut-off because IKA assumes that full time workers have 25 insurance days per month. Therefore, those workers will be above the old cap by working the average number of days just with regular earnings, and hence there will be a discontinuity in marginal tax rates for additional days, overtime, or multiple jobs.

Figure IV, Panel B displays the average number of monthly hours of work among the group that we just defined by month of entry in IKA. The number of hours of work displays a small downward trend by date of entry. Note that the scale is very compressed as many workers work a standard 200 hours (=25 days times 8 hours) per month. Most importantly, there is no visible discontinuity at the cut-off entry date, suggesting that high earners do not respond to the higher rates by cutting their number of hours of work.

Table IV, Panel B provides regression estimates of labor supply effects along the intensive margin. The estimates show that there is no discontinuity in hours of work, days in regular job, overtime, or multiple jobs likelihood at the cut-off date: except for overtime in two specifications, all estimates are insignificant. Even for overtime (which has a wrong positive sign relative to

our theory prediction), the significant estimates are not robust across specifications. Our results show that the labor supply of upper income earners (about the top decile) affected by the reform is not responsive to the payroll tax differential, even in the long-run as the discontinuity has been in place since 1993 and we observe earnings in 2009, i.e. 16 years later.

We will come back to the labor supply analysis and estimate labor supply elasticities so as to bound efficiency costs of payroll taxes after we complete the tax incidence analysis. Importantly, the absence of labor supply responses along both the extensive and intensive margins simplifies the incidence analysis as we can focus directly on earnings instead of wage rates (as the workforce composition and hours of work are not affected by the tax differential).

III.E Tax Incidence

As discussed in Section II.C, tax incidence analysis can be directly done in terms of earnings (as opposed to wage rates) because we have shown that there are no labor supply responses along both the extensive and intensive margins. The prediction of the standard model is that new regime workers should bear the full incidence of the payroll tax differential.

The simplest way to test the standard model is therefore to assess whether there is a discontinuity in the distribution of gross earnings, posted earnings, or net earnings around the entry cut-off date. Under standard incidence, we should see no discontinuity for gross earnings but a discontinuity for posted and net earnings above the old cap. We have $c = (1 - t_E)w$ and $z = (1 + t_R)w$ where t_E and t_R are the average employee and employer payroll tax rates defined respectively as the ratios of employer and employee payroll taxes to posted earnings w.

The reform affects the average payroll tax rates t_E and t_R for workers above the old cap. Figure V, Panel A depicts $\log(1 + t_R)$ and $\log(1 - t_E)$ (along with the normalized x-axis line in solid line) for workers above the old cap (in March 2009) by year of entry.[21] As expected from our first stage results, there is a clear upward jump for $\log(1 + t_R)$ and a clear downward jump for $\log(1 - t_E)$ from 1992 to 1993. Panel A in Table V confirms that there is a significant discontinuity in those variables at the cut-off date that is robust across all RDD specifications.

Figure V, Panel B depicts the average log-gross earnings, log-posted earnings, and log-net earnings for workers above the old cap in March 2009 (posted earnings above €2432) by year of entry. Under standard incidence, log-gross earnings should be flat, while log-posted earnings,

[21] We present results at the annual level (instead of monthly) on Figure V so that we can display several graphs on the same chart. Monthly graphs with quadratic fit show essentially the same results.

and log-net earnings should jump down. However, the graph shows compellingly that gross earnings jump up at the cut-off date, posted earnings are flat, and net earnings jump down. There is a striking similarity between Panel A and Panel B which shows that the incidence of the employer payroll tax differential is on gross earnings and hence borne by employers, while the incidence of employee payroll tax differential is on net earnings and hence borne by employees. Panel B in Table V confirms those findings. There is a clear and significant upward discontinuity in log gross earnings, no discontinuity in posted earnings, and a downward discontinuity in net earnings. Those results are very robust across all five RDD specifications. The size of the discontinuities in gross and net earnings mirror the discontinuities in $\log(1+t_R)$ and $\log(1-t_E)$ from Panel A. As a caveat, note that the standard errors around our estimates are often large.

Instead of considering average log-earnings statistics, we can also consider an alternative statistic, namely the fraction of workers with gross earnings, posted earnings, or net earnings above given fixed thresholds z^*, w^*, c^*. Under standard tax incidence, when this threshold is above the old cap, this fraction should be stable for gross earnings z, and go down for w and c. Figure VI displays, by year of entry in IKA, the fraction of workers with gross earnings, posted earnings, and net earnings above $z^* = 3500 \cdot (1+\tau_R)$, $w^* = 3500$, and $c^* = 3500 \cdot (1-\tau_E)$ as of March 2009. The cut-off €3500 is chosen so as to fall in between the old and new caps. Unsurprisingly, the fraction of high earners is declining with date of entry as older entrants have more experience and hence higher earnings as we documented in Table II. The striking finding however is that this declining pattern does not happen for gross earnings around the cut-off date: the fraction with high gross earnings actually increases from 1992 to 1993. For posted earnings, the series are smoothly declining with no visible discontinuity. For net earnings, the decline is actually more pronounced from 1992 to 1993 than in any other year. Those findings are fully consistent with our previous findings showing that gross earnings (resp. posted earnings, net earnings) are actually higher (resp. the same, lower) for new entrants than for old entrants around the cut-off. They are also confirmed by regression analysis in Table V, Panel C which shows that the fraction of workers with gross earnings above z^* jumps up at the cut-off date, while the fraction of workers with posted earnings above w^* is stable, and the fraction of workers with net earnings above c^* jumps down.[22]

The evidence displayed on Figures V and VI and Table V offers striking evidence of non-

[22]Note however that the results are not as strongly consistent as in the case of log-earnings, as some of the gross earnings regressions are not significant, although the jump in the graph is striking.

standard tax incidence. In sharp contrast to the standard model we developed above and which predicts that new regime entrants should bear the full (employee plus employer) payroll tax differential, we find that employers compensate new regime entrants for the extra *employer* payroll taxes so that gross earnings are higher for new entrants and posted earnings are actually the same for new and old entrants. In contrast, employees seem to bear the full burden of the extra *employee* payroll taxes so that net earnings are lower for new entrants. All standard theoretical models predict that the division between employer and employee payroll taxes should not matter for the ultimate incidence of the payroll taxes between employees and employers. The unusual cohort based Greek reform offers clear evidence contradicting this clear-cut prediction of the standard model.

We provide in the on-line appendix placebo tests showing that there is no discontinuity at the cut-off entry date in the distribution of (gross, posted, and net) earnings *below* the old cap. We also present in the on-line appendix a heterogeneity analysis where we cut the sample by various characteristics such as age (at entry), gender, and firm size. We find consistent evidence of non-standard incidence within all groups.[23]

In principle, our results could also be consistent with a situation where the employer and employee sharing of payroll taxes is irrelevant for incidence but it happens co-incidentally that employers bear the same fraction of taxes as the fraction of employer taxes in total payroll taxes. We cannot test this hypothesis because we do not have significant variation in the relative employer vs. employee tax rates. However, this alternative hypothesis does not seem very plausible to us because this result holds relatively widely, both among men and women, small and large firms, or across industrial sectors. It would be very surprising to obtain a tax incidence exactly proportional to the nominal employer and employee tax shares in all sectors.

IV Interpretation and Policy Implications

IV.A Interpretation

In models with frictions such as search models, employees and employers share a surplus so that there is typically an interval of wages that are acceptable to both the employee and the employer. Hence, wages are not systematically equal to marginal product as in the standard model and

[23]Incidence seems somewhat closer to standard in the case of older workers (those entering IKA at age 23 or after), but our estimates are not precise enough to rule out identical incidence among all sub-groups.

are in part determined by other factors such as bargaining power, wage setting norms, or pay fairness norms. If such norms are based on posted-earnings, then this will create an asymmetry between employer and employee payroll taxes.

First, employers may not be able to pay similar workers differently for the same job because of pay fairness norms. Conceivably, offering different posted earnings for workers with different regime status but performing the same job might be perceived as discriminatory and could adversely impact morale and productivity inside the firm. In that situation, employers would have to pay new and old regime workers doing the same job the same posted earnings. There is substantial evidence for such fairness norms in the empirical literature. In case of the minimum wage for example, employers are unwilling to use youth sub-minimum wages (see Katz and Krueger 1991, 1992 for empirical evidence on youth sub-minimum wages) and Falk, Fehr, and Zehnder, 2006 show with laboratory experiments that minimum wages can create entitlement effects and shape the perception of what is a fair wage. There is also substantial evidence of downward wage rigidity which has been explained by such morale effects and fairness perceptions (see e.g., Blinder and Choi, 1990, Campbell and Kamlani, 1997 or Bewley, 1999).

Second, it is also conceivable that bargaining is based on posted earnings as this is the reference wage in negotiations. This could happen for example if it is costly for employers to observe and incorporate regime status in hiring negotiations, or if union bargaining and anti-discrimination rules are based on posted earnings. In that case, new and old regime workers with similar characteristics will also receive the same posted earnings.

Third, there is strong evidence for seniority-based wage norms in Greece so that younger workers are underpaid relative to their productivity and older workers are overpaid relative to their productivity.[24] In that case, employers get surplus from hiring young workers and hence may be willing to pay the extra employer tax cost for hiring young workers in the new regime.

As discussed in detail in the on-line appendix, we have carried out a small survey with five managers and one union member involved in personnel decisions at firms of medium to large size in Greece. The survey confirmed our empirical findings that employers do not take into account the new vs. old regime status when making hiring and wage setting decisions. According to the survey, Unions and anti-discrimination rules do not play a role in this. One manager mentioned the role of fairness and morale. Three managers mentioned that seniority-based wage norms

[24] A large literature has documented such seniority-based wage norms in many countries (see Skirbekk [2004] for a recent survey) and has been confirmed by a small survey of Greek employers we carried out (see below).

make young workers attractive to firms, in spite of the new regime tax differential.

Note that all three potential explanations, fairness norms, bargaining norms, or seniority-based norms can explain our tax incidence results in a partial equilibrium model if such norms are based on posted-earnings. However, such non-standard incidence could not be sustained in general equilibrium as employers would try to avoid recruiting new regime workers in the first place, or would try to lay them off in priority. This would generate a discontinuity in earnings around the cut-off date in the long-run equilibrium. Interestingly, even 15 years after the reform has been in place, we do not observe such a discontinuity suggesting that general equilibrium forces are not sufficient to alter the non-standard incidence results.

IV.B Policy Implications

Efficiency Costs of Payroll Taxes. Using our key incidence result that workers bear only the employee portion of the payroll tax at the discontinuity, the labor supply response to the tax reform is due solely to the employee portion of the payroll tax. This allows us to estimate and bound the labor supply elasticities with respect to the net-of-tax rate. Panel C of Table IV reports estimates the elasticity of hours of work with respect to the net-of-employee payroll tax rate. Those estimates are obtained by regressing log-hours on $\log(1-\tau_E)$ where τ_E is the marginal employee payroll tax rate, instrumenting $\log(1-\tau_E)$ with a dummy for entering IKA in 1993 or after, and using additional controls as in the other RDD estimates. The key identification assumption is that, absent the reform, workers on each side of the cut-off date would supply the same number of hours of work. Unsurprisingly as we did not find any discontinuity in hours of work (Table IV, Panel B), all our elasticity estimates are insignificant and fairly precisely estimated, and actually slightly negative, implying that hours of work do not respond to marginal tax rates.

Perhaps even more importantly, if we accept our incidence results that employees bear only the burden of the employee payroll taxes, our results show that there is no discontinuity in posted-earnings at the cut-off date. This implies that the elasticity of reported posted-earnings with respect to the net-of-tax rate $1-\tau_E$ is also zero. We present such estimates in Panel C of Table IV by regressing log-posted earnings on $\log(1-\tau_E)$ using a dummy for entering IKA in 1993 or after as instrument. Those posted-earnings elasticities are close to zero and fairly precisely estimated. Importantly, such an elasticity includes not only hours of work responses

but also all tax avoidance (such as having new regime workers paid with deferred compensation or perks on the job instead of cash) or tax evasion (for example supplemental unreported cash wages). In particular, although tax evasion is a general concern in Greece (see e.g., Matsaganis and Flevotomou, 2010) our results suggest that highly skilled workers in the IKA system have few opportunities to evade taxes, perhaps because they have to work in formal firms that comply with the tax system. This is consistent with the tax evasion literature that shows that, even in countries where tax evasion rates are high, there is still a formal sector (composed of the largest firms) where tax enforcement is high.[25] In the taxable income elasticity literature, large elasticities for upper incomes are in general due to tax avoidance opportunities (Saez, Slemrod, and Giertz, 2011). If upper earners in the IKA sector in Greece have few avoidance opportunities, our results are fairly consistent with the taxable income elasticities evidence.

Taken together, those results suggest that the high payroll tax rates in Greece (as in most European countries) may not have large efficiency costs on high income earners. Two important caveats should be noted. First, those results are predicated on assuming that our non-standard incidence results are valid. If employees were bearing more than the employee portion (as for example in the standard incidence model), then the elasticity would be negative (in contrast with the theoretical prediction of the standard labor supply model laid out on Figure I). If employees were bearing less than the employee portion (pushing us further away from the standard incidence model), then the elasticity would be positive. Overall, absence of supply responses combined with nominal non-standard incidence strikes us as a much simpler explanation for the empirical facts. Second, even though we do not find evidence of extensive margin responses, the bound on extensive elasticities (not reported) would be large as the standard errors reported in Panel A of Table IV are fairly large and could not rule out substantial extensive elasticities.

Lessons for Tax Policy. In contrast to the standard model, we find that nominal tax incidence (employer vs. employee portions of the tax) is relevant for the long-run economic incidence. Such findings are consistent with the experimental studies on re-employment bonuses. Woodbury and Spiegelman (1987) shows that such bonuses are more effective when they are nominally given to the employee rather than given to the employer although they are economically equivalent in a standard model (see also the survey by Meyer, 1995).

[25]It is still possible that increasing IKA payroll tax rates across the board would induce low paid formal workers to shift to the informal sector which is large in Greece.

Therefore, our results imply that employer vs. employee payroll tax cuts are likely to be sticky at least in the medium term. Under such non-standard stickiness, reducing employer payroll taxes would increase profits while not affecting net wages, a desirable outcome when businesses face liquidity constraints to grow but an undesirable outcome when businesses are hoarding cash and reluctant to invest. In contrast, reducing employee payroll taxes (as was done in the recent US stimulus packages) would increase net wages without increasing profits, a desirable outcome to make work more attractive or to stimulate aggregate consumption. If the policy goal is to improve take-home earnings of some specific groups of workers such as low paid workers or other disadvantaged workers, then the employee tax cut option is likely to be much more effective than the employer tax cut option, at least in the short-run and quite possibly the medium-run as well.

More generally, our study shows that the institutional context–employee vs. employer taxes–plays a key role in the incidence of taxation even though it should be irrelevant in standard models. Our study therefore complements a growing literature showing that the institutional and informational contexts play a crucial role in behavioral responses to taxes. For example, Chetty et al. (2009) and Finkelstein (2009) show that tax salience is critical for incidence and behavioral responses to taxation. Chetty and Saez (2009) show that information about the tax system also has on impact on behavioral responses to taxation. Overall, those new studies show that the analysis of taxation is conceivably much more complex than previously thought as many additional factors which are in general omitted because irrelevant in standard models, can actually have a substantial impact on behavioral responses, and hence on tax policy design.

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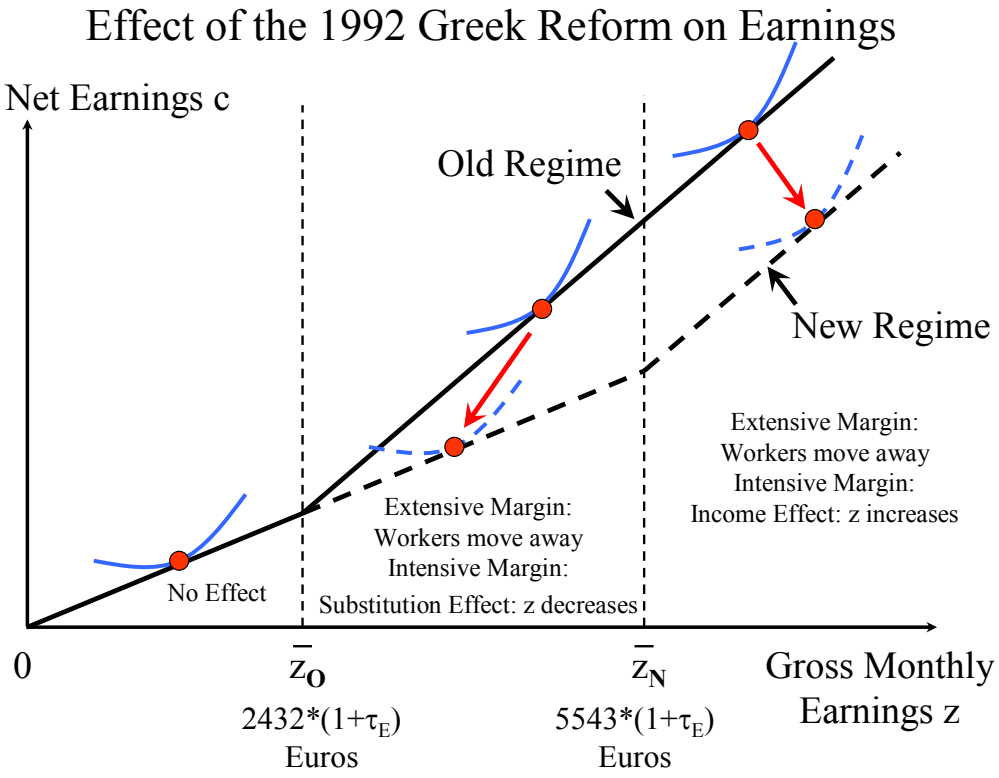

Figure I. Conceptual Framework

The figure displays the effects of the 1992 pension reform in Greece on the monthly budget constraint of private sector employees (covered by the IKA social insurance system). The x-axis represents monthly gross earnings (including both employer and employee payroll taxes). The y-axis represents monthly net earnings (earnings net of both employer and employee payroll taxes). The solid line is the old regime budget (for those entering the IKA system before 1993) and the dashed line is the new regime budget (for those entering the IKA system on or after 1993). The reform increased the cap in earnings subject to payroll taxes from z_O to z_N for new regime workers, hence shifting outward the kink point in the budget set where the payroll marginal tax rate ends.

Along the extensive margin, workers with earnings above z_O are induced by the reform to move away from the IKA sector (either drop out of the labor force, shift to another sector not covered by IKA, or move to a foreign country).

Along the intensive margin, workers with monthly earnings below z_O are unaffected by the reform. Workers with earnings between z_O and z_N experience a substitution effect which decreases gross earnings (and also an income effect but small relative to substitution effects). Workers with earnings above z_N experience only an income effect which increases gross earnings.

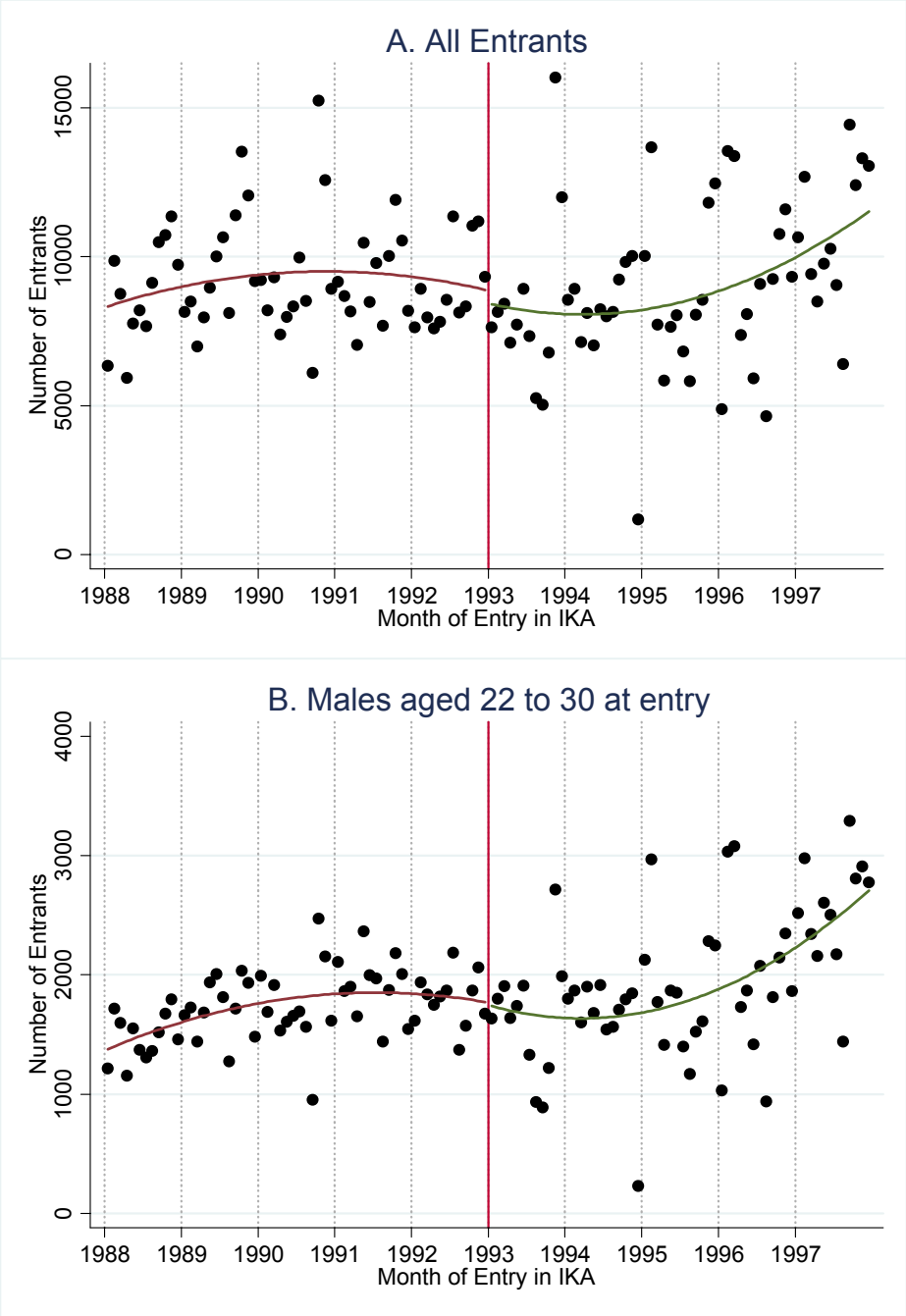

Figure II. Identification Checks: Number of Entrants by Month of Entry

Panel A displays the number of entrants by month of entry in the sample of all entrants (regardless of subsequent IKA earnings). Panel B displays the number of male entrants aged 22 to 30 at entry by month of entry (males aged 22 to 30 at entry have the highest expected earnings and hence are the most likely to be affected by the cap increase in the new regime). In both panels, the curve on each side of the discontinuity is the best quadratic fit. Both graphs display no discontinuity at the cut-off date showing that individuals did not game the system by entering IKA before 1993 after the reform was enacted in October 1992.
Source is IKA administrative Social Security earnings data.

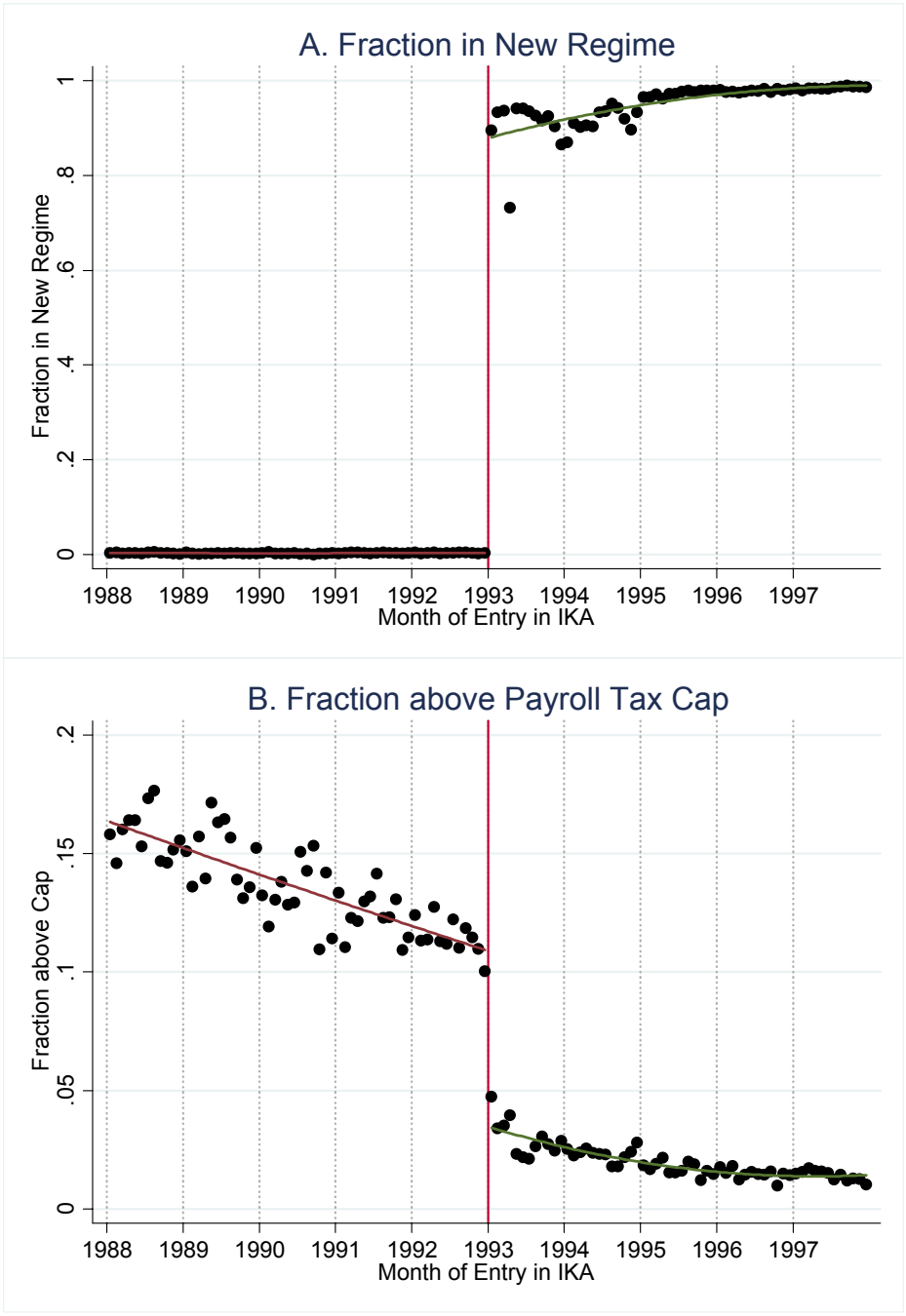

Figure III. First Stage: Fraction in New Regime and Above Cap by Month of Entry
In both panels, the sample is all workers with positive earnings in the IKA social insurance scheme as of March 2009. Panel A displays the fraction of workers in the new regime by month of entry into the IKA system. Workers entering IKA before 1993 are all in the old regime. The vast majority of workers entering IKA on or after 1993 are in the new regime. Some post-1993 entrants are in old regime because workers who had covered earnings before 1993 in any other social insurance scheme (outside IKA) still qualify for the old regime. Panel B displays the fraction of workers with earnings above the payroll tax cap. There is a sharp drop at the 1/1/1993 cut-off date as the cap for new regime workers is 2.28 times higher than for old regime workers. In both panels, the curve on each side of the discontinuity is the best quadratic fit.
Source is IKA administrative Social Security earnings data.

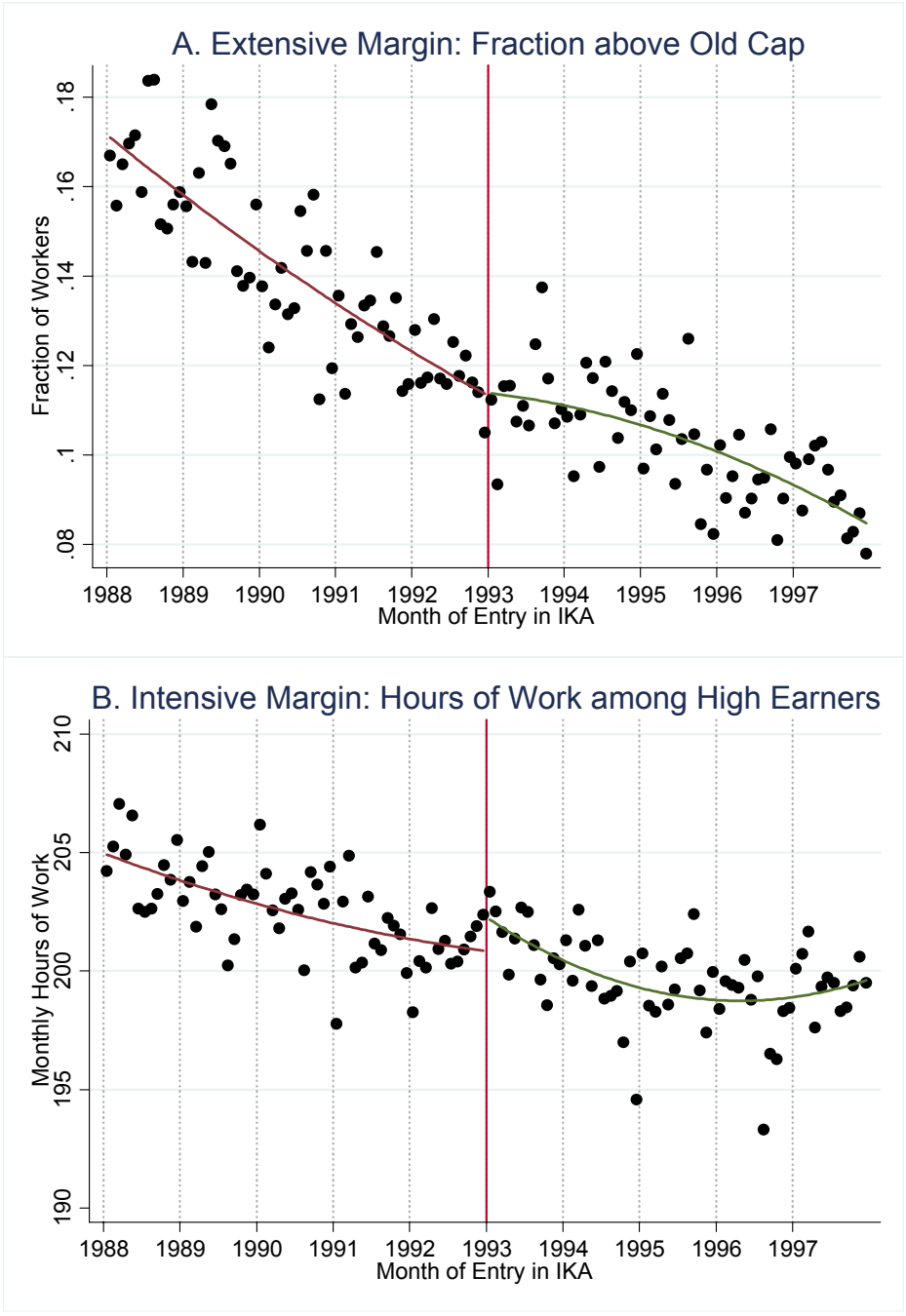

Figure IV. Labor Supply Responses

Panel A displays the fraction of workers with IKA earnings above the old cap in March 2009 (among all workers with positive earnings in March 2009) by month of entry. Panel B displays, by month of entry in IKA, the average number of monthly hours of work among high earners in March 2009 (defined as those with regular earnings per day of work above 2500/25 Euros, i.e., would reach the old cap by working full month). In both panels, the curve on each side of the discontinuity is the best quadratic fit. Both graphs display no significant discontinuity at the cut-off date. Panel A implies that highly skilled workers in the new regime did not respond to the higher tax along the extensive margin. Panel B implies that there is no intensive labor supply response to the higher marginal payroll tax rate in the new regime.

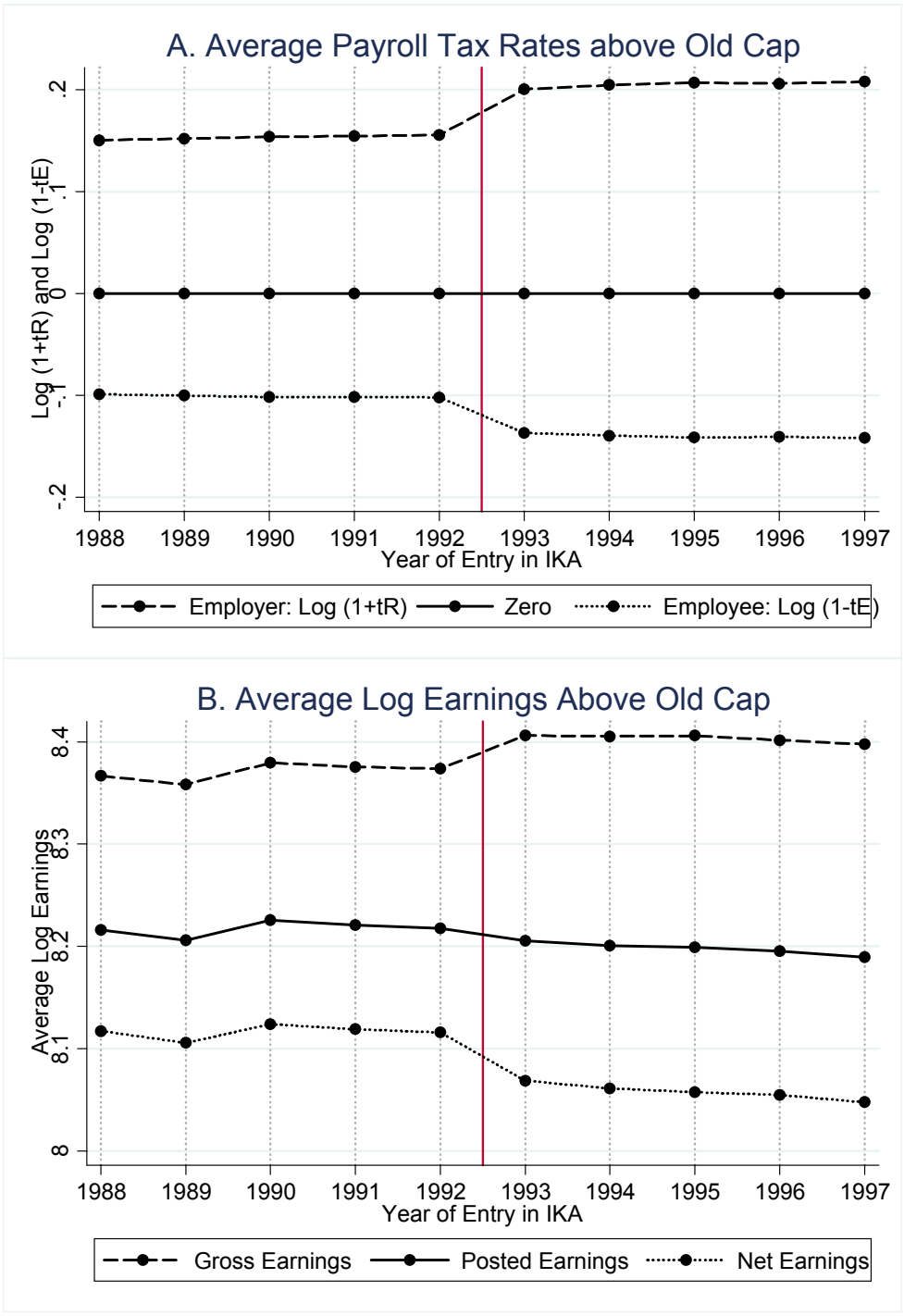

Figure V. Tax Incidence Effects: Average Tax Rates and Earnings above Old Cap

Panel A displays, by year of entry in IKA, the average $\log(1+t_R)$ and $\log(1-t_E)$ for workers with posted earnings above the old cap in March 2009. t_R is the average employer payroll tax rate (employer taxes/posted earnings) and t_E is the average employee payroll tax rate (employee taxes/posted earnings). The zero line is displayed for illustration. As expected, $\log(1+t_R)$ jumps up and $\log(1-t_E)$ jumps down at the reform cut-off entry date. Panel B displays, by year of entry in IKA, the average log gross earnings, log posted earnings, and log net earnings for all workers above the old cap in March 2009. Panel B shows that gross earnings jump up at the cut-off date, posted earnings are flat, and net earnings jump down. The striking similarity between Panel A and Panel B shows that employers bear the incidence of employer taxes while employees bear the incidence of employee taxes.

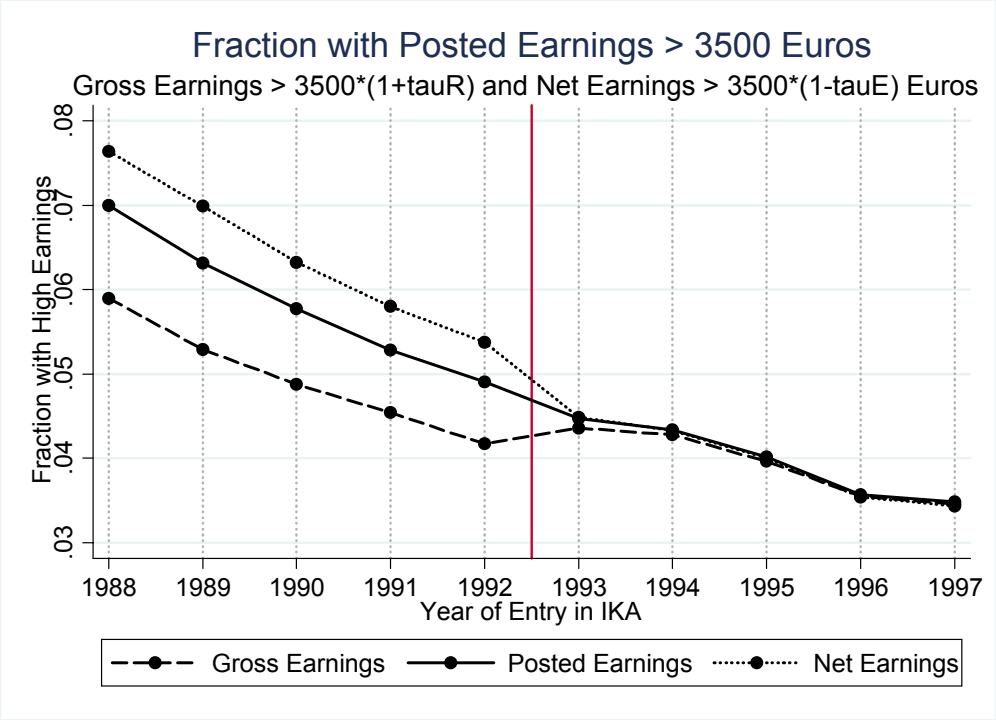

Figure VI. Tax Incidence Effect: Fraction with high earnings

The graph displays, by year of entry in IKA, the fraction of workers in March 2009 with monthly gross earnings, posted earnings, and net earnings above $3500*(1+\tau_R)$, 3500, and $3500*(1-\tau_E)$ Euros. The graph shows that gross earnings jump up (relative to trend) at the cut-off date, posted earnings are continuous, and net earnings jump down, confirming the results from Figure V.

Table I. IKA Payroll Tax System

A. Contribution Rates (most common case):

	Employer tax rate τ_R	Employee tax rate τ_E	Combined rate $\tau=(\tau_R+\tau_E)/(1+\tau_R)$
Retirement benefits	16.33%	9.67%	
Sickness benefits	5.10%	2.55%	
Unemployment benefits	5.53%	2.43%	
Other benefits	1.10%	1.35%	
Total	**28.06%**	**16.00%**	**34.41%**

B. Monthly Earning Cap for Contributions (2009):

Old regime (individuals with covered earnings before 1/1/1993)	**€ 2,432.25**
New Regime (individuals with no covered earnings before 1/1/1993)	**€ 5,543.25**

Panel A displays contribution rates for employees covered by IKA in the most common case (coverage code 101). IKA contributions are assessed as a percentage of monthly earnings and shared between employees and employers. Those contributions fund retirement benefits, sickness benefits, unemployment benefits, and various other smaller benefits. Contributions vary by coverage code corresponding to the occupation/sector of the employee. For example, contribution rates are higher in hazardous occupations. IKA covers a total of 2 million employees (45% of all active workers in Greece).

Panel B displays the earnings caps for IKA contributions. The cap applies on monthly earnings. The cap for employer contributions is based on the sum of monthly earnings paid to a given employee (including bonuses, overtime, etc.). The cap for employee contributions is based on the sum of monthly earnings from all covered jobs for the given employee (employees with multiple jobs who reach the cap and have overpaid contributions receive a refund from the government). As of 2009, the cap is 2,432.25 Euros for old regime workers. Old regime workers are workers with positive covered earnings before 1/1/1993. The cap is 2.28 times higher at 5,543.25 Euro for new regime workers. New regime workers are workers with no covered earnings before 1/1/1993. The caps have increased annually to reflect approximately cost of living changes (legislated changes).

Table II. Summary Statistics (March 2009)

	1988-1992 entrants Any positive earnings	1993-1997 entrants Any positive earnings	1988-1992 entrants Posted earnings above old cap	1993-1997 entrants Posted earnings above old cap
	(1)	(2)	(3)	(4)
Percent new regime	0.3%	95.4%	1.1%	91.7%
Percent above old cap (2432 Euros)	13.9%	10.0%	100.0%	100.0%
Percent above new cap (5543 Euros)	1.9%	1.2%	14.1%	12.4%
Average monthly posted earnings	€ 1,648	€ 1,468	€ 4,335	€ 4,144
Average monthly posted regular earnings	€ 1,430	€ 1,282	€ 3,147	€ 2,891
Percent with overtime	10.4%	9.5%	21.2%	16.6%
Percent with bonuses	9.0%	9.4%	32.4%	42.4%
Percent male	53.7%	49.1%	65.5%	61.0%
Average age	40.9	36.8	41.9	37.8
Number of jobs	1.032	1.044	1.039	1.049
Number of workers in firm	1055	1416	2059	2124
Percent changed jobs from March '08 to March '09	21.9%	26.1%	17.8%	19.4%
Average employer MTR τ_R	23.8%	26.4%	0.6%	20.0%
Average employee MTR τ_E	13.7%	15.2%	0.1%	11.3%
Average total MTR $\tau=(\tau_R+\tau_E)/(1+\tau_R)$	29.3%	32.6%	0.5%	24.8%
Number of observations:	203,089	217,045	27,595	21,669

The table displays summary mean statistics for 4 groups of individuals with positive IKA covered earnings as of March 2009. Column (1) is the set of individuals who entered IKA (i.e., started having covered IKA earnings) from 1988 to 1992 (old regime). Column (2) is the set of individuals who entered IKA (i.e., started having covered IKA earnings) from 1993 to 1997 (new regime). Column (3) includes 1988-1992 entrants with total monthly posted earnings above 2432 Euros in March 2009 (old regime cap). Column (4) includes 1993-1997 entrants with total monthly posted earnings above 2432 Euros in March 2009 (old regime cap).

The percent new regime is not 100% for 1993-1997 entrants because individuals who can prove they had covered earnings in another insurance scheme before 1/1/1993 qualify for the old regime under IKA rules. Number of workers in firm is the average number of employees in the firm the individual has his main job (defined as highest regular earnings). A change of job from March '08 to March '09 is defined as a change in the employer for the main job (where regular earnings are highest). Earnings are defined as earnings upon which payroll taxes are computed (posted earnings). Regular earnings include only base pay and exclude bonuses, overtime, and other forms of earnings. The Marginal Tax Rates (MTR) are set equal to zero when the individual reaches the earnings cap corresponding to his/her regime.

Table III. Identification Checks and First Stage Results

SAMPLE:	1988-1997 entrants	1991-1994 entrants only	1988-1997 entrants	1988-1997 entrants	1988-1997 entrants
	(1)	(2)	(3)	(4)	(5)
OUTCOMES:					
A. Identification Checks (all entrants)					
Number of monthly entrants	-2061	-1245	-1679	-47	-1356
	(822)	(1237)	(701)	(1029)	(1426)
Number of monthly entrants	-500	-9	-546	-67	-315
(males aged 22 to 30 at entry)	(157)	(218)	(138)	(197)	(272)
Number of observations:	120	48	120	120	120
B. First Stage (workers with positive earnings in March 2009)					
Percent in new Regime (%)	89.32	89.25	89.21	87.38	88.97
	(0.12)	(0.22)	(0.12)	(0.19)	(0.27)
Percent with posted earnings above cap (%)	-7.91	-7.57	-7.89	-7.52	-7.38
	(0.16)	(0.25)	(0.16)	(0.24)	(0.33)
Total Marginal Tax Rate $\tau=(\tau_R+\tau_E)/(1+\tau_R)$ (%)	2.29	2.30	2.27	2.22	2.27
	(0.06)	(0.10)	(0.06)	(0.09)	(0.13)
Total Average Tax Rate $t=(t_R+t_E)/(1+t_R)$ (%)	0.54	0.64	0.52	0.60	0.63
	(0.04)	(0.06)	(0.04)	(0.06)	(0.08)
Number of observations:	420,134	160,857	420,134	420,134	420,134
Included Controls					
Linear entry date trends	Yes	Yes	Yes	Yes	Yes
Monthly dummies			Yes	Yes	Yes
Quadratic date trends				Yes	Yes
Cubic entry date trends					Yes

The table displays the coefficients (with robust standard errors in parentheses) from regressing various outcomes (listed in the left-hand side column) on a dummy for entering IKA on or after 1/1/1993 (which corresponds to new regime with higher earnings cap). The sample in Panel A includes all entrants (regardless of their subsequent IKA earnings). The sample in Panel B includes all entrants with positive monthly earnings in March 2009. For all dummy outcomes, estimates are expressed in percent (i.e., the dummy is set equal to 0 or 100 in the regression).

Column (1) estimates includes a linear entry date (normalized to 0 at 1/1/1993) and a linear entry date interacted with the dummy for entering IKA after 1/1/1993. Column (2) uses the same controls as column (1) but limits the sample to those entering IKA from 1991 to 1994. Column (3-5) use all 1988-1997 entrants but add successively monthly dummies (col. 3), quadratic date trends (quadratic term and quadratic term interacted with the dummy for entering IKA after 1/1/1993), cubic date trends (cubic term and cubic term interacted with the dummy for entering IKA after 1/1/1993).

In Panel A, we collapse the data by month of entry and run the regression at the monthly level (120 observations with 1988-1997 entrants, and 48 observations with 1991-1994 entrants). In Panel B, the regression is based on micro level data. New regime is a dummy for being in the new regime (with the higher cap). Posted earnings above cap is a dummy for having posted earnings above the payroll tax earnings cap corresponding to the regime the individual is in. Total marginal tax rate is based on combined employee and employer payroll tax rates and set at zero when the individual is above the cap. Total average tax rate combines employee and employer payroll average tax rates.

Table IV. Labor Supply Responses

SAMPLE:	1988-1997 entrants	1991-1994 entrants only	1988-1997 entrants	1988-1997 entrants	1988-1997 entrants
	(1)	(2)	(3)	(4)	(5)
OUTCOMES:					
A. Extensive Margin					
Percent with earnings above old cap	0.45	-0.32	0.47	-0.04	-0.50
	(0.20)	(0.32)	(0.20)	(0.30)	(0.41)
Number of observations:	420,134	160,857	420,134	420,134	420,134
B. Intensive Margin (workers with daily regular posted earnings above old cap)					
Hours of work	0.40	1.16	0.31	1.22	1.12
	(0.56)	(0.92)	(0.56)	(0.86)	(1.19)
Number of days in regular job	-0.041	-0.037	-0.052	-0.058	-0.037
	(0.038)	(0.064)	(0.039)	(0.059)	(0.083)
Percent with overtime	0.69	2.53	0.60	2.37	1.86
	(0.67)	(1.11)	(0.68)	(1.04)	(1.45)
Percent with multiple jobs	-0.46	-0.70	-0.46	-1.02	-0.53
	(0.41)	(0.66)	(0.42)	(0.63)	(0.85)
Number of observations:	28,124	10,587	28,124	28,124	28,124
C. Intensive Labor Supply Elasticities					
Elasticity of hours of work with respect to the net of employee payroll tax rate ($1-\tau_E$)	-0.042	-0.089	-0.037	-0.107	-0.088
	(0.033)	(0.060)	(0.033)	(0.055)	(0.081)
Number of observations:	28,124	10,587	28,124	28,124	28,124
Elasticity of posted-earnings with respect to the net of employee payroll tax rate ($1-\tau_E$)	0.120	0.092	0.141	0.212	-0.006
	(0.074)	(0.129)	(0.074)	(0.120)	(0.175)
Number of observations:	50,084	18,846	50,084	50,084	50,084
Included Controls					
Linear entry date trends	Yes	Yes	Yes	Yes	Yes
Monthly dummies			Yes	Yes	Yes
Quadratic date trends				Yes	Yes
Cubic entry date trends					Yes

The table displays the coefficients (with robust standard errors in parentheses) from regressing various outcomes (listed in the left-hand-side column) on a dummy for entering IKA on or after 1/1/1993 (which corresponds to new regime with higher earnings cap). For all dummy outcomes, estimates are expressed in percent (i.e., the dummy is set equal to 0 or 100 in the regression).

Column (1) estimates includes a linear entry date (normalized to 0 at 1/1/1993) and a linear entry date interacted with the dummy for entering IKA after 1/1/1993. Column (2) uses the same controls as column (1) but limits the sample to those entering IKA from 1991 to 1994. Column (3-5) use all 1988-1997 entrants but add successively Monthly dummies (col. 3), quadratic date trends (quadratic term and quadratic term interacted with the dummy for entering IKA after 1/1/1993), cubic date trends (cubic term and cubic term interacted with the dummy for entering IKA after 1/1/1993).

In panel A, the sample includes all workers with positive earnings in March 2009 and regresses a dummy for having posted earnings above the old payroll tax earnings cap (2432 Euros).

In panel B, the sample is limited to workers with regular earnings per day of work above 2500/25 Euros, i.e., would reach the old cap by working full month. Number of days is the recorded number of days worked during the month. Percent with Overtime is a dummy for having positive overtime earnings. Percent with Multiple jobs is a dummy for having positive earnings from more than one employer. Monthly hours of work are estimated as number of days in the regular job times 8 (or 4 if part-day) times (1+overtime earnings/regular earnings). Monthly hours are capped at 300.

In panel C, the elasticity of hours of work is obtained from a 2SLS regression of log(hours) on $\log(1-\tau_E)$ where τ_E is employee marginal payroll tax rate instrumented with a dummy for entering IKA after 1/1/1993 using the same sample as panel B. The elasticity of posted earnings is obtained from a 2SLS regression of log(posted earnings) on $\log(1-\tau_E)$ where τ_E is employee marginal payroll tax rate instrumented with a dummy for entering IKA after 1/1/1993 using the sample of all workers above the old cap (posted earnings above 2432 Euros in March 2009).

Table V. Tax Incidence Effects

SAMPLE:	1988-1997 entrants	1991-1994 entrants only	1988-1997 entrants	1988-1997 entrants	1988-1997 entrants
	(1)	(2)	(3)	(4)	(5)
OUTCOMES:					
A. Employer and Employee Payroll Tax Rates (above old cap):					
Average employer log tax rate: $\log(1+t_R)$	0.044	0.042	0.044	0.043	0.039
	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)
Average employee log tax rate $\log(1-t_E)$	-0.034	-0.034	-0.034	-0.034	-0.031
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
B. Gross, Posted, and Net Earnings (above old cap):					
Log gross earnings z	0.031	0.033	0.029	0.021	0.040
	(0.007)	(0.012)	(0.007)	(0.011)	(0.016)
Log posted earnings w	-0.013	-0.009	-0.015	-0.021	0.001
	(0.008)	(0.013)	(0.008)	(0.012)	(0.017)
Log net earnings c	-0.047	-0.043	-0.050	-0.055	-0.031
	(0.009)	(0.014)	(0.009)	(0.013)	(0.018)
Number of Observations:	50,084	18,846	50,084	50,084	50,084
C. Fraction with Posted Earnings above 3500 Euros:					
Percent with gross earnings above	0.656	0.291	0.641	0.292	0.319
$(1+\tau_R)$*3500 Euros	(0.127)	(0.201)	(0.130)	(0.190)	(0.260)
Percent with posted earnings above	0.121	-0.264	0.103	-0.241	-0.237
3500 Euros	(0.133)	(0.210)	(0.136)	(0.199)	(0.273)
Percent with net earnings above	-0.317	-0.733	-0.322	-0.668	-0.686
$(1-\tau_E)$*3500 Euros	(0.136)	(0.216)	(0.139)	(0.204)	(0.280)
Number of Observations:	420,134	160,857	420,134	420,134	420,134
Included Controls					
Linear entry date trends	Yes	Yes	Yes	Yes	Yes
Monthly dummies			Yes	Yes	Yes
Quadratic date trends				Yes	Yes
Cubic entry date trends					Yes

The table displays the coefficients (with robust standard errors in parentheses) from regressing various earnings outcomes (listed in the left-hand-side column) on a dummy for entering IKA on or after 1/1/1993 (which corresponds to new regime with higher earnings cap). Robust standard errors are presented.

Column (1) estimates includes a linear entry date (normalized to 0 at 1/1/1993) and a linear entry date interacted with the dummy for entering IKA after 1/1/1993. Column (2) uses the same controls as column (1) but limits the sample to those entering IKA from 1991 to 1994. Column (3-5) use all 1988-1997 entrants but add successively Monthly dummies (col. 3), quadratic date trends (quadratic term and quadratic term interacted with the dummy for entering IKA after 1/1/1993), cubic date trends (cubic term and cubic term interacted with the dummy for entering IKA after 1/1/1993).

In panels A and B, the sample includes all entrants with monthly posted earnings above the old cap (2432 Euros) in March 2009. The employer (employee) average payroll tax rate t_R (t_E) is defined as the ratio of employer (employee) payroll taxes to posted earnings (in March 2009). In panel C, the sample includes all entrants with positive earnings in March 2009. The regressions use a dummy variable for having gross earnings, posted earnings, net earnings above $(1+\tau_R)$*3500, 3500, $(1-\tau_E)$*3500 Euros where τ_R (τ_E) is the marginal employer (employee) payroll tax rate.

A On-line Appendix of "EARNINGS DETERMINATION AND TAXES: EVIDENCE FROM A COHORT BASED PAYROLL TAX REFORM IN GREECE" by Emmanuel Saez, Manos Matsaganis, and Panos Tsakloglou

A.1 Summary Statistics using Narrower Groups

Table A1 repeats Table II in the text but considering a smaller window around the cut-off entry date. Table A1 reports summary statistics, as of March 2009, for four groups of workers with positive IKA earnings in March 2009: (1) Those entering IKA from 1991 to 1992, i.e., old regime workers, (2) those entering IKA from 1993 to 1994, i.e., new regime workers, (3) those entering IKA from 1991 to 1992 with March 2009 posted earnings above €2432 (the old regime cap), (4) those entering IKA from 1993 to 1994 with March 2009 posted earnings above €2432 (the old regime cap). The results from Table A1 are quantitatively similar to the differences reported in Table II. Naturally, the differences between the pre and post 1993 entrants are smaller in Table A2 than in Table II as those two groups are within a narrower window than in Table A2 and hence more similar. This shows that, as we consider groups closer to the cut-off entry date, the groups become more comparable, the key identification assumption needed for our RDD estimation method.

A.2 Additional Identification Checks

Figure A1 repeats Figure I Panel A but zooming in around the reform at the daily level. Panel A displays the number of entrants by day of entry in the sample of all entrants (regardless of subsequent IKA earnings) in a six month window around the reform cutoff date of 1/1/1993. There is no visible discontinuity at the high daily frequency around the reform showing that individuals did not game the system by entering IKA before 1993 after the reform was enacted in October 1992.

As a placebo test, Panel B displays the number of entrants by day of entry in the sample of all entrants (regardless of subsequent IKA earnings) in a six month window around 1/1/1992, i.e., one year the reform cutoff date of 1/1/1993. The placebo figure is very similar to Panel A which confirms that there was no discontinuity in entry around the reform cut-off.

Figure A2 provides further identification checks by plotting the fraction male (Panel A) and the average age (Panel B) by month of entry among all entrants. Unsurprisingly, the average age falls by date of entry. Most importantly however, in both cases, the graphs show that there is no discontinuity at the cut-off line supporting our hypothesis that entrants just before and

just after the cut-off date are comparable.[26]

The regression results corresponding to Figure A2 are presented in Table A2, Panel A. It shows that there is no consistent discontinuity in age or gender at the cut-off threshold. Note that some of coefficients are highly significant but they are not robust to changes in the number of controls. The sign of the coefficients actually changes across specifications.

There is a concern that the state of the economy at the time individuals enter the workforce has long-term term effects on their career (see e.g., Kahn 2010). Therefore, if the state of economy was changing rapidly around the time of the reform in 1992 and 1993, it is conceivable that our regression discontinuity assumption could be violated. Figure A3 depicts the unemployment rate in the years around the tax reform from 1988 to 1997 in Greece for the full population in Panel A and for the young (those aged 20-29) in Panel B for all, men only, and women only. Unemployment rates do increase during the 1988-1997 period but with no break around the reform year (depicted in a dashed vertical line), especially for the young. This suggests that changes in the macro-economic conditions around the cut-off date are unlikely to bias our results. This is further confirmed by the placebo results described next that show no discontinuity in the earnings distribution below the old cap (as macro-economic changes would presumably affect not only the top of the distribution).

A.3 Tax Incidence Placebo Tests

Figure A4 proposes two tests of our incidence identification strategy showing that there is no discontinuity in the earnings distribution at the cut-off date of entry below the old cap (recall that theoretically, the earnings distribution below the old cap should not be affected by the tax reform, see Figure I).

Panel A offers a first placebo test by displaying the fraction of workers with gross earnings, posted earnings, and net earnings above $z^* = 2000 \cdot (1+\tau_R)$, $w^* = 2000$, and $c^* = 2000 \cdot (1-\tau_E)$ as of March 2009. The cut-off €2000 is chosen so as to fall below the old cap of €2432 in 2009. In principle, there should be no effect because the regime change does not affect taxes below the old cap as we discussed earlier. In that case, the series indeed do not display any discontinuity in their downward trend by date of entry around the cut-off date, providing a successful placebo check.

Panel B presents a second placebo test by displaying, the average log gross earnings, log posted earnings, and log net earnings for all workers with posted earnings above 1500 Euros and below the old cap in March 2009. Panel B also shows no discontinuity at the cut-off date.

The regression results corresponding to Figure A4 are presented in Table A2, Panel B. In sharp contrast with our main incidence results in Table V in the text, we do not find any systematic discontinuity at the cut-off date. Some of the coefficients are significant in some specifications but the magnitudes are much smaller than in Table V and a number of those coefficients are not significant.

[26] Note however that the slope of the fitted curves seems to be changing around the cut-off date.

Taken together, those graphs and regression results confirm that there are no discontinuities in the earnings distribution below the old cap at the cut-off date. Therefore, our key identification assumption that there should be no discontinuity in the earnings distribution above the old cap and absent the tax reform, seems reasonable.

A.4 Tax Incidence Robustness Tests

The main text analysis focuses on the March 2009 sample. It is possible to pool together all waves March 2004, March 2005, March 2006, March 2007, March 2008, March 2009 in the analysis. In that case, we inflate earnings for years before 2009 by the annual legislated adjustments in the caps so that caps align exactly across the 6 waves. Both the old and new cap were adjusted upward by the same percentage, 4% each year from 2004 to 2007, 3% in 2008, and 2% in 2009. Those adjustments roughly reflect price inflation during the period. Figure A5 reproduces Figure V.B and Figure VI incidence analysis in the text and Table A3 reproduces our main Table V incidence results in the text.

The results for the full sample are very close to the results for the 2009 wave only. This is most easily seen by comparing Figures V.B and A5.A and Figures VI and A5.B respectively. The shape of the graphs is almost identical. Note that the level for Figure A5.B is lower than for Figure VI as earnings are lower (even after the legislated adjustment) earlier in the career.

Panels B and C both show that the non-standard incidence results are robust to the inclusion of the full sample. Furthermore, comparing Table A3 to Table V shows that the gain in precision from the larger sample is actually very modest. This is due to two facts. First, we cluster standard errors at the individual level because there is very substantial overlap in the population across waves. Second, the number of workers above the old cap increases overtime as workers gain seniority so that the 2009 sample above the cap represents almost a quarter of the 6 wave full sample above the cap. The minimal gain in precision and the great similarity in results explains why we chose to present results for March 2009 only in the text.

A.5 Heterogeneity Analysis for Incidence

Effects by Age at Entry

Figure A6 focuses on heterogeneity by age at entry. Both panels display, by year of entry in IKA, the average monthly gross earnings, posted earnings, and net earnings, capped at the new cap, for all workers above the old cap (as in Figure V Panel B). Panel A is for workers aged 22 or less when they entered IKA while Panel B is for workers aged over 22 when they entered IKA. The age 22 cut-off is chosen because it is approximately the median age at entry among workers above the old cap (as of March 2009). Panel A shows that incidence effects are non standard for young workers but are perhaps a bit closer to standard for older workers as posted earnings seem to decline slightly at the discontinuity.[27]

[27]In an earlier working paper version, Saez, Matsaganis, and Tsakloglou (2010), we show that incidence is

Panel A of Table A4 confirms those graphical results. For older workers, gross earnings do not display as strong an upward discontinuity as for young workers, although our estimates are not precise enough to rule out a significant difference between young and older workers.

As an additional caveat, note also that differential incidence among older and younger workers, if any, could be due to characteristics of workers (such as education, outside options, etc.) that are correlated with age and not due to age itself.

Effects by Gender

We estimate incidence effects on total earnings by gender in Table A4, Panel B. The results show that the RDD effect on gross earnings, posted earnings, and net earnings are about the same for men and women, and display in both cases the same non-standard incidence effects that we have found in the full sample. Those results imply that the inability or unwillingness of employers to pass on new regime highly paid workers the extra cost of payroll taxes is equally present for men and women.

Effects by Size of Firms

It is conceivable that small firms have less formal compensation policies and perhaps less Union pressure and hence more flexibility to adjust pay based on the specific situation of the employee, and in particular the tax regime of the employee. We present estimates by size of firms in Table A4, Panel C. The estimates are very close across small and large firms. Those results imply that the inability or unwillingness of employers to pass on new regime highly paid workers the extra cost of payroll taxes is equally present in large and small firms.[28]

A.6 Survey of Employers

To understand the mechanism behind our non-standard incidence results, we carried out a small informal survey of five managers involved in personnel decisions at firms of medium to large size. Those managers were talking and providing perspective on behalf of employers, and hence we will refer to them as "employers". We also interviewed one union manager specializing on social security issues. Each of those six interviewees was asked a set of questions on knowledge of employers about the new vs. old tax regime and regime status of prospective recruits. Then we asked whether tax status matters to employers when making recruitment decisions and salaries offers, when offering pay raises to existing employees, or for lay-off decisions. If told that regime status does not affect those personnel decisions, we asked managers why this is the case. The exact formulation of the questions is provided in annex I to this appendix.

Four important findings emerge from this survey. First, all five employers knew about the tax differential between old and new entrants but only two out of five said that they knew or

very close to standard for the 15% oldest workers, i.e., those aged 27 or more at entry. However, those results are not very precise.

[28]We have experimented with different cuts by size of firm. We find that incidence results are similar across all firm's sizes.

asked this information for potential recruits.

Second and related, none of the five employers said that being in the new regime negatively affected hiring decisions, salaries offered, or subsequent pay raises or lay-off decisions. As one employer said "An employee's social insurance regime does not even come to mind when recruitment, pay, promotion or dismissal decisions are decided within the firm." This is consistent with our empirical results showing that salaries (i.e., posted earnings w) are the same for old and new regime workers. This also explains why only two employers mentioned asking/knowing about tax regime when making recruiting decisions. In the end, regime status does not seem like a relevant parameter when making recruiting or compensation decisions. Only one manager said "Discrimination against new regime workers at the time of recruitment may arise in theory when two candidates for a job not only are equally qualified but have similar age too. Clearly, such cases are exceptional."

Third, when we asked why regime status was not relevant for recruiting and compensation decisions, none of the three reasons we proposed in the questionnaire was seen as very relevant. None of the employers said that Union pressure to offer equal salary was relevant. This could be explained by the fact that Unionization rates in the private sector in Greece are low, around 15% (Matsaganis, 2007) and Unions are even less relevant for highly paid workers above the old cap for whom the regime change is relevant. As one employer put it: "Since unions are rather weak in the private sector, wage setting (especially of highly-qualified workers) typically results from individual agreements and not collective bargaining. The deals struck are usually expressed in terms of salary [i.e., posted earnings and hence not gross earnings including employer payroll taxes]. Therefore, any difference in social contributions due to the higher cap of "new insurees" is absorbed by the firm." None of the employers said that fear of legal anti-discrimination action was a factor. One manager said "Fear of litigation cannot explain firms' decisions, since younger workers are often less aware of their rights and more likely to be bullied by employers into accepting less favorable terms." The Union manager told us that he was not aware of any action on the part of the two union confederations he is advising, in defence of younger workers discriminated against by employers by virtue of their new regime status. Finally, only one employer said that fairness and morale concerns could explain the equal treatment of new and old regime employees, but even that point was made as a general statement against any form of discrimination: "Any kind of discrimination is against company policy. Moreover, it would definitely harm morale at the firm."

Fourth and perhaps most important, three of the five employers volunteered the following explanation, which we did not propose, for the absence of discrimination. Younger workers are often the most productive workers and yet are paid less because of pay seniority practices. As a result, young workers are valuable to companies, and that remains the case, even when factoring in the extra taxes due to the new regime. One manager said "Younger workers are not only not discriminated against, they are generally preferred because productivity is higher." Another volunteered "The importance of seniority in wage setting and pay rise decisions is such

that in actual fact younger workers tend to be paid less for the same work than older ones, even though younger workers are more costly to the firm in terms of payroll costs compared to older workers at the same level of take-home pay." Finally, one employer mentioned "Since seniority and/or previous experience (and, sometimes, age) are the main determinants of pay, younger workers are by definition paid less. This compensates for the possibility of higher social contributions because of the cap." The Union manager also mentioned "If anything, it may be older workers that are discriminated against [in hiring and firing decisions]: on the one hand, because of seniority they are often paid better - while on the other hand, because of fatigue, they perform less well."

Appendix References

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Matsaganis, Manos (2007) "Union structures and pension outcomes in Greece." *British Journal of Industrial Relations* 45(3), 537–555.

Saez, Emmanuel, Matsaganis, Manos, and Panos Tsakloglou (2010) "Earnings Determination and Taxes: Evidence from a Cohort Based Payroll Tax Reform in Greece," NBER Working Paper No. 15745.

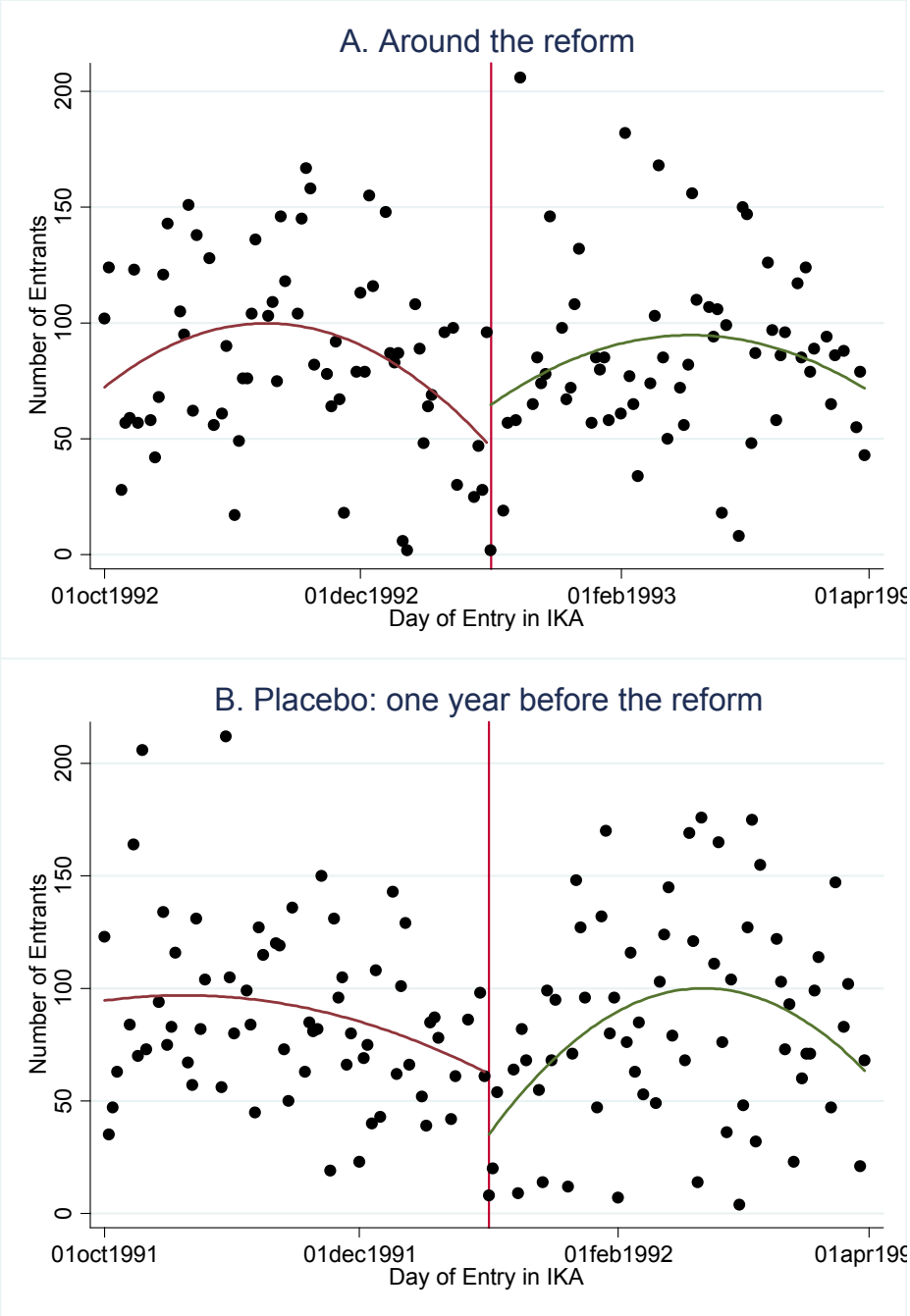


Figure A1. Further Identification Checks: Number of Entrants by Day of Entry

Figure A1 repeats Figure I Panel A but zooming in around the reform at the daily level. Panel A displays the number of entrants by day of entry in the sample of all entrants (regardless of subsequent IKA earnings) in a six month window around the reform cutoff date of 1/1/1993. There is no visible discontinuity at the high daily frequency around the reform showing that individuals did not game the system by entering IKA before 1993 after the reform was enacted in October 1992.

As a placebo test, Panel B displays the number of entrants by day of entry in the sample of all entrants (regardless of subsequent IKA earnings) in a six month window around 1/1/1992, i.e., one year the reform cutoff date of 1/1/1993. The placebo figure is very similar to Panel A which confirms that there was no discontinuity in entry around the reform cut-off.

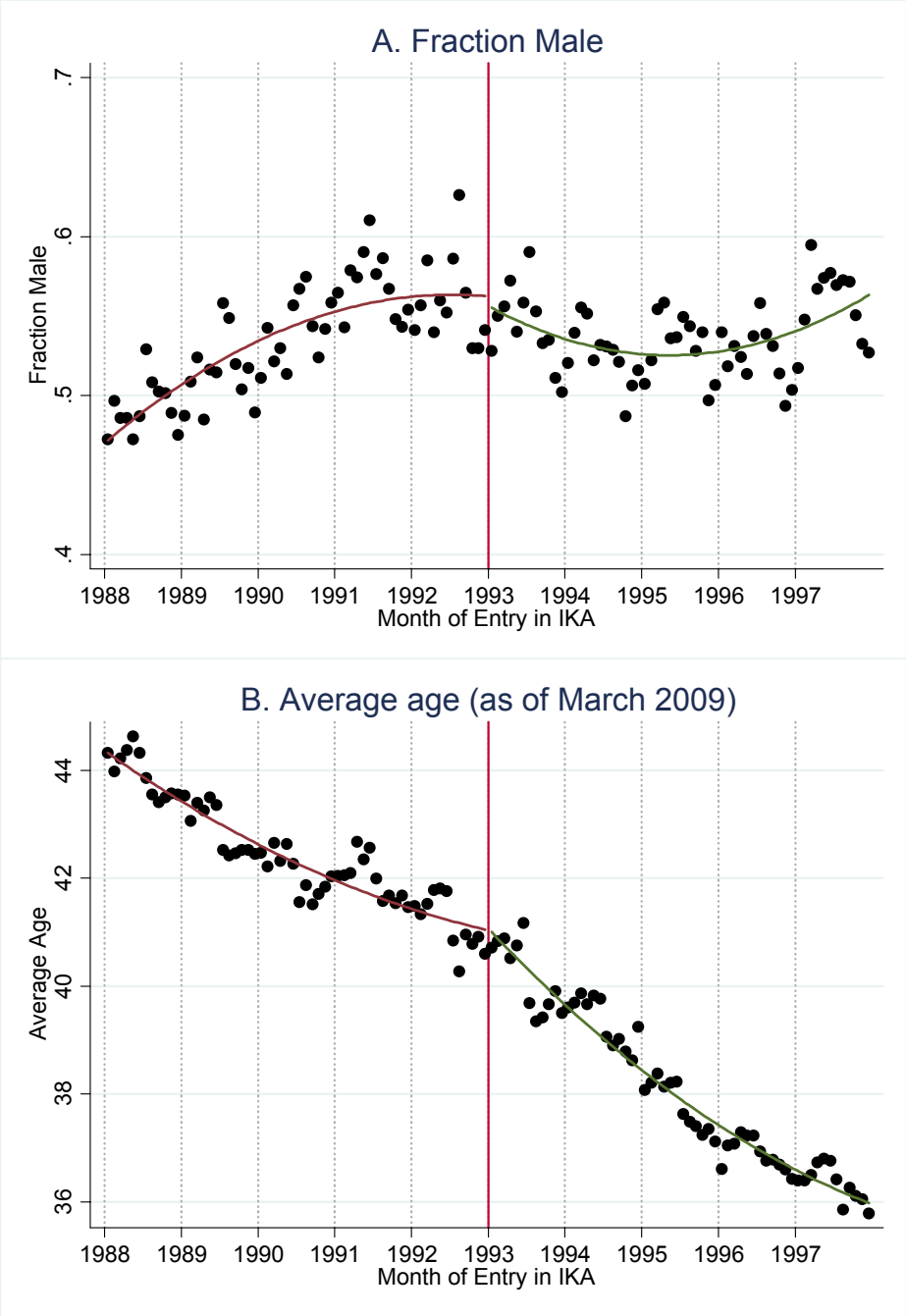


Figure A2. Further Identification Checks: Gender and Age Composition

In both panels, the sample is all entrants into the IKA system from 1988 to 1997 regardless of their subsequent IKA earnings. Panel A displays the fraction of male workers by month of entry in IKA. Panel B displays the age of workers (as of March 1st, 2009) by month of entry in IKA. In both panels, the curve on each side of the discontinuity is the best quadratic fit. Both graphs display no discontinuity at the cut-off date showing that there is no systematic difference in observable variables between entrants just above and just below the cut-off, a requirement for the Regression Discontinuity Design to be valid. Note the strong seasonality effects for age by month of entry.

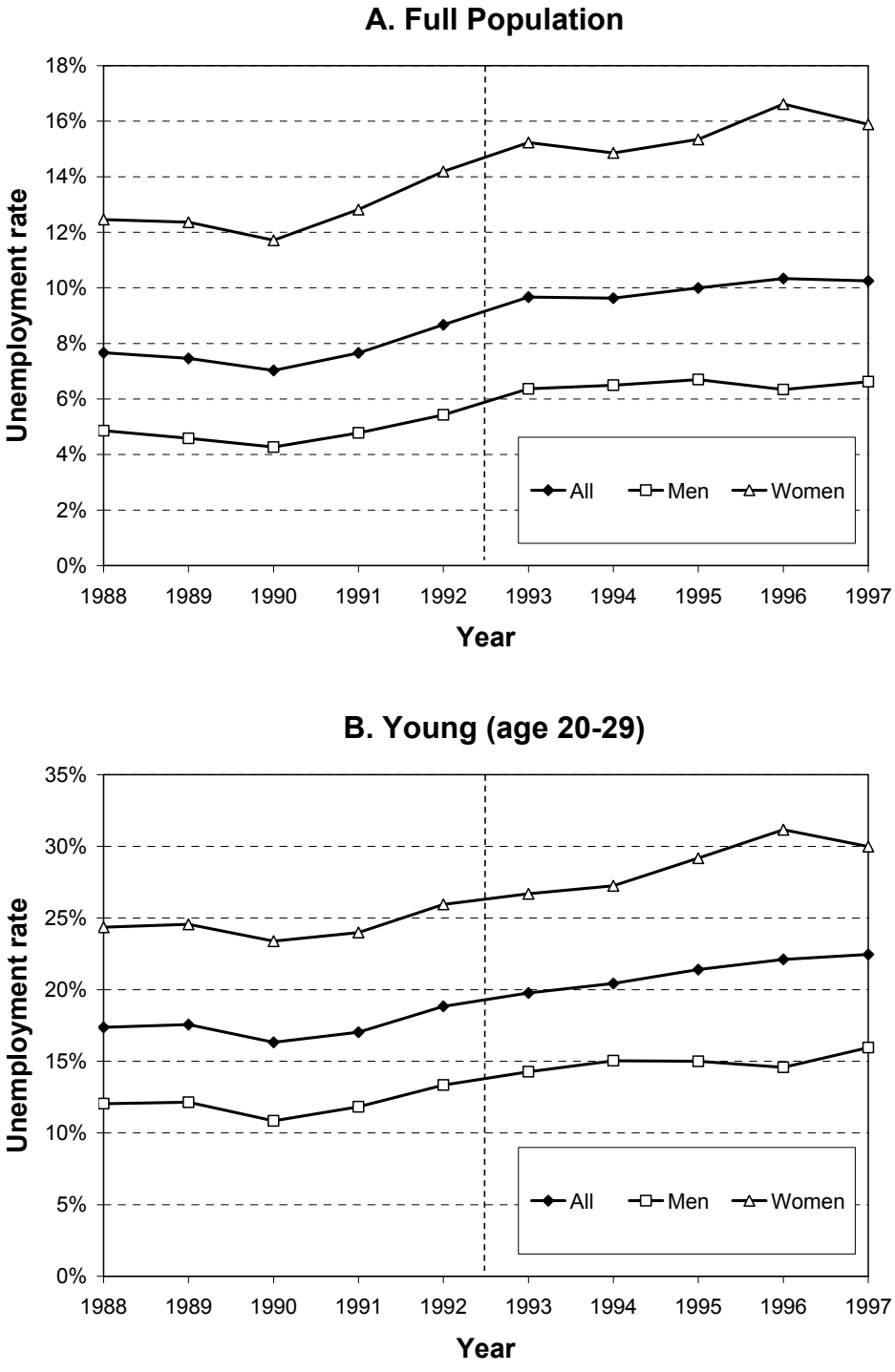
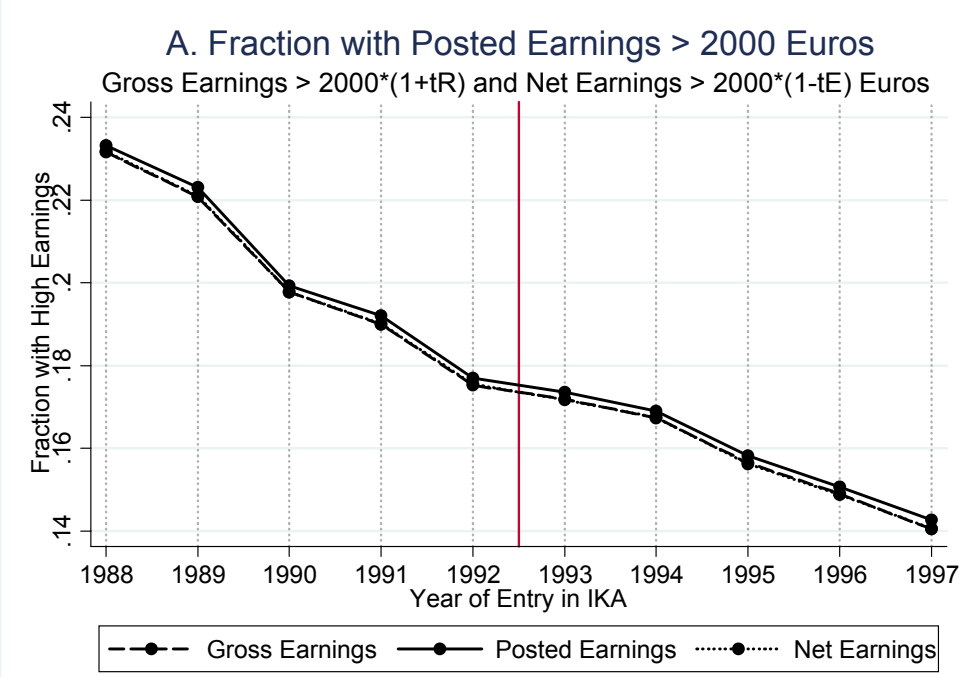


Figure A3. Unemployment Rate around Payroll Tax Reform

The figure displays the unemployment rate from 1988 to 1997 in Greece for the full population in Panel A, and for the young (those aged 20-29) in Panel B for all, men only, and women only. Unemployment rates increase during the 1988-1997 period but with no break around the reform year (depicted in dashed vertical line), especially for the young.

Source is the Labor Force Survey, years 1988 to 1997, National Statistical Service of Greece.



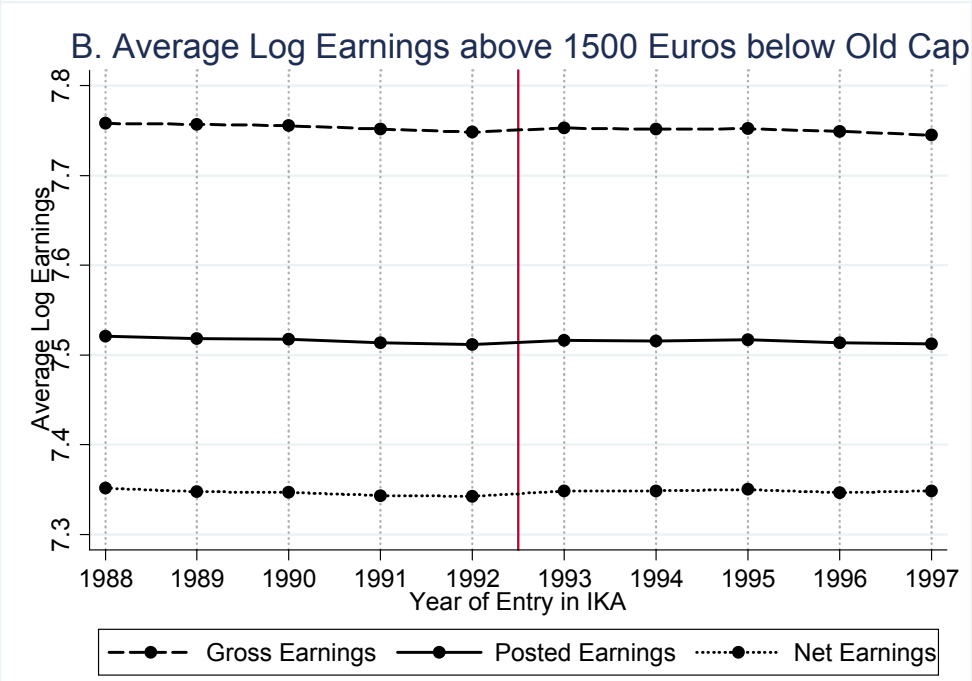


Figure A4. Incidence Effects: Placebo Tests

This figure offers a placebo test of Figure V, Panel B and Figure VI by repeating the same graphs but for earnings groups below the old cap that are not affected by the reform. Panel A displays the fraction of workers in March 2009 with gross earnings, posted earnings, and net earnings above 2000*(1+τ_R), 2000, and 2000*(1-τ_E) Euros, which are below the old cap and should not be affected by the reform. Panel B displays, the average log gross earnings, log posted earnings, and log net earnings for all workers with posted earnings above 1500 Euros and below the old cap in March 2009. Both graphs confirm that there are no discontinuities in any of those series at the cut-off date.

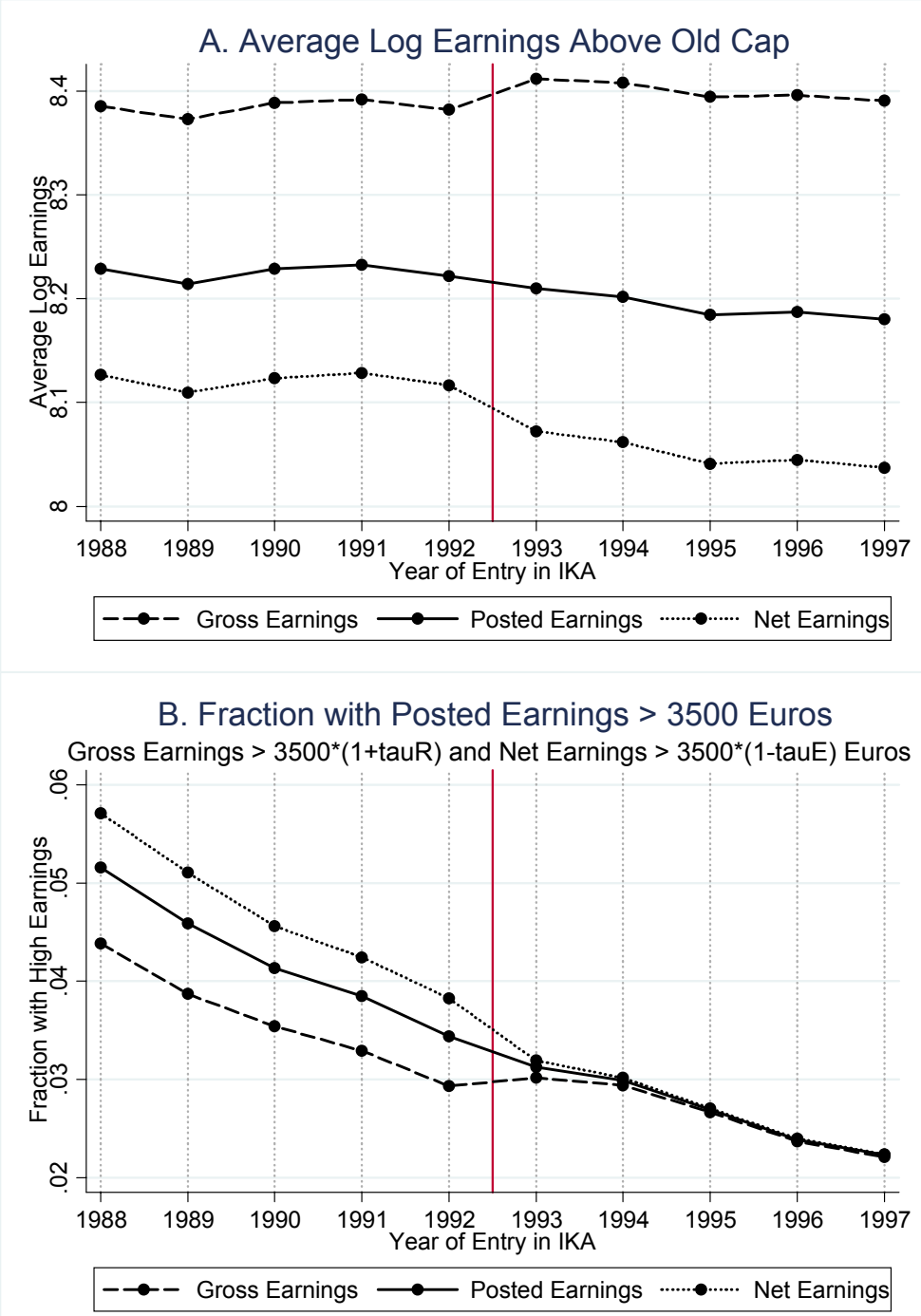


Figure A5. Tax Incidence Effects (Full March 2004 to March 2009 sample)

This figure repeats Figures V.B and Figure VI in the text but expanding the sample to include all March 2004, March 2005, March 2006, March 2007, March 2008, March 2009 waves (instead of only March 2009 data as in Figures V and VI). Panel A displays, by year of entry in IKA, the average log gross earnings, log posted earnings, and log net earnings for all workers above the old cap. Panel B displays, by year of entry in IKA, the fraction of workers with monthly gross earnings, posted earnings, and net earnings above $3500*(1+\tau_R)$, 3500, and $3500*(1-\tau_E)$ Euros. Earnings for pre-2009 waves are adjusted so that the cap is aligned to the 2009 cap for all waves.

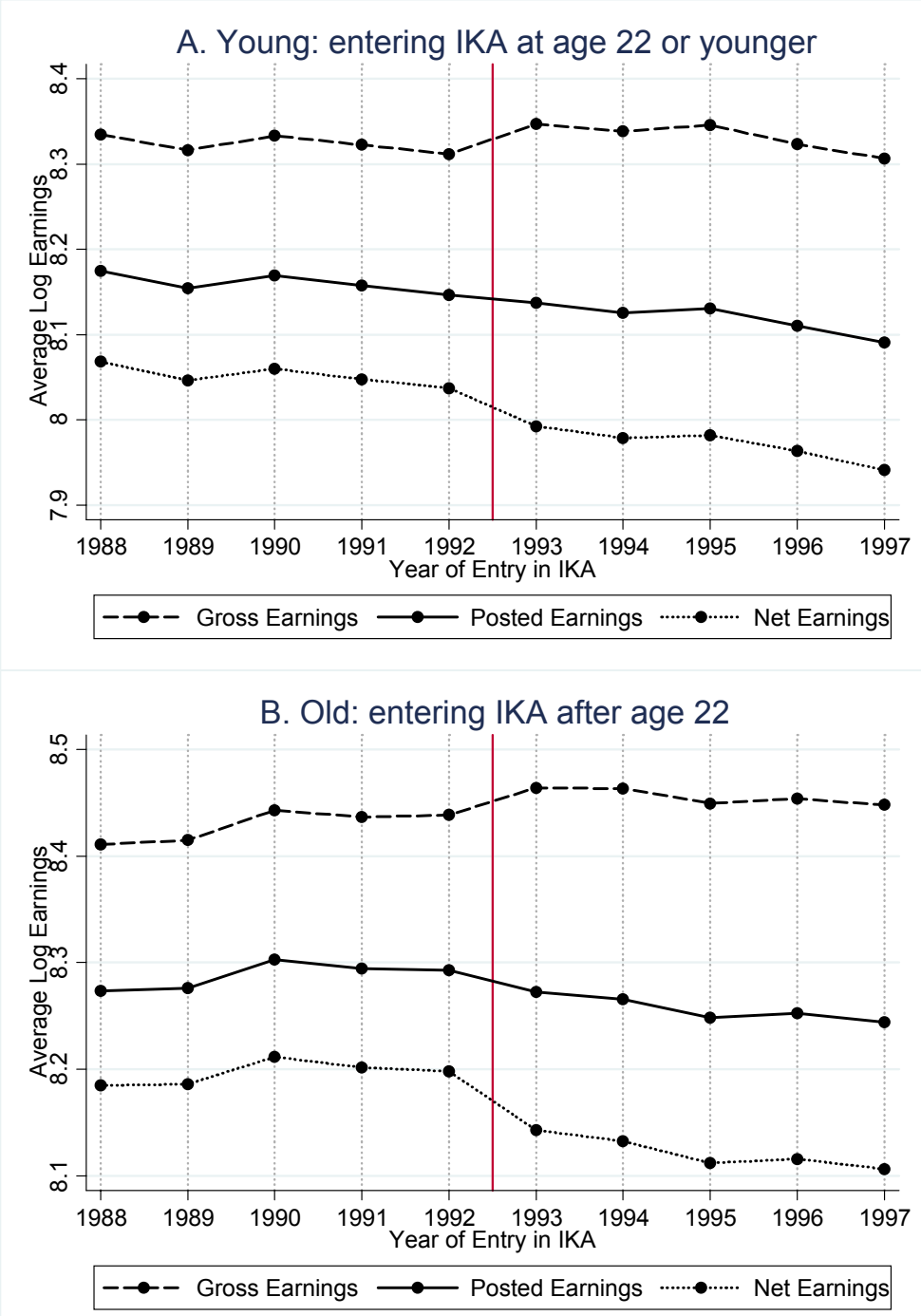


Figure A6. Heterogeneous Effects on Earnings by Age at Entry

Both panels display, by year of entry in IKA, the average monthly log gross earnings, log posted earnings, and log net earnings for all workers above the old cap (as in Figure V.B) in March 2009. Panel A is for workers aged 22 or less when they entered IKA. Panel B is for workers aged over 22 when they entered IKA. Panel A shows that incidence effects are non standard for young workers (employers compensate workers the extra employer tax burden at the discontinuity and gross earnings jump up) while incidence effects are somewhat closer to standard for older workers.

Table A1. Summary Statistics for Narrower 1991-1994 Entrants Window (March 2009)

	1991-1992 entrants Any positive earnings	1993-1994 entrants Any positive earnings	1991-1992 entrants Posted earnings above old cap	1993-1994 entrants Posted earnings above old cap
	(1)	(2)	(3)	(4)
Percent new regime	0.3%	90.9%	1.4%	86.3%
Percent above old cap (2432 Euros)	12.3%	11.1%	100.0%	100.0%
Percent above new cap (5543 Euros)	1.7%	1.4%	14.4%	12.7%
Average monthly posted earnings	€ 1,590	€ 1,521	€ 4,378	€ 4,206
Average monthly posted regular earnings	€ 1,381	€ 1,326	€ 3,110	€ 2,956
Percent with overtime	10.0%	9.8%	19.6%	17.6%
Percent with bonuses	8.9%	9.4%	35.1%	41.0%
Percent male	53.9%	50.6%	65.7%	62.3%
Average age	40.1	38.5	40.6	39.0
Number of jobs	1.034	1.039	1.043	1.044
Number of workers in firm	1096	1284	2017	2101
Percent changed jobs from March '08 to March '09	22.6%	24.6%	18.4%	18.9%
Average employer MTR τ_R	24.2%	26.3%	0.6%	18.9%
Average employee MTR τ_E	14.0%	15.1%	0.1%	10.6%
Average total MTR $\tau=(\tau_R+\tau_E)/(1+\tau_R)$	29.8%	32.5%	0.6%	23.4%
Number of observations:	82,015	78,842	9,895	8,659

The table repeats Table II in the text but for the narrower 1991-1994 window of entrants (instead of 1988-1997 entrants from Table II).

The table displays summary mean statistics for 4 groups of individuals with positive IKA covered earnings as of March 2009. Column (1) is the set of individuals who entered IKA (i.e., started having covered IKA earnings) from 1991 to 1992 (old regime). Column (2) is the set of individuals who entered IKA (i.e., started having covered IKA earnings) from 1993 to 1994 (new regime). Column (3) includes 1991-1992 entrants with total monthly posted earnings above 2432 Euros in March 2009 (old regime cap). Column (4) includes 1993-1994 entrants with total monthly posted earnings above 2432 Euros in March 2009 (old regime cap).

The percent new regime is not 100% for 1993-1994 entrants because individuals who can prove they had covered earnings in another insurance scheme before 1/1/1993 qualify for the old regime under IKA rules. Number of workers in firm is the average number of employees in the firm the individual has his main job (defined as highest regular earnings). A change of job from March '08 to March '09 is defined as a change in the employer for the main job (where regular earnings are highest). Earnings are defined as earnings upon which payroll taxes are computed (posted earnings). Regular earnings include only base pay and exclude bonuses, overtime, and other forms of earnings. The Marginal Tax Rates (MTR) are set equal to zero when the individual reaches the earnings cap corresponding to his/her regime.

Table A2. Further Identification Checks and Placebo Incidence Results

SAMPLE:	1988-1997 entrants	1991-1994 entrants only	1988-1997 entrants	1988-1997 entrants	1988-1997 entrants
	(1)	(2)	(3)	(4)	(5)
OUTCOMES:					
A. Further Identification Checks (all entrants)					
Age (as of March 2009)	-0.107	0.181	-0.176	0.042	0.090
	(0.028)	(0.047)	(0.029)	(0.042)	(0.058)
Gender (percent male)	-5.03	0.52	-5.44	-0.90	0.45
	(0.19)	(0.31)	(0.20)	(0.29)	(0.40)
Number of observations:	1,089,929	412,599	1,089,929	1,089,929	1,089,929
B. Placebo Incidence Results:					
B1. Average posted earnings above 1500 Euros (for those below old cap):					
Log gross earnings z	0.0064	0.0060	0.0067	0.0063	0.0062
	(0.0019)	(0.0031)	(0.0020)	(0.0030)	(0.0041)
Log posted earnings w	0.0067	0.0058	0.0071	0.0066	0.0057
	(0.0019)	(0.0031)	(0.0020)	(0.0029)	(0.0040)
Log net earnings c	0.0077	0.0055	0.0082	0.0071	0.0046
	(0.0021)	(0.0033)	(0.0021)	(0.0031)	(0.0043)
Number of observations:	85,120	32,647	85,120	85,120	85,120
B2. Fraction with posted earnings above 2000 Euros:					
Percent with gross earnings above	0.935	0.311	1.035	0.628	0.213
$(1+\tau_R)$*2000 Euros	(0.238)	(0.379)	(0.242)	(0.357)	(0.490)
Percent with posted earnings above	0.908	0.322	1.004	0.636	0.180
2000 Euros	(0.239)	(0.381)	(0.243)	(0.359)	(0.492)
Percent with net earnings above	0.912	0.310	1.005	0.622	0.203
$(1-\tau_E)$*2000 Euros	(0.238)	(0.379)	(0.242)	(0.357)	(0.490)
Number of observations:	420,134	160,857	420,134	420,134	420,134
Included Controls					
Linear entry date trends	Yes	Yes	Yes	Yes	Yes
Monthly dummies			Yes	Yes	Yes
Quadratic date trends				Yes	Yes
Cubic entry date trends					Yes

Panel A presents additional identification checks for age and gender following the specifications of Table III, Panel A. The sample include all entrants regardless of subsequent earnings. Panel B presents placebo incidence results using the model of the incidence regressions of Table V. Panel B1 reports the effects on gross, posted, and net earnings for those with posted earnings above 1500 Euros and below the old cap (2432 Euros). Panel B2 reports the probability of having gross, posted, and net earnings above $(1+\tau_R)$*2000, 2000, and $(1-\tau_E)$*2000 Euros. In both cases, there should be no discontinuity at the cut-off date as the reform affected only earnings above the old cap.

Table A3. Tax Incidence Effects using all March 2004,.., March 2009 waves

SAMPLE:	1988-1997 entrants	1991-1994 entrants only	1988-1997 entrants	1988-1997 entrants	1988-1997 entrants
	(1)	(2)	(3)	(4)	(5)
OUTCOMES:					
A. Employer and Employee Payroll Tax Rates (above old cap):					
Average employer log tax rate: log(1+t_R)	0.041	0.038	0.041	0.038	0.035
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Average employee log tax rate log(1-t_E)	-0.032	-0.031	-0.032	-0.031	-0.028
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
B. Gross, Posted, and Net Earnings (above old cap):					
Log gross earnings z	0.028	0.039	0.026	0.027	0.047
	(0.007)	(0.011)	(0.007)	(0.010)	(0.014)
Log posted earnings w	-0.014	0.001	-0.015	-0.011	0.012
	(0.007)	(0.012)	(0.007)	(0.011)	(0.015)
Log net earnings c	-0.046	-0.030	-0.048	-0.042	-0.017
	(0.008)	(0.013)	(0.008)	(0.012)	(0.016)
Number of Observations:	223,508	84,351	223,508	223,508	223,508
C. Fraction with Posted Earnings above 3500 Euros:					
Percent with gross earnings above	0.469	0.319	0.447	0.254	0.246
(1+τ_R)*3500 Euros	(0.083)	(0.131)	(0.085)	(0.123)	(0.169)
Percent with posted earnings above	0.111	-0.007	0.085	-0.080	-0.089
3500 Euros	(0.087)	(0.138)	(0.089)	(0.130)	(0.179)
Percent with net earnings above	-0.177	-0.301	-0.201	-0.371	-0.368
(1-τ_E)*3500 Euros	(0.090)	(0.143)	(0.092)	(0.135)	(0.185)
Number of Observations:	2,657,825	1,021,028	2,657,825	2,657,825	2,657,825
Included Controls					
Linear entry date trends	Yes	Yes	Yes	Yes	Yes
Monthly dummies			Yes	Yes	Yes
Quadratic date trends				Yes	Yes
Cubic entry date trends					Yes

The table repeats Table V in the text but using all waves March 2004, .., March 2009 (instead on only March 2009 in Table V). It displays the coefficients (with robust standard errors clustered at the individual level in parentheses) from regressing various earnings outcomes (listed in the left-hand-side column) on a dummy for entering IKA on or after 1/1/1993 (which corresponds to new regime with higher earnings cap). Robust standard errors are presented.

Column (1) estimates includes a linear entry date (normalized to 0 at 1/1/1993) and a linear entry date interacted with the dummy for entering IKA after 1/1/1993. Column (2) uses the same controls as column (1) but limits the sample to those entering IKA from 1991 to 1994. Column (3-5) use all 1988-1997 entrants but add successively Monthly dummies (col. 3), quadratic date trends (quadratic term and quadratic term interacted with the dummy for entering IKA after 1/1/1993), cubic date trends (cubic term and cubic term interacted with the dummy for entering IKA after 1/1/1993).

In panels A and B, the sample includes all entrants with monthly posted earnings above the old cap. The employer (employee) average payroll tax rate t_R (t_E) is defined as the ratio of employer (employee) payroll taxes to posted earnings. In panel C, the sample includes all entrants with positive earnings. The regressions use a dummy variable for having gross earnings, posted earnings, net earnings above (1+τ_R)*3500, 3500, (1-τ_E)*3500 Euros where τ_R (τ_E) is the marginal employer (employee) payroll tax rate.

Table A4. Tax Incidence Heterogeneity Effects

SAMPLE:	1988-1997 entrants	1991-1994 entrants only	1988-1997 entrants	1988-1997 entrants	1988-1997 entrants
	(1)	(2)	(3)	(4)	(5)
OUTCOMES:					
A. Age					
A1. Young workers (aged less than 23 at entry)					
Log gross earnings z	0.035	0.028	0.041	0.031	0.048
	(0.009)	(0.014)	(0.009)	(0.013)	(0.018)
Log posted earnings w	-0.009	-0.016	-0.002	-0.011	0.012
	(0.009)	(0.015)	(0.009)	(0.014)	(0.019)
Log net earnings c	-0.045	-0.051	-0.037	-0.044	-0.018
	(0.010)	(0.016)	(0.010)	(0.015)	(0.021)
Number of observations:	25,065	9,477	25,065	25,065	25,065
A2. Older workers (aged 23 or more at entry)					
Log gross earnings z	0.018	0.014	0.017	0.013	0.028
	(0.012)	(0.019)	(0.012)	(0.018)	(0.025)
Log posted earnings w	-0.029	-0.031	-0.029	-0.030	-0.013
	(0.013)	(0.021)	(0.013)	(0.019)	(0.027)
Log net earnings c	-0.064	-0.065	-0.064	-0.063	-0.045
	(0.014)	(0.022)	(0.014)	(0.021)	(0.029)
Number of observations:	25,019	9,369	25,019	25,019	25,019
B. Gender					
B1. Male workers					
Log gross earnings z	0.037	0.042	0.034	0.023	0.053
	(0.010)	(0.016)	(0.010)	(0.015)	(0.020)
Log posted earnings w	-0.007	-0.002	-0.010	-0.020	0.015
	(0.010)	(0.017)	(0.011)	(0.016)	(0.022)
Log net earnings c	-0.041	-0.037	-0.043	-0.053	-0.017
	(0.011)	(0.018)	(0.011)	(0.017)	(0.024)
Number of observations:	31,892	12,120	31,892	31,892	31,892
B2. Female workers					
Log gross earnings z	0.029	0.018	0.029	0.018	0.016
	(0.011)	(0.018)	(0.011)	(0.017)	(0.024)
Log posted earnings w	-0.018	-0.022	-0.019	-0.024	-0.023
	(0.012)	(0.020)	(0.012)	(0.018)	(0.026)
Log net earnings c	-0.054	-0.055	-0.055	-0.057	-0.054
	(0.013)	(0.021)	(0.013)	(0.020)	(0.027)
Number of observations:	18,192	6,726	18,192	18,192	18,192
C. Firm size					
C1. Small firms (less than 400 workers)					
Log gross earnings z	0.030	0.021	0.030	0.023	0.015
	(0.011)	(0.018)	(0.011)	(0.017)	(0.023)
Log posted earnings w	-0.015	-0.019	-0.015	-0.017	-0.022
	(0.012)	(0.019)	(0.012)	(0.018)	(0.025)
Log net earnings c	-0.050	-0.051	-0.049	-0.047	-0.052
	(0.013)	(0.021)	(0.013)	(0.020)	(0.027)
Number of observations:	23,306	8,814	23,306	23,306	23,306
C2. Large firms (400 workers or more)					
Log gross earnings z	0.034	0.044	0.030	0.019	0.062
	(0.010)	(0.016)	(0.010)	(0.015)	(0.021)
Log posted earnings w	-0.010	0.000	-0.014	-0.026	0.022
	(0.010)	(0.017)	(0.011)	(0.016)	(0.023)
Log net earnings c	-0.044	-0.036	-0.049	-0.062	-0.012
	(0.011)	(0.019)	(0.011)	(0.017)	(0.024)
Number of observations:	26,778	10,032	26,778	26,778	26,778
Included Controls					
Linear entry date trends	Yes	Yes	Yes	Yes	Yes
Monthly dummies			Yes	Yes	Yes
Quadratic date trends				Yes	Yes
Cubic entry date trends					Yes

The table breaks down the incidence regressions of Table V (gross earnings, posted earnings, and net earnings) by subsample. The specifications are identical to those of Table V. Panel A is for age at entry, Panel B is gender, Panel C is firm size.

Annex I

Questions in the Survey of Employers

- When you recruit a relatively young executive, do you know (or ask) which insurance regime s/he is under?
- Are you aware that social contributions for high earners first insured in 1993 or later are higher, due to the fact that their upper earnings ceiling is higher (e.g. €5,280 vs. €2,315 in 2007)?

  If **yes**, do you take this factor into consideration when you take decisions with respect to hiring, paying, promoting or firing employees?

  More specifically, does the different social insurance regime make it more likely for you to:

  - avoid recruitment of high-earning "new insurees"?
  - offer lower remuneration to high-earning new insurees (as their labour costs may be higher) compared to older workers with similar skills?
  - grant high-earning new insurees lower pay rises (to recoup the extra cost in terms of social contributions) compared to older workers with similar skills?
  - make new insurees redundant ahead of older workers with similar skills?

  If **not**, why should a profit-maximising firm not take this factor into consideration?

  [let the interviewee respond spontaneously and then ask:]

  Is it because the firm is concerned that discriminations on grounds of social insurance regime might:

  - provoke new insurees to take legal action?
  - harm morale in the firm?
  - cause a reaction on the part of unions?