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DISCUSSION PAPER SERIES

IZA DP No. 17399

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Bernardo Fanfani
University of Torino, IZA, CRILDA and LABORatorio R. Revelli

Filippo Passerini
University of Milan and LABORatorio R. Revelli

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Are Alternative Work Arrangements a Substitute for Standard Employment? Evidence from Worker-Level Data*

This study analyses the impact of vouchers, an Italian alternative work arrangement, on earnings of atypical workers. We investigate whether this form of very flexible casual work substitutes for income from more standard labor contracts and from employment insurance programs. We rely on panel data estimators and a difference-in-differences specification that exploits a plausibly exogenous variation in the use of vouchers. Results show that around 50% of reductions in earnings from vouchers can be compensated by an increase in income derived from standard labor contracts and, to a much lower extent, by higher income from employment insurance. However, when considering a sub-sample of intensive users, only around 10% of losses in earnings from vouchers are compensated by other income sources. Thus, policies aiming at restricting or abolishing alternative work arrangements should be complemented by targeted interventions, particularly on intensive users, in order to mitigate the short-run earning losses of atypical workers.

JEL Classification: J24, J22, D12, C13, C21

Keywords: alternative work arrangements, policy evaluation, labor supply, cross-income elasticity, sample selection, difference-in-differences, event-study

Corresponding author:
Bernardo Fanfani
Università di Torino
ESOMAS Department
corso Unione Sovietica 218b
10134 Torino
Italy
E-mail: bernardo.fanfani@unito.it

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1 Introduction

A well-developed literature has analyzed the effect of fixed-term employment contracts on various labor market outcomes.[1] Several countries, including Italy, have provided interesting case studies on this respect, as they often transitioned from a rather rigid legislation towards a dual labor contract system during the 1990s and 2000s.[2] More recently, new forms of precarious and atypical employment have emerged in OECD countries besides fixed-term employment contracts (Katz and Krueger 2019). These new forms of employment can be broadly defined as "Alternative Work Arrangements", or AWAs for short (Mas and Pallais 2020).

AWAs may include several forms of casual work, and are generally characterized by a highly flexible schedule and by the possibility of dismissing workers on a very short notice without incurring in firing costs. They are typically characterized by low bureaucracy, and they are usually more widespread in low-wage segments of the labor market (Boeri et al. 2020). The emergence of AWAs has been linked to firms' demand for increasingly flexible tasks, for example that arising in the context of the gig economy, and their relatively low cost, but also to a weakening of traditional labor market institutions (Katz and Krueger 2017).

Due to their potential effect on inequalities, AWAs have often represented a contentious issue in the policy debate. Thus, flexible work has been at the center of the legislative agenda in the recent years, as for example in the case of the recently approved European Commission's Platform Workers Directive, which tries to limit the use of false self-employment and to forbid the firing of workers based on algorithms' decisions.

AWAs offer several advantages to firms, as they enable them to adjust to labor demand fluctuations in a quick and efficient manner (Dolado et al. 2021). Additionally, some studies have suggested that these arrangements may also benefit workers, by allowing them to adjust labor supply to their preferences.[3] Workers in weaker segments of the labor market may also benefit from a reduced exposure to unemployment, which could facilitate their transition to more stable employment (Addison and Surfield 2006; Cockx and Picchio 2012; Caliendo et al. 2016; Auray

[1] See for example Booth et al. 2002.

[2] The Italian case has been analysed, among many others, by Boeri and Garibaldi 2007, Berton et al. 2011 and Cappellari et al. 2012. For more recent evidence, see Ardito et al. 2023 and Daruich et al. 2023.

[3] Schedule flexibility among ride-share drivers has been linked to positive effects on workers in some studies, although its interaction with individual preferences may lead to greater earning inequalities (Chen et al. 2019; Cook et al. 2020). Mas and Pallais 2017 suggest that most workers do not value flexibility, as they generally prefer a full-time working schedule.

and Lepage-Saucier 2021; Jeon and Ostrovsky 2024). However, the use of AWAs may also result in reduced worker welfare, particularly if employers exploit them to avoid sanctions related to undeclared work (Di Porto et al. 2022) or to coerce workers into less protected forms of employment when they hold considerable bargaining power (Glasner 2023; Boeri et al. 2020; Datta et al. 2019).

In this study, we investigate the extent to which AWAs are substitute or complementary for other sources of formal labor income. Relying on a simple labor supply model, we show that this elasticity of substitution is an important parameter to establish whether workers' reliance on AWAs allows them to increase their welfare, as they are systematically constrained by limited employment opportunities under other labor contracts, or whether AWAs can be easily substituted by potentially better jobs. While most of the related literature has focused on longer-term effects of past exposure to AWAs, our approach focuses on short-run effects. Importantly, we account for the fact that atypical workers usually take up AWAs while also relying on other sources of income, and that casual work cannot be easily classified into rigid labor market status definitions. For example, in this application AWAs constituted on average only 7% of quarterly earnings of workers that have been using them at least once within a two-year window. In this context, this study addresses a research question that is central for an evaluation of atypical work, that is, its direct short-run influence on the welfare of atypical workers.

For this purpose, we analyze an AWA that has been introduced in the Italian labor market, the so-called *voucher*. This form of work can be considered broadly similar to Germany's *mini-jobs* or UK's *zero hours contracts*, among others. With this type of arrangement, employers purchase a given number of fixed-value vouchers from INPS (the Italian Social Security Institute), which they can use to pay for an hour of work each. Workers, on the other hand, can redeem the vouchers for 75% of their face value, with the remaining 25% covering the cost of pension contributions and injury risk insurance.[4] Importantly, no other employment contract is needed to pay the worker, so that there are no predetermined schedules and there are virtually no direct firing costs or other obligations on employers.

Vouchers were originally intended for occasional activities involving irregular working tasks with no fixed schedule. Contrary to other types of labor contracts in Italy, they involve considerably simplified bureaucracy and virtually null direct firing costs. According to policy-makers' expectations, both characteristics could encourage employers to reduce the use of undeclared work

[4]During the years covered by our study, the gross value of each voucher was 10 Euros. Since 2023, this value has been set at 12.5 Euros.

by relying on them. Vouchers were first introduced in 2008, but there were strong limitations on the activities for which they could be used, and on workers' eligibility conditions. In the following years, they were significantly liberalized, and their use continuously increased. Due to a widespread opposition from trade unions, they were then abolished in 2017. However, starting from 2023 they have been reintroduced by Italian legislators with only small differences with respect to their 2017 version.[5]

We rely on a comprehensive administrative dataset on labor and employment insurance income covering a large and representative sample of voucher users. We estimate the effect of voucher income on overall earnings, earnings from more standard labor contracts, and welfare transfers from employment insurance programs (sick and parental leave and unemployment benefits). Thus, we test whether vouchers are complementary to other formal employment arrangements and welfare transfers, or whether these income sources are substitutes. In the former case, AWAs would likely be welfare improving for workers, allowing them to adjust labor supply to an optimal consumption level in the absence of better job opportunities. If instead vouchers substitute for standard employment, AWAs could potentially distort workers and employers from more protected forms of work, reducing workers' welfare.

Using longitudinal data on the complete work history of voucher users during the period 2012-2014, we adopt two alternative identification strategies. We first rely on panel regression methods on the full sample, accounting for endogeneity by restricting the identifying variation. Then, we adopt a difference in differences approach that exploits a legal threshold imposing a cap on worker's maximum yearly income with vouchers, set at 6,667 (5,000) euros gross (net). In this second approach, we exploit only a sub-sample of highly intensive voucher users, as the threshold was set at a relatively high level compared to the usual size of yearly income from vouchers for most workers.

In the full sample estimates, we use pooled OLS, a fixed effects estimator (FE), and the Semykina and Wooldridge 2010 and Wooldridge 1995 Correlated Random Effect (CRE) estimator. The latter method allows to correct for sample selection bias within a correlated random effects framework, where time-constant unobserved individual heterogeneity is accounted for through a parametric specification, while the sample selection process is allowed to vary across time. Results

[5]The current version of vouchers involves small differences considering the sectors where they can be used, but it is less restrictive considering the total amount of vouchers that can be used by employers. Anastasia et al. 2016 provides a comprehensive account of institutional features and descriptive evidence on vouchers before their abolition in 2017.

are broadly consistent across estimators. They show that an increase of voucher earnings by 1 euro is usually accompanied by a strong and significant reduction in income from standard contracts and, to a lesser extent, by a reduction in earnings from employment insurance programs. As a consequence, overall earnings increase less than proportionally with respect to voucher income, by around 0.5 Euros only.

When adopting the difference in differences approach, we employ both the two-way fixed effects (TWFE) and the De Chaisemartin and d'Haultfoeuille 2020 estimators. Results show that, once workers reach their yearly cap, they experience a decrease in both voucher and overall income. The reduction in total earnings is less than proportional than the reduction in vouchers. However, according to both the TWFE and the De Chaisemartin and d'Haultfoeuille 2020 estimators, only around 10-20% of the income lost from vouchers is recovered through other income sources, with employment insurance playing a relatively larger role in this case. Thus, the substitution elasticity between AWAs and labor income from other contracts becomes considerably closer to zero, implying that vouchers' abolition would induce relevant short-run earnings losses among intensive users.

In summary, our findings indicate that, on average, vouchers displace income from standard labor contracts and are only weakly associated to the use of employment insurance programs. As a consequence, they have only a limited positive effect on overall income. However, for individuals who heavily rely on vouchers, a reduction in their use leads to a stronger reduction in formal income. Given that this is a relatively small proportion of voucher users, policies restricting the access or abolishing vouchers should be accompanied by targeted interventions for intensive AWAs users in order to mitigate their income loss, perhaps through welfare transfers or incentives to employers for the adoption of other feasible legal contractual forms.

Due to difficulties in observing atypical forms of employment in standard labor force surveys (Farina et al. 2021), the vouchers considered in this analysis, and similar forms of AWAs, have not been extensively studied. One exception is Di Porto et al. 2022, who analyse the use of vouchers by Italian firms. They compare employers that increase the use of vouchers when random labor inspections occur, with those for which the use of vouchers is unrelated to inspections. They show that the former group of firms increased (relative to the latter) the use of standard labor contracts after the abolition of vouchers in 2017, suggesting that they were using vouchers to "hide" and potentially increase their reliance on undeclared work. We complement this study on two respects.

First, our sample is based on the recipients of vouchers, rather than firms. Moreover, for these individuals we can observe their complete work history. Second, our empirical approach recovers an elasticity of substitution between vouchers and income from standard employment, which allows to evaluate the direct effect of vouchers on workers' welfare. By contrast, Di Porto et al. 2022 document a behavioral heterogeneity in the use of vouchers by firms, related to the underlying interaction between the reliance on undeclared work and labor inspections.

The rest of the paper is organized as follows. Section 2 provides a conceptual framework illustrating the reserarch question. Section 3 provides an institutional background on the legislation regarding vouchers in Italy. Section 4 presents the data and provides descriptive statistics. The estimation approaches are discussed in Section 5, Section 6 presents the results and Section 7 provides the concluding remarks.

2 Conceptual Framework

Before presenting the data and the empirical analysis, we provide a brief conceptual framework to illustrate our research question. We rely on a standard labor supply model that describes workers' choices between regular contracts and AWAs. This model aims at illustrating if and under which conditions workers' welfare could be improved by the presence of AWAs. It accounts for the possibility that atypical work is used for casual jobs that often coexist with other sources of labor income, which is quite realistic given that the vouchers considered in our analysis constitute on average only 7% of total labor income typically earned by workers in a quarter.[6]

In the model, we assume that workers always prefer standard employment contracts to AWAs. This choice is motivated by the fact that vouchers are associated to lower firing costs and higher flexibility, thus they entail a reduction in employment protection and potentially other amenities for workers. Workers maximize the following utility function, which depends on leisure (L) and

[6]The co-existence of gig work and regular jobs has been documented in several studies, as for example by Jeon and Ostrovsky 2024 using Canadian administrative data. See McVicar et al. 2019 for a discussion on the importance of defining the labor market status of casual workers as the combination of potentially multiple and coexisting conditions, rather than rigid and mutually exclusive categories.

consumption (C):

$$\max_{L,C} \; U(L, C)$$
$$\text{s.t.} \qquad L + h \leq T$$

We assume that the first derivatives of $U()$ are positive with respect to both arguments, while the second derivatives are negative. T is the amount of time available in a given period, while h is the labor supply. Workers can be employed under an alternative work arrangement at a wage w_a, or with a standard employment contract at a wage w_c, and, given the above discussion, we always assume $w_a < w_c$. We assume that all income is spent on consumption and that workers face the following budget constraint:

$$C = \begin{cases} w_c h & \text{if } \; h \leq \bar{h} \\ w_c \bar{h} + w_a (h - \bar{h}) & \text{if } \; \bar{H} \geq h > \bar{h} \end{cases}$$

where $\bar{h}$ is the maximum employment available for the worker under standard contracts, while $\bar{H} - \bar{h}$ is the maximum employment available relying on AWAs. We can interpret this model as a situation where workers can find only a limited amount of employment and only two types of jobs. Jobs under an alternative work arrangement are paid less. Thus, they are chosen only if there is no additional employment under a regular contract available. The black lines in Figure 1 represent an optimal solution such that the labor supply h^* is higher than $\bar{h}$. At this solution, workers choose both types of jobs in order to reach the preferred consumption level C^*, and they gain an utility level U^*.

If preferences are kept constant, the only mechanism inducing changes in the labor supply are shocks occurring in the labor demand faced by workers. We can study similar adjustments by assuming that the labor demand (thus also the budget constraint faced by workers) is not constant across time. For simplicity, we model the labor demand as subject to short-run fluctuations that are not predictable by workers, so that inter-temporal maximization considerations do not affect their choices.[7] However, we assume that at each point in time t the following relationship exists

[7] Abstracting from inter-temporal maximization can be motivated by at least two arguments. First, the empirical literature has shown that the inter-temporal elasticity of labor supply is quite rigid in response to short-run wage fluctuations (Martínez et al. 2021). Second, workers that rely on AWAs are more likely to be cash-constrained, thus less likely to optimally adjust their supply when their average wage changes across time.

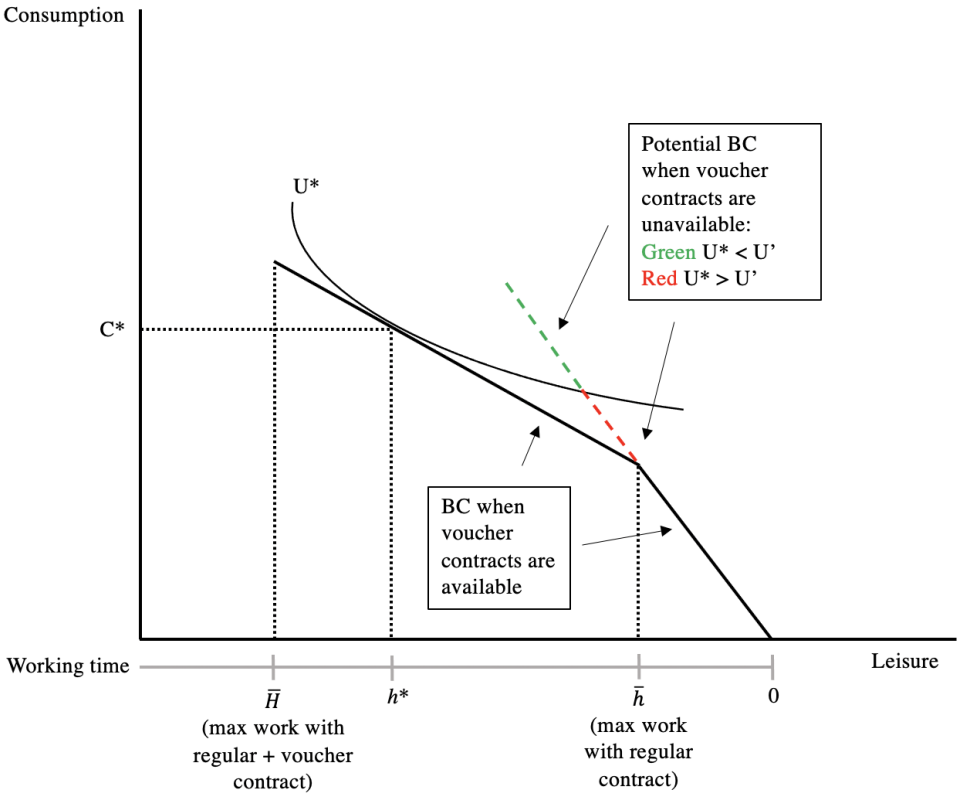

Figure 1: **Labor supply with regular contracts and vouchers, and potential budget constraint when AWAs are unavailable.**

Note: Authors' realization.

between the realized demand of standard employment ($\bar{h}_t$) and the demand of AWAs ($\bar{H}_t - \bar{h}_t$)

$$\bar{h}_t = \frac{\eta}{1+\eta}\bar{H}_t + \frac{\epsilon_t}{1+\eta} \qquad \Longrightarrow \qquad \bar{h}_t = \eta(\bar{H}_t - \bar{h}_t) + \epsilon_t$$

where ϵ_t is a random process and η is a parameter of interest, which describes the complementarity between the demand of AWAs and that of standard contracts. If $\eta < 0$, this implies that AWAs substitute for standard employment contracts, in the sense that a higher availability of them reduces the demand for more protected jobs. Determining the sign and size of η is the main purpose of our empirical analysis.

AWAs could substitute for other contracts if, for example, a lower demand of vouchers was a push factor inducing workers to put more effort in their search of standard jobs, leading to a higher $\bar{h}_t$. Similarly, reductions in the demand of AWAs could be driven by employers relying on more protected contracts for positions previously covered by vouchers. In similar circumstances, we should expect $\eta < 0$. If instead a lower demand of AWAs is typically associated to a depreciation

of workers' skills that negatively affects also $\bar{h}_t$, or to a general tendency of employers to reduce their demand, including that of standard contracts, or to rely more on informal (off the books) arrangements, then we should expect $\eta > 0$.

The size and sign of the substitution parameter η have direct implications that are relevant to evaluate the effect of AWAs on workers' welfare. To illustrate this point, consider how the solution represented in Figure 1 is affected by the unavailability of alternative work arrangements.[8] The dotted line represents potential budget constraints that could emerge after that AWAs become unavailable due to an unexpected labor demand shock, so that $\bar{H}_t - \bar{h}_t = 0$. The portion of the budget constraint below the indifference curve corresponding to the utility level U^*, which is highlighted in red, represents a type of shock that reduces workers' welfare. This is a situation in which $\eta > z$, where z is a negative number sufficiently close to zero. If instead the availability of employment opportunities under standard contracts is high enough, so that the budget constraint above the indifference curve U^* (highlighted in green) becomes feasible, workers' welfare is improved. This is a situation in which $\eta < z$.

Let U' represent the utility level reached by workers after the labor demand shock. Notice that a sufficient (but not necessary) condition to ensure that workers' welfare is improved by a binding reduction in the availability of AWAs is that total earnings obtained relying proportionally less on vouchers after this shock are higher than total earnings at the previous solution. That is, any optimal consumption level greater than C^*, if obtained relying less on AWAs, is sufficient to guarantee that $U' > U^*$. In order for this condition to occur, η should be negative and sufficiently large in absolute value.

Given this discussion, estimating the substitution elasticity between *realized* earnings from vouchers and total earnings allows to evaluate the impact of AWAs on workers' welfare. If this cross-income elasticity is negative, then $\eta < z$ and workers' welfare systematically improves when the use of AWAs reduces. A similar result suggests that abolishing these types of contracts would be beneficial for workers, given that better employment opportunities would emerge as a result of this shock. However, the test on the sign of the cross-income elasticity imposes a stricter condition than what would be needed to conclude that workers' welfare improves without vouchers. Indeed, this hypothesis cannot be ruled out also if the elasticity of substitution between total earnings and voucher income is positive, but close to zero. In Figure 1 this case would be represented by

[8] Similar considerations hold if the availability of alternative work arrangements only partially reduces.

solutions that lie on the green portion of the dashed budget constraint laying below C^*. Indeed, for such solutions $\eta < z$ still holds.

Finally, notice that in this conceptual framework we have assumed that workers' preferences are always constant in response to shocks to the budget constraint. Thus, to conduct a meaningful welfare analysis, the substitution of AWAs with standard contracts should be estimated using only shifts in the labor demand as a source of variation in vouchers' use. We discuss in more detail under which assumptions this substitution elasticity can be identified correctly when presenting the empirical approaches of this study.

3 Institutional Context

Vouchers were first introduced in the Italian legislation in 2008. They represent an Alternative Work Arrangement (AWA) through which employers can purchase a given number of vouchers to pay workers for occasional activities without relying on a formal employment contract. During the study period (2012-2014) each voucher covered one hour of work and it was worth 10 euros, with 7.5 euros representing net earnings for the worker, while 2.5 euros representing the sum of pension contributions and injury risk insurance.[9]

Compared to other employment forms in Italy, such as standard fixed-term and open-ended contracts, the costs for employers in terms of taxes and firing costs are significantly lower using vouchers. The purpose of this arrangement is to provide employers with a tool to quickly adjust employment levels for low-qualified and nonstandard forms of work, especially for seasonal, touristic, and agricultural duties that were characterized by irregularity and flexibility, and to reduce undeclared work in these sectors (Anastasia et al. 2016; Passerini 2017).

When vouchers were introduced in 2008, there were several limitations concerning their use. Over time, the conditions for the use of AWAs became gradually less restrictive. This process determined a considerable growth in the size of this market since 2008 (Figure 2), and in the intensity of their use by individual workers (Figure A1, in the Appendix). Table A1 (in the Appendix) shows that the growth in the absolute number of vouchers occurred in all industries, with the agricultural sector becoming relatively small compared to other sectors across time. Figure A2 (in the Appendix) provides a time-line of the main legislative interventions regarding

[9]The value of each voucher is 12.5 gross Euros (9 net) in the current legislation.

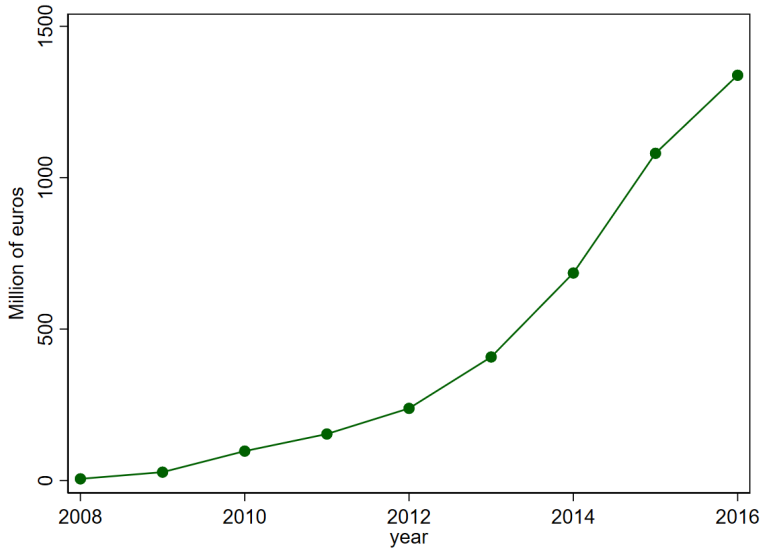

Figure 2: **Gross market size of vouchers by year between 2008 and 2016.**

Notes: Authors' calculation based on official statistics (see UPB 2017). Market size is computed as the product of the number of vouchers sold per year and their gross value of 10 euros.

vouchers in Italy.

The rapid growth of vouchers created concerns and opposition from trade unions. As a consequence, the liberalization trend began to partially reverse in 2012. In this year, a more stringent cap on the use of AWAs was introduced, as the total net income from vouchers for a single worker across all employers was not allowed to exceed 5,000 euros per year (6,667 gross). In 2017, due to opposition form trade unions and public protests, vouchers were completely abolished. However, in 2022 a bill was passed introducing again the possibility of using vouchers to pay workers. The bill has come into effect in 2023, and it allows the use of vouchers with some minor limitation concerning the sector where they can be used, and with a yearly limit of 10,000 euros per worker.

The empirical analysis is focused only on the years 2012-2014. This choice is motivated by two main reasons. First, this is a period of stable legislation concerning vouchers, and their use was close to the peak level during these years. Reforms occurring after 2014, in particular the "Jobs Act" of 2015, could be difficult to control for and affect our results. Second, our difference in differences analysis exploits the yearly cap of voucher earnings set at 5000 net euros that was in place only during this period. Thus, in order to provide broadly comparable results using both the panel regression models and the difference in differences approach, we decided to restrict also the former set of analyses on the same period.

4 Data

We combine two different administrative sources of data that are presented below.

We exploit an administrative dataset ("vouchers records") extracted from the Italian Social Security Institute (INPS) archives, providing information on a representative sample of voucher users between January 2008 and December 2015. Individuals are sampled using two days of birth for each month and year from the population of workers using vouchers at least once in the period of analysis. Therefore, our sample covers approximately 6.6% of the whole population of voucher users between 2008 and 2015. This corresponds to 155,861 individuals and 1,478,722 voucher spells. For each spell paid with vouchers, we know the start and end dates, gross remuneration (*i.e.,* before income taxes and including social security contributions), the province and macro-industry of use, basic demographic characteristics and an employer identifier.

We also exploit a second administrative dataset ("*estratti conto*"), which is also derived from the INPS archives. This second dataset provides information on all labor income sources (excluding vouchers) and income derived from employment insurance programs (sick and parental leave and unemployment benefits)[10]. The population covered includes all voucher users that were present in the first dataset of voucher recors. Labor income included in the *estratti conto* may derive from standard private sector employment contracts (86% of all earnings during the period), from self-employment (8.4%), from occasional collaborations (3.5%), and the rest from public-sector jobs or employment contracts in sectors with contribution funds that are separated from the main private-sector social security fund. Since our main analysis focuses on the elasticity of substitution between vouchers and other forms of employment available in the formal sector, for brevity we refer to all sources of labor earnings that are not paid with vouchers as "earnings from standard labor contracts", although considerable heterogeneity exists among these alternative contractual forms. Overall, the *estratti conto* dataset covers the same period between January 2008 and December 2015. For each employment or employment insurance spell we know gross earnings, start and end dates as well as additional information on the type of contract, and basic demographic characteristics.

We merge the two data sources described above using a unique individual identifier. Thus, for all individuals using vouchers at least once between January 2008 to December 2015, we can

[10]Unemployment benefits include both standard unemployment insurance and an insurance for reduced work time called "*Cassa Integrazione Guadagni*".

Variable	Observations	Mean	St.Dev.
No. workers	82,005	-	-
Labor Income	970,460	825.605	2276.432
Voucher Income	970,460	70.29227	281.0904
Welfare Transfers	970460	133.1343	897.1608
Total Income	970,460	1029.032	2507.291
Total Income (> 0)	331694	3010.709	3525.143
Total Income (less voucher)	970460	958.7393	2494.081
Age	970,460	36.99127	13.16663
Non-Italians	970,460	24.9%	
Male	970,460	59.56%	

Source: Authors's calculation on *INPS Estratti Conto* archive.

Table 1: **Summary Statistics at the quarterly-level in the full sample.**

Notes: The sample includes only workers with at least a voucher spells between 2012 and 2014 belonging to the active age population (between 16 and 64 years old). The unit of observations if a worker-quarter tuple. The panel was filled to include all periods of workers' administrative silence. Outliers, defined as workers with records above 99^{th} percentiles in vouchers and labor earnings, are excluded from the sample.

reconstruct their full career including all sources of income received from formal employment contracts and employment insurance programs. We aggregate the data at the quarterly level and focus the analysis on the period between January 2012 and December 2014, as this is a period of stable legislation regarding vouchers, relatively high intensity in their use, and also the period when the yearly cap of 5000 net euros used for the difference in differences analysis was in place. We fill in all periods of administrative silence, considering them as quarters spent out of formal employment and out of employment insurance programs.

We further restrict the sample of analysis as follows. We trim all the observations above the 99^{th} percentile of voucher earnings and earnings form standard labor contracts. Moreover, we keep only individuals that worked with vouchers at least once between 2012 and 2014. We additionally keep only those individuals of age between 16 to 64 years old. The resulting sample is a fully balanced quarterly panel describing the income trajectories of 82,005 workers that used vouchers at least once during the period between 2012 and 2014, for which descriptive statistics are reported in Table 1.

The outcomes of interest are *total income*, defined as the sum of all sources of income including vouchers, *standard labor income*, defined as the sum of all labor income sources excluding vouchers (representing on average 80% of total income), and *welfare transfers*, defined as the sum of all income derived from employment insurance programs (representing on average 13% of total

income). The independent variable of interest is *AWAs income*, which is the quarterly income earned through vouchers, and it represents on average around 7% of total income. Table 1 shows that the average age in our sample of analysis is 36 years old, men represent 59% of the sample and Italians 75%. Thus, there is a significant representation of foreigners,[11] which is considerably higher than the national average set slightly below 10%. The average monthly income in the entire sample is just under 400 euros, which reflects the fact that voucher users tend to be marginal, low-income workers. It rises to approximately 1700 euros when only considering the months in which workers are employed.

5 Empirical Strategy

The objective of the empirical analysis is to identify an elasticity of substitution between AWAs and other sources of income. As outlined in Section 2, this is a relevant parameter to assess the welfare effect of atypical work on voucher users. Our focus on earnings, rather than on labor market status, allows to take into account the possibility that atypical workers may rely on several income sources at the same time. Moreover, earnings are also more informative than wages. Indeed, even in the absence of a compensating wage differential, if atypical work was complementary to standard employment it would allow workers to improve their welfare by adjusting their labor supply to an optimal consumption level.[12]

The empirical analysis is based on several estimators and two alternative identification strategies. First, we estimate panel regression models on the full sample of voucher users over the period 2012-2014. We account for potential endogeneity concerns by restricting the identifying variation. Moreover, we account for sample selection bias using an estimator proposed by Semykina and Wooldridge 2010. Second, we build a difference in differences analysis exploiting a yearly cap in the use of vouchers. We estimate this model using standard OLS, the De Chaisemartin and d'Haultfoeuille 2020 estimator to account for the potential bias arising from treatment effect heterogeneity. The difference in differences analysis is restricted on a sub-sample of intensive voucher

[11] The most common nationalities are Morocco, Tunisia, Albania, Romania, Moldova, Ukraine, and Bangladesh.

[12] In the conceptual framework of Section 2 AWAs may have positive welfare effects even in the absence of compensating wage differentials for job protection. The evidence on compensating wage differentials for atypical work is mixed. A wage premium is documented for some atypical workers by Addison and Surfield 2007. UK zero-hours contracts are associated with penalties in Koumenta and Williams 2019 and Datta et al. 2019, while the conditional wage gap is not significant in Farina et al. 2021. Some studies have pointed to a positive conditional premium for fixed-term employees in Italy (Albanese and Gallo 2020), but this type of contract is included among standard employment arrangements in our framework.

users, since the cap was set at a relatively high level with respect to the usual income from vouchers observed for most workers. In the reminder of this section we present each estimation approach in more detail.

5.1 Fixed Effects Specification

In order to recover an elasticity of substitution between AWAs and other sources of income, we first consider the following fixed effects specification:

$$Y_{i,q} = \theta X_{i,q} + f(Age_{i,q}) + f(WE_{i,q}) + \delta_i + \beta_q + e_{i,q} \tag{1}$$

where i index individuals and q index time at the quarterly level. $Y_{i,q}$ represents the outcome, defined alternatively as total income, income from standard labor contracts, and welfare transfers from employment insurance programs (unemployment benefits, sick and parental leave). $X_{i,q}$ is the independent variable of interest, representing voucher income. δ_i and β_q represent individual and time fixed effects, respectively. $f(Age_{i,q})$ is a cubic polynomial in workers' age, which we assume to be flat at 45 years old following the approach of Card et al. 2018 to deal with its multi-collinearity with worker and time fixed effects. $f(WE_{i,q})$ is a quadratic polynomial in cumulative months of work experience in the four years preceding q. We estimate standard errors by clustering at the worker level.

Given the presence of zero income spells in the sample, we keep both the outcomes and voucher income variables in levels, given the impossibility of estimating unit-invariant percentage effects in such contexts (Chen and Roth 2024). The parameter of interest, denoted by θ, is the marginal effect of one additional euro earned from vouchers on one of the income variables denoted by Y. When the outcome is total income, a marginal effect lower than one implies that vouchers substitute earnings from other sources, such as standard labor contracts or employment insurance. The size of this substitution is given by the marginal effect for each of these outcomes, respectively.

As discussed in Section 2, the parameter θ should be estimated using only shifts in the use of vouchers that are driven by labor demand shocks faced by workers. Instead, changes in the labor supply that are driven by workers' preferences should be controlled for by the regression model. On this respect, the inclusion of worker fixed effects controls for any time-constant individual heterogeneity in workers' preferences. The nonlinear age effect and quarter fixed effects further

control for time-varying shifts in individual preferences, as long as they are common across age groups and time. Similarly, we assume that these control are sufficient to account for any cross-sectional correlation between voucher use and individual earnings' potential. This correlation could indeed arise because AWAs tend to be more common among workers segregated in low-productivity and low-value-added industries (Addison and Surfield 2007), but individual fixed effects allow to restrict the identifying variation and to exploit only within worker variation in voucher availability and earnings across time.

A particular form of time-varying shock in preferences could be generated by intertemporal optimization. For example, if only vouchers are available in the current period, while workers correctly expect greater job opportunities with standard contracts in the future, they may increase leisure today and work more when better jobs are available. A similar mechanism would negatively bias the marginal effect of vouchers to total income, since labor supply would partly drop because of a shift in workers' preferences when vouchers are the only income source. While this form of adjustment would be efficient from a theoretical point of view, the most recent micro-based estimates of this intertemporal elasticity show that employment (both at the extensive and intensive margin) is not particularly responsive to temporary wage shocks (Martínez et al. 2021)[13].

As mentioned, θ should capture whether voucher income is used as a complement to other income sources, or whether it substitutes for them. Thus, if vouchers tend to be intensively used when alternative employment opportunities are scarce for reasons that are independent from individual preferences for work, this should be reflected in a greater complementarity between vouchers and total income. However, if individual-specific shocks in the use of vouchers and alternative employment contracts were systematically correlated due to changes in workers' preferences for work, this would represent a violation of our identification assumptions. On this respect, the inclusion of a polynomial for employment intensity in the previous four years should further account for changes in workers' preference for work. Section 5.3 presents an identification approach based on a plausibly exogenous shock in the availability of vouchers determined by a yearly cap imposed by the law.

[13]Using an announced staggered Swiss tax holiday (two years of income that never formed the basis for taxation) Martínez et al. 2021 show that extensive margin employment and hours of work were not positively affected by this event.

5.2 Semykina and Wooldridge 2010 Estimator

Since the seminal work by Heckman 1979, the econometric literature has extensively studied methods to take into account the problem of sample selection bias. In our application, labor income levels can be observed only when workers are employed. However, the selection of individuals in the labor market is typically non-random, and it may also depend on the frequency and intensity in the use of vouchers. Moreover, our identification strategy exploits variations in income and voucher use across time, thus it is a longitudinal setting where sample selection could depend on time-varying determinants.[14]

Semykina and Wooldridge 2010 have proposed a consistent estimator for the case of endogenous selection of individuals in the sample depending on observable time-varying and unobservable time-invariant individual characteristics.[15] This estimator is particularly suited for our application, as there might be time-varying worker characteristics influencing workers' participation. Moreover, this approach still allows to control for individual heterogeneity, which is important in our context given that the use of vouchers could be more intensive among low income groups.

The Semykina and Wooldridge 2010 estimator is based on a Correlated Random Effects (CRE) approach and is estimated in two stages. In the first stage individuals' selection into the labor market is modeled at each point in time, while in the second stage the cross-income elasticity of interest is estimated conditioning on the time-specific inverse Mills ratios. The CRE model is similar in spirit to a fixed effect approach, in that time-varying workers' unobserved heterogeneity must be exogenous in the regression and selection equations. Time-constant unobserved individual heterogeneity is instead modelled as a parametric function of individual-specific averages (Mundlak 1978).

In the first stage, we estimate the following probit regressions

$$\forall q : W_{i,q} = \eta M_i + f(Age_{i,q}) + f(WE_{i,q}, STWE_{i,q}) + \gamma Sex_i + \delta Nat_i + \theta X_{i,q} + \epsilon_{i,q} \qquad (2)$$

where W_{iq} is a dummy equal to 1 if the individual i works in quarter q, 0 otherwise. X_{iq} are earnings

[14] An application with a similar identification problem, which proposes a solution based on the same estimator presented in this study, can be found in Jäckle and Himmler 2010, which estimate the effect of health status on wages in the US. In that case, time-varying health determinants, such as individual lifestyle, also affect the selection in the labor market and could lead to biased estimates. Semykina 2018 uses a similar approach to study the impact of children on women's self employment status, accounting for non-random selection into employment and the endogeneity of fertility decisions.

[15] See also Wooldridge 1995 for a similar correction procedure.

from vouchers of worker i in quarter q. M_i is a matrix containing the across-time averages of all covariates of the model, to account for time constant individual heterogeneity (Mundlak 1978, Wooldridge 1995). The estimator controls hence for individuals' endogenous selection into the labor market depending on both time-varying and individual time-constant determinants.

In the above equation, $f(WE_{i,q}, STWE_{i,q})$ denotes a quadratic polynomial of work experience in the previous four years, and a quadratic polynomial for short-term working experience, defined as the cumulative months worked in the two years preceding quarter q. The latter explanatory variable (short-term experience) is included only in the selection equation[16]. Thus we assume that, conditional on individual time constant heterogeneity and on the other controls of the model, short-term working experience is a good predictor for the probability of working, but can be ignored in the second-stage wage equation as its residual predictive power for the level of earnings conditional on working is low. Among the time-varying predictors, besides the polynomial in mid- and short-term working experience, we also include sex, nationality, and a cubic polynomial in age.

The equation is estimated separately for each q with a probit model, and the estimator produces for each q an individual-specific Inverse Mills Ratio ($IMR_{i,q}$) that is used as a covariate interacted with time effects in the second stage. The IMR is a probability predicting individuals' conditional likelihood of participating in the labor market, and hence its inclusion at the second stage adjusts the estimates for the sample selection bias. In the second stage, we estimate the following regression by OLS:

$$Y_{i,q} = \eta M_i + f(Age_{i,q}) + f(WE_{i,q}) + \gamma Sex_i + \delta Nat_i + IMR_{i,q}\beta_q + \theta X_{i,q} + v_{i,q} \tag{3}$$

where the outcome $Y_{i,q}$, is either total, standard labor income or employment insurance related earnings. The covariate of interest $X_{i,q}$ is the level of voucher earnings in quarter q, and the estimated parameter θ provides the effect of AWAs on other income sources.[17] $IMR_{i,q}\beta_q$ are quarter-specific interactions bewteeen quarter fixed effects and the inverse Mills ratios. Other controls are the same as in Equation (2), with the only exception of short-term working experience

[16] As is standard for the selection model, these types explanatory variables included only in the first stage allow to break the near-perfect multi-collinearity between the inverse Mills ratio and the other covariates included in the wage equation.

[17] Notice that the second-stage estimation sample is different for each outcome, as it is restricted to observations with positive outcome levels. However, this sample selection is controlled for in a parametric way, and θ can thus be interpreted as an average marginal effect for the entire population nonetheless.

that is omitted in the second stage. The probit and OLS models were jointly estimated by pseudo-maximum likelihood with analytical standard errors clustered at the individual level.[18]

5.3 Difference in Differences Approach

In this section, we present an identification strategy that exploits a cap regulating the maximum yearly income that workers could earn using vouchers. Specifically, between 2012 and 2014 legislators set a yearly limit of 6,667 gross euros (5,000 net) on the cumulative voucher income that each worker could earn across all employers and industries.

In this difference in differences approach, we compare the earnings of workers who reach the threshold in a given month of the year (the treated group), to the earnings of workers that have still not reached it in the same month (the control group), despite being close to or having reached the cap by the end of the year as well. In short, we exploit the timing in the use of vouchers, as some workers might reach the threshold before others. We then compare the income trajectories of workers that, having reached the cap, were potentially facing sanctions from their use, to those that were still able to legally earn income through vouchers, despite being intensive users themselves.

We restricted the population to individuals with similar AWAs income levels to improve the comparability between treatment and control groups, which we further investigated using a formal parallel trend test. Focusing on workers that are more likely to reach the yearly voucher income threshold provides insights into the potential impact of vouchers on the segments of the labor market characterized by the highest intensity in their use. However, these results may have more limited external validity with respect to evidence derived from longitudinal regression models estimated on the full sample of voucher users, as is the case for the CRE or fixed-effect approaches.

For the empirical specification, we constructed a monthly-level panel for the years 2012-2014. We focused on workers earning between 5,000 and 8,000 euros gross during the year. Table A2 (in the Appendix) provides descriptive statistics for the sub-sample considered for the difference-in-differences analysis, which consists of 1,672 workers and 20,064 observations. As can be noticed, total income tends to be higher in this sample,[19] and vouchers represent around 52% of its composition. Moreover, this sample is older on average, and the proportion of Italians is higher.

In our sample, around 1000 workers per year reached or exceeded the yearly cap between 2012

[18] The Stata routine xtheckmanfe was used for this purpose.

[19] Monthly income amounts to around 400 euros per month in the full sample, with respect to 986 euros in the difference-in-differences sample.

and 2014. Around 30% of workers with earnings above 5,000 euros per year were not compliant with the threshold. Thus, the difference-in-difference estimator can identify only an intention-to-treat parameter. Figure A3 (in the Appendix) shows a histogram of workers' earnings above 5000 euros per year, with a vertical line indicating the threshold of 6,667 euros corresponding to the cap. There is a decreasing trend in the distribution of earnings around the threshold, and a mass of observations just below the 6667 euros limit, followed by a drop in the density above it. This suggests that the limit was potentially effective for some workers.

The most relevant driver of partial compliance with the yearly cap was likely related to its monitoring and sanctions system. Sanctions for violations of the yearly threshold, in principle, were very high. They included not only pecuniary fines. If an employer used vouchers exceeding the threshold for tasks that could have been performed by a regular employee, the law even prescribed an obligation on firms to hire the voucher worker under an open-ended full time employment contract. However, since no automatic monitoring system for violations existed, to be exempt from sanctions the employer could ask the worker to provide a self-declaration certifying compliance with the yearly cap, at least with reference to previous voucher positions held at different firms.[20] To sum up, given the presence of an imperfect monitoring system, compliance with the yearly cap could be avoided, but this choice implied some risk of being exposed to strong sanctions for both, employers and workers.

We adopted two alternative specifications, namely a standard difference-in-differences and an event-study approach. The difference-in-differences was estimated using the following model

$$Y_{i,m} = \delta_i + \beta_m + \sigma Z_{i,m} + \alpha I_{m \geq M_i} + \epsilon_{i,m} \tag{4}$$

where i indexes worker-year tuples, m indexes months, while δ_i and β_m represent fixed effects for workers by year and months, respectively. $Z_{i,m}$ is a vector of controls that includes a cubic age polynomial. M_i denotes the month in which unit i reaches the yearly cap of voucher income, and $I_{m \geq M_i}$ is a dummy for all months in which this threshold has been already reached. In this specification, α is the parameter of interest, as it captures relative differences in the outcomes' evolution between workers that have reached the vouchers' maximum legal yearly income, and

[20] Providing a false declaration would qualify as a criminal offense by workers, but there is little anecdotal evidence suggesting that similar false declarations were systematically persecuted.

workers that, despite being intensive users, have not reached it yet.

The outcome variable $Y_{i,m}$ was defined alternatively as AWAs income, standard labor income, welfare transfers and total income. Each of these outcomes was expressed in levels. Notice that when voucher income is the outcome, the difference-in-differences parameter provides the size of the direct policy effect. That is, it represents the reduction in voucher income that is observed after that workers have reached their legal yearly limit, if compared to a control group of similar workers that are close, but have not yet reached the cap.

The event-study specification reads as follows

$$Y_{i,m} = \delta_i + \beta_m + \sum_{m=M_i-k}^{M_i-1} \gamma_m I_m + \sum_{m=M_i}^{M_i+h} \alpha_m I_m + v_{i,m} \tag{5}$$

here, γ_m and α_m represent monthly treatment effects for up to k months before the event, and up to h months after it, respectively. Ideally, all parameters γ_m should not be different from 0 in order for the parallel trend assumption to hold. Instead, the parameters α_m should capture short- and long-run effects of the treatment of interest.

There is a growing body of literature that documents the risk of bias in the context of difference-in-differences with a staggered treatment adoption, which could be driven by the presence of treatment effect dynamics and heterogeneity.[21] To deal with this issue, we rely on the De Chaisemartin and d'Haultfoeuille 2020 estimator for the static difference-in-differences specification of equation (4), and on the De Chaisemartin and d'Haultfoeuille 2022 estimator for the event-study specification given by equation (5). De Chaisemartin and d'Haultfoeuille 2023 show that this latter approach is comparable to alternatives available in the literature for a binary treatment and a staggered design, although, as common with other heterogeneity-robust estimators, it shows higher variance than the traditional two-way fixed effects approach.

[21] We direct to De Chaisemartin and d'Haultfoeuille 2023 for an extended discussion.

6 Results

6.1 Full Sample Results

This section presents the results obtained from the longitudinal regression models estimated on the full sample of voucher users covering the years 2012-2014. The main regression results are reported in Table 2. This table shows the estimated marginal effect of voucher income on three outcomes: total income (inclusive of vouchers), standard labor income, and welfare transfers.

In interpreting the size of each coefficient, notice that a marginal effect on total income lower than one implies that vouchers partly substitute for other income sources. The size of this substitution effect is given by the corresponding coefficients for standard labor income and welfare transfers.[22] In the case of OLS-based regression approaches, the three coefficients sum up to one. That is, the effect of an additional euro of vouchers on total income is going to be one minus the potentially negative effects on other income sources. This is not the case with the Semykina 2018 CRE estimator. Indeed, in the latter approach the second-stage estimation sample includes only observations with positive outcome values, thus it is different for each dependent variable. However, since in this approach sample selection is controlled for parametrically, the reported coefficients represent the estimated average marginal effect for the same population of OLS-based regression approaches.

Estimates contained in the first column of Table 2 (pooled OLS) do not include individual fixed effects. The second column reports fixed effects regression results, which use only within worker variation in the variables of interest to estimate the marginal effects. The third column reports the results derived from the Semykina 2018 estimator. All models include among the controls a cubic polynomial of age, a quadratic polynomial of months of work experience in the previous four years, and time fixed effects.

In the first row of coefficients in Table 2, the marginal effect of vouchers on total income is similar across specifications. For one euro of additional voucher earnings, total income increases by only around 0.5 euros. The estimate is slightly higher in the fixed effects specification. In general, since the marginal effect is significantly lower than one, this suggests that a substitution for other

[22] Since we rely on administrative data, informal work is not observable, and we can only document the effect of vouchers on other legal income sources. If vouchers substitute for undeclared work, this is likely to lead to a more positive formal income effect of vouchers, thus to a lower substitution between other legal income sources and AWAs.

Dependent variable	**OLS**	**FE**	**CRE**
Total Income	0.485***	0.572***	0.445***
	(0.011)	(0.010)	(0.016)
Standard Labor Income	-0.448***	-0.373***	-1.108***
	(0.010)	(0.009)	(0.023)
Welfare Transfers	-0.067***	-0.054***	-0.817**
	(0.004)	(0.004)	(0.056)
Observations	970,470	970,470	970,470
No. of workers	82,005	82,005	82,005
$f(WE_{i,q})$	√	√	√
$f(Age_{i,q})$	√	√	√
Time FE	√	√	√
Sex & Immigrant dummy	√	-	√
Worker FE	-	√	-
Worker parametric FE	-	-	√

Table 2: **Baseline estimates of Equations 1 and 3.**

Notes: The specifications are estimated on individuals of age from 16 to 64 years, observed working at least once with vouchers in 2012-14. Column (1) contains standard OLS estimates with no fixed effects, Column (2) FE estimates, while Column (3) contains estimates of the correlated random effect (CRE) model of Semykina and Wooldridge 2010. Coefficients of Column (3) should be interpreted as average marginal effects for the whole population, regardless of labor market participation.

income sources exists and is significant. That is, either standard labor income or employment insurance income tend to reduce whenever earnings from vouchers increase.

The second and third rows of coefficients of Table 2 show that the substitution effect is significant both in the case of labor income derived from alternative contractual forms, and also in the case of income derived from employment insurance programs (sick and parental leave and unemployment benefits). However, substitution with standard labor income is quantitatively much larger. According to the fixed effects estimates, one euro of additional voucher earnings is associated to an almost 40 cents reduction in income derived from standard labor contracts, and with a reduction of only 5 cents in the case of employment insurance.

As mentioned, the size of the marginal effects in the case of the Semykina 2018 CRE estimator is more difficult to interpret due to differences in the second-stage estimation samples depending

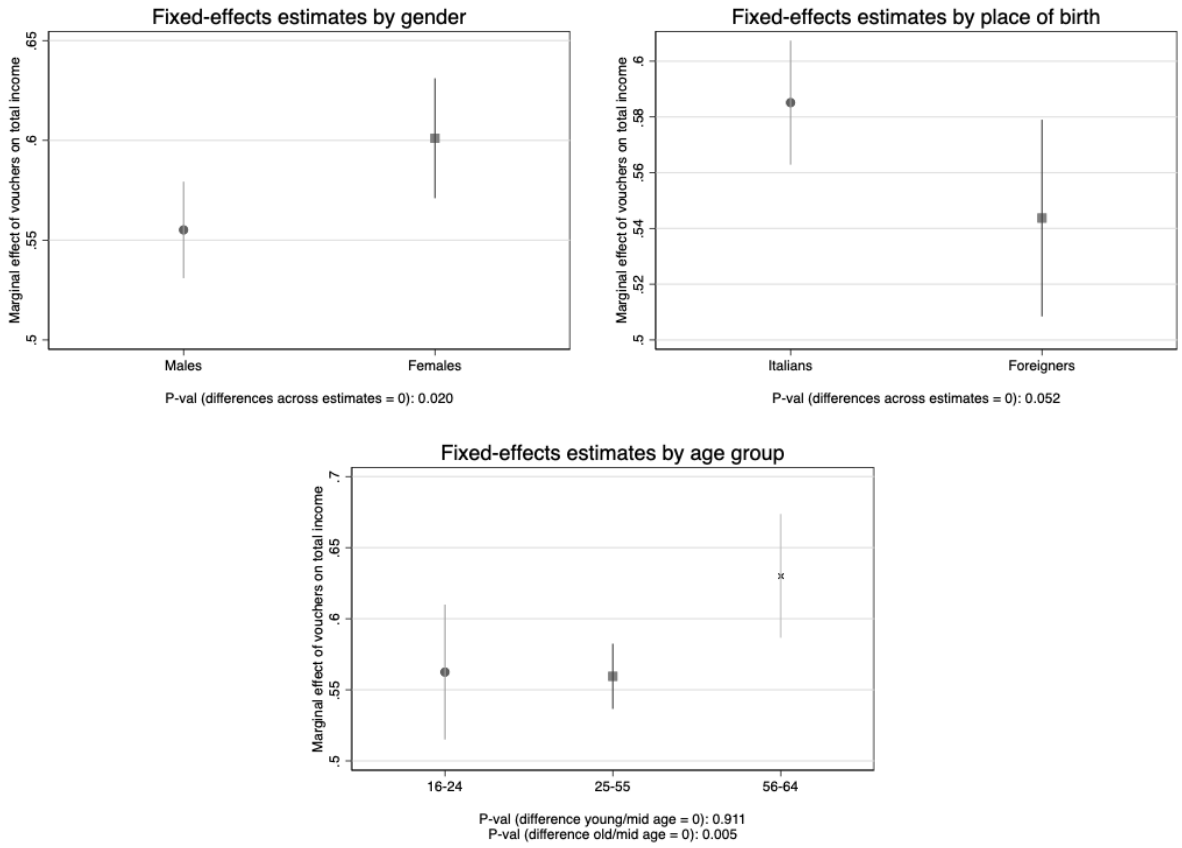

Figure 3: Fixed effect estimates of voucher effect on total earnings by demographic groups.

on the outcome considered.[23] The size of the substitution with standard labor income is even lower than -1 according to this estimator, which suggest that an extensive-margin adjustment out of standard labor contracts is likely to take place in response to higher voucher income.[24] As mentioned, this type of selection is controlled for parametrically in the model, and this could be driving the quite negative estimated marginal effect. Similar considerations hold for what concerns the estimated substitution effect for employment insurance, which is also quite negative in the case of the CRE estimator, suggesting that selection in and out of this income source is significantly associated to voucher income.

Figure 3 reports an analysis of the heterogeneity in the fixed-effects estimates of the marginal effect of vouchers on total income by demographic groups. The top-left panel shows that women

[23]CRE coefficients represent average marginal effects on the entire population (employed and non-employed individuals), thus they are the closest parameter for comparisons with marginal effects derived from OLS estimates on the entire sample.

[24]A formal test for the presence of selection effects can be carried out by Wald tests on the joint significance of the time-specific inverse Mills ratios. Results, not attached, show that the IMR are always significant and suggest that sample selection is a relevant mechanism.

tend to have relatively less opportunities to substitute vouchers with other income sources, thus the effect of AWAs on total income is more positive for them. There is also a significant, but slightly smaller difference between Italians and foreign-born workers, with the latter group having more substitution opportunities (top-right panel). Finally, the largest difference in the marginal effects is found between older workers above 55 years old and younger ones. Elders tend to increase proportionally more their total earnings whenever they receive vouchers, which is consistent with them having less (or less responsive) alternatives in terms of additional formal earnings opportunities.

Overall, these results suggest that the use of vouchers allows workers to increase their overall earnings. However, access to AWAs also partly substitutes for more protected forms of work, which are usually reduced when individuals take up vouchers. Considering only short-run adjustments and ignoring general equilibrium effects, restricting the access to vouchers would lead to a reduction of only 50% of the amount of income that atypical workers usually earn through this type of arrangement. General equilibrium effects could lead to an even lower loss of earnings, if employers relying on vouchers started to use other type of contracts for the same occupations. However, general equilibrium effects could be less relevant, at least for what concerns formal income, if employers started relying on off-the-book arrangements or reduced their labor demand.

As mentioned, the analyses presented in this section attempted to control for shocks in individual preferences for work by restricting the identifying variation through fixed effects and other controls. The following section presents results obtained from a plausibly exogenous shock in the use of voucher by workers. However, this estimator is based on a more restricted sample of intensive voucher users.

6.2 Difference in Differences Results

This section presents the evidence derived from event-study and difference in differences specifications. These models were estimated on a subsample of intensive users of vouchers, and they exploited the yearly cap of 5000 net euros per worker. Figure 4 show the results from the dynamic specification of this model, as given by equation 5. This specification allows to test for parallel trends, and to estimate dynamic treatment effects.

Given the staggered design of this specification, where workers close to reaching the cap, and potentially reaching it in the future, serve as a control group for workers who had already

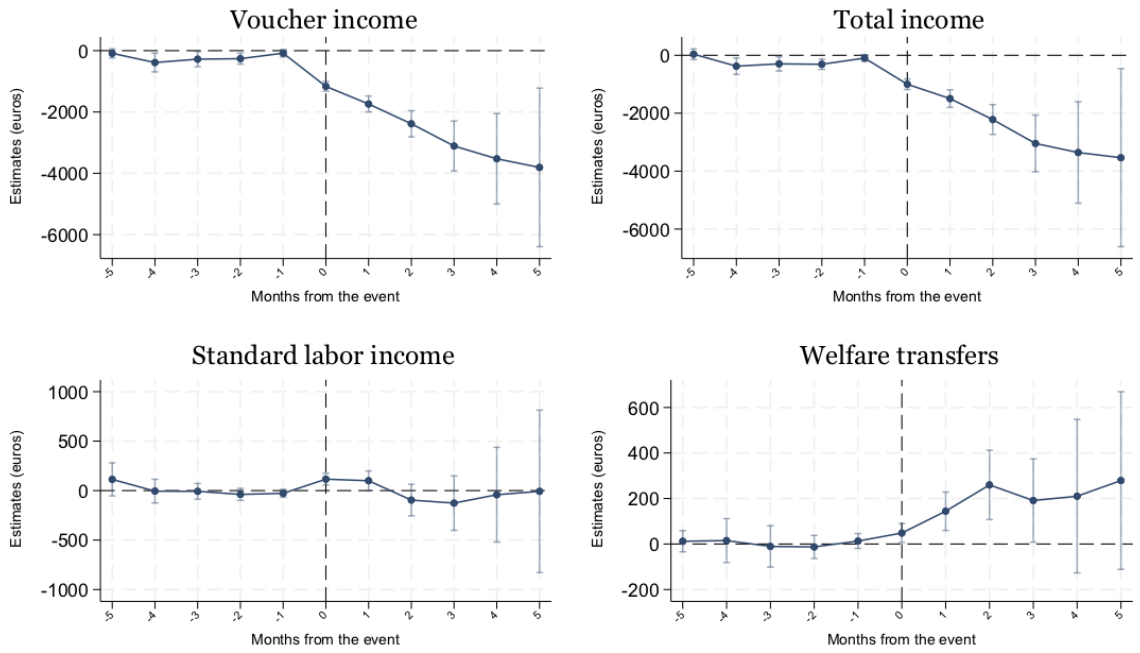

Figure 4: Treatment effect estimates of the model of equation 5 based on De Chaisemartin and d'Haultfoeuille 2022. 500 bootstrap replications.

reached the cap during the year, we have adopted the De Chaisemartin and d'Haultfoeuille 2022 estimator, which is robust to the potential bias that could arise in the presence of treatment effect heterogeneity when adopting a standard fixed effects model. The De Chaisemartin and d'Haultfoeuille 2022 estimator is based on a weighted average of long- and short-term differences between not-yet treated and first-time treated units in each period.[25] In this application, we have chosen to estimate treatment effects within a 10-months window around the event.

The top-left panel of Figure 4 shows that treated and control workers have similar growth rates in their use of vouchers before reaching the yearly cap. As treated workers reach the yearly limit of AWAs, the growth rate in their use declines sharply compared to the control group. Thus, the yearly cap seems effective in reducing the intensity in the use of vouchers once workers reach it, even if compliance is not perfect. Importantly, the parallel trend assumption also seems to hold, as there are no significant differences in the growth rate of vouchers between treated and control workers before reaching the cap.

When considering the effect of reaching the cap on total income (top-right panel of Figure 4), a sharp decline similar to the one documented for vouchers occurs after the treatment. This suggests

[25]In the current application, there are only first-time treated, not-yet treated, or never treated workers, given the perfectly staggered treatment adoption design.

Dependent variables	(1) TWFE	(2) Robust DiD
AWAs income	-874.50***	-1901.87***
	(37.06)	(197.45)
Total income	-689.76***	-1721.68***
	(54.63)	(233.92)
Labor income	120.08***	43.67
	(34.839)	(58.77249)
Welfare transfers	64.66*	136.52***
	(32.955)	(45.665)
Implied marginal effect of AWA income by outcome		
Total income	0.789	0.905
Labor income	-0.137	-0.023
Welfare transfers	-0.074	-0.072
Observations	19,836	19,836
Workers	1,672	1,672

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Treatment effect estimates of the model of equation (4) with the two-way fixed-effect estimator (column 1), the De Chaisemartin and d'Haultfoeuille 2020 estimator (column 2). Standard errors are clustered at the worker level in column (1), and bootstrapped with 200 replications in column (2).

that substitution for other income sources plays a smaller role, or that it is not significant. Indeed, in the bottom panels it can be noticed that standard labor income is hardly affected by the drop in income from vouchers, while there is only a marginal increase in income derived from employment insurance programs, and only in the relatively short-run. Importantly, for all outcomes there are parallel trends between the treated and control groups before the treatment, an evidence supporting the validity of our identifying assumptions. Overall, the results of Figure 4 suggest that the lower reliance on vouchers induced by reaching the yearly cap has strongly negative effects on labor income, given the limited availability of alternative working opportunities.

The event-study model of equation 5, while useful for exploring the dynamics of the treatment effects and testing for the presence of parallel trends, does not provide a single cumulative policy effect, which is useful for an overall assessment of the size of the income and substitution effects of vouchers. For this reason, we have also estimated the static difference-in-differences specification

of equation (4), which provides a single (cumulative) treatment effect parameter.

Table 3 provides the treatment effects obtained using this static specification and two alternative estimators: the two-way fixed effect estimator (column 1), and the De Chaisemartin and d'Haultfoeuille 2020 estimator that is robust to the heterogeneity bias (column 2). The first four rows of Table 3 provide the treatment effect of reaching the yearly cap in voucher income on each of the outcomes considered. As we discuss in more detail below, results are qualitatively similar between the TWFE and the De Chaisemartin and d'Haultfoeuille 2020 estimator. However, in the latter case the size of the coefficients is generally larger, suggesting that negative weighting problems in the case of the TWFE, and differences between treatment-control comparisons across estimators tend to be relevant and induce some differences across models.

The treatment effect on the use of vouchers is negative in the first row of Table 3. According to the more robust estimator of column (2), reaching the cap induces a loss in voucher earnings in subsequent periods of around 1900 euros with respect to the control group. This loss translates to a reduction in total earnings inclusive of vouchers of around 1720 euros (second row). By taking the ratio between the policy effect in the second and first row we obtain the marginal effect of voucher income on total earnings, which is conceptually equivalent to the marginal effects obtained from the longitudinal regression models discussed in Section 5.1. This marginal effect is reported in the lower part of the table, showing that a one euro reduction in vouchers induces a loss in total earnings of around 90 cents. This loss is slightly smaller, amounting to almost 80 cents, according to the TWFE estimates.

Given the large loss in earnings following the drop in income from vouchers, substitution for other income sources does not seem to be particularly relevant among intensive users. Indeed, according to the robust estimator only around 2 cents are recovered through standard labor contracts for a one euro reduction in vouchers, and this marginal effect is not statistically significant. This marginal effect is instead significant in the case of the TWFE estimator, but it is small in size, amounting to only around 13 cents. Instead, estimates across models are more similar for what concerns substitution with employment insurance programs, suggesting that a one euro reduction in vouchers is associated to an increase in this type of income of only around 7 cents.

Overall, the difference-in-difference analysis provides a more causal evidence of the worker-level consequences of facing a loss in income from vouchers. This evidence was obtained on a group of workers for which vouchers represented a large proportion of their income, as AWAs consist

of around 50% of their overall monthly earnings on average. In this sample, being faced with a reduction in the availability of vouchers represents a likely welfare loss, given that workers seem unable to compensate through a reliance on other legal contractual forms of work, or through higher income from employment insurance programs.

It is possible that a complete abolition of vouchers would induce a shift in employers' demand and other general equilibrium effects that we have not considered in this analysis. Such general equilibrium effects could in part improve the opportunities for workers to substitute AWAs with other legal jobs. Yet, the quite small size of substitution mechanisms found among intensive users suggests that short-run income losses would probably still be relevant for this group of workers. Given this result, policies that aim at reducing the availability or abolishing the access to AWAs should complement such legislation with targeted interventions compensating voucher users either through fiscal incentives or welfare transfers, especially in cases for which these work arrangements represent a considerable source of earnings.

7 Conclusions

The importance of atypical work has increased substantially in recent years, a trend partly related to the emergence of the so-called gig economy, and to employers' demand for more flexible and simplified procedures for hiring workers for occasional activities. This study has provided new evidence on an under-explored dimension of AWAs. In particular, it analyzed the worker-level consequences of the availability of atypical work, focusing on its effect on earnings. It exploited high quality information on income sources derived from administrative data, analyzing an important Italian case study. It proposed several identification approaches, exploiting also a plausibly exogenous variation in the use of AWAs.

Results show that atypical employment tends to substitute for more standard and protected forms of work. They also tend to substitute for income derived from employment insurance programs, although to a rather limited extent. However, the vouchers considered in our analysis also allowed atypical workers to increase their overall formal income, as they usually face limited employment opportunities under more standard employment arrangements. Moreover, intensive users of vouchers did not appear to have relevant alternatives to AWAs, and within this group of workers a restriction in the access to vouchers represented a likely welfare loss.

An implication of these results is that policies aiming at reducing the access to AWAs should take into account the welfare consequences of such restrictions on atypical workers. Even if general-equilibrium effects could potentially reduce the size of such losses, earnings of atypical workers would likely drop in response to restrictive policies, particularly whenever AWAs represent one of their largest sources of income. For this reason, restrictions on atypical contracts should be complemented by targeted interventions on employees relying on them. Such interventions could take the form of fiscal incentives on the transformation of AWAs into other contractual forms, or of welfare transfers supporting casual workers' earnings, at least in the short-run.

The institutional setting analysed in this study bears similarities with several AWAs that have been introduced in other Western countries, such as UK's zero hour contracts or Germany's mini-jobs. However, our results could be partly influenced by the characteristics of alternative employment opportunities in the Italian labor market, where the size of the informal sector could be more relevant. Extending our approach to other case studies would improve our understanding of the welfare effects of atypical and flexible work.

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Appendix

A Additional Tables and Figures

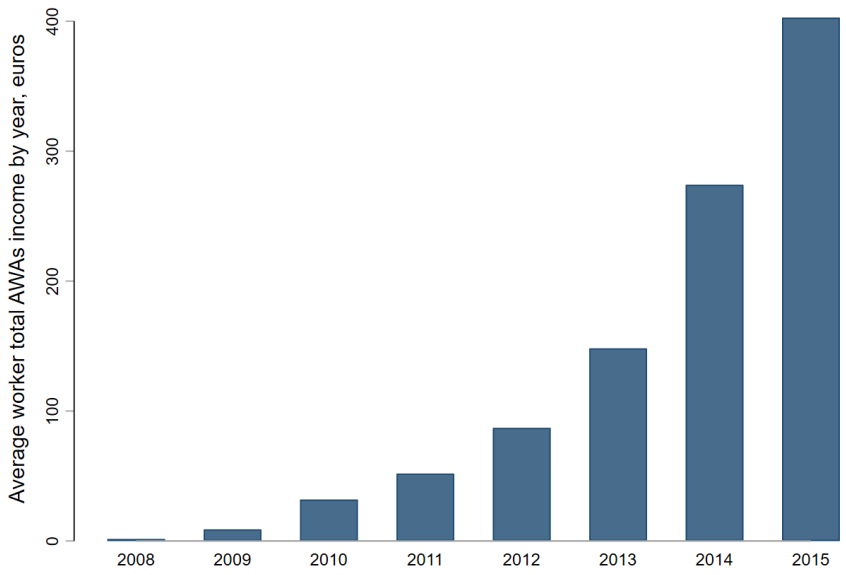

Figure A1: **Average worker voucher income, by year**.

Note: Our sample goes from 2008 to 2015. Calculations are based on the full population, so regardless of workers' age. Data have previously been cleaned to remove all workers above 99^{th} percentiles in vouchers and labor earnings. The panel is made up of 14,096,928 worker-month tuples associated to 146,843 workers.

	Agriculture	Trade	Gardening & Cleaning	Houseworks	Sports & Cultural events	Services	Tourism	Others	Total
					No. of sold vouchers				
2008	535.314	401	85	-	67	60	40	18	535.985
2009	1.239 .594	253.175	99.370	14.269	454.401	229.313	193.415	264.231	2.747 .768
2010	1.686 .859	1.185 .510	903.434	219.038	1.706 .575	1.144 .004	631.891	2.222 .192	9.699 .503
2011	2.013 .991	2.027 .321	1.676 .592	369.076	2.228 .887	1.995 .824	1.081 .163	3.954 .309	15.347 .163
2012	2.208 .622	3.723 .867	2.574 .561	601.913	2.936 .494	3.073 .598	1.836 .567	6.858 .356	23.813 .978
2013	2.166 .709	7.922 .685	2.952 .291	1.168 .150	3.296 .390	5.864 .761	4.978 .821	12.438 .010	40.787 .817
2014	2.017 .074	14.522 .256	4.201 .260	1.811 .026	4.083 .704	10.463 .767	11.299 .655	20.120 .244	68.518 .986
2015	2.067 .100	17.539 .691	4.586 .932	4.590 .040	4.128 .495	13.026 .961	16.532 .320	45.577 .534	108.049 .073
2016	1.461 .644	18.676 .154	5.668 .737	4.252 .771	5.540 .550	15.272 .750	19.896 .105	63.059 .132	133.827 .843
					% over the total				
2008	99,9	0,1	0,0	0,0	0,0	0,0	0,0	0,0	
2009	45,1	9,2	3,6	0,5	16,5	8,3	7,0	9,6	
2010	17,4	12,2	9,3	2,3	17,6	11,8	6,5	22,9	
2011	13,1	13,2	10,9	2,4	14,5	13,0	7,0	25,8	
2012	9,3	15,6	10,8	2,5	12,3	12,9	7,7	28,8	
2013	5,3	19,4	7,2	2,9	8,1	14,4	12,2	30,5	
2014	2,9	21,2	6,1	2,6	6,0	15,3	16,5	29,4	
2015	1,9	16,2	4,2	4,2	3,8	12,1	15,3	42,2	
2016	1,1	14,0	4,2	3,2	4,1	11,4	14,9	47,1	

Table A1: **No. of vouchers sold across industries and over time**.

Notes: Authors' realization based on UPB 2017.

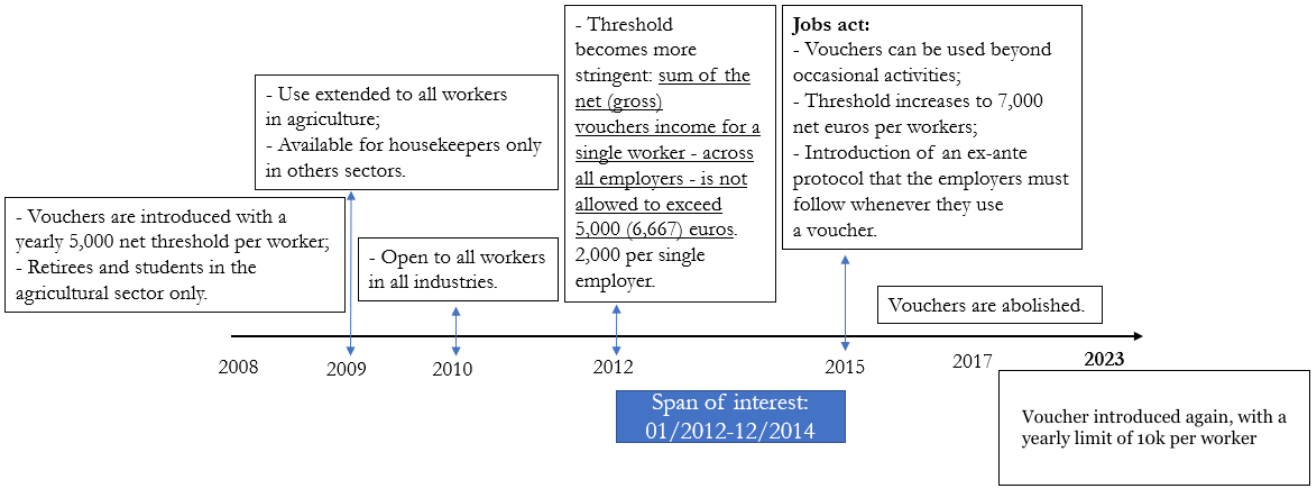

Figure A2: **Time-line of the legislation on vouchers**

Notes: Time-line of the legislation on vouchers from their introduction to the present days. The *span of interest* period highlighted in blue refers to the period covered in our empirical analysis.

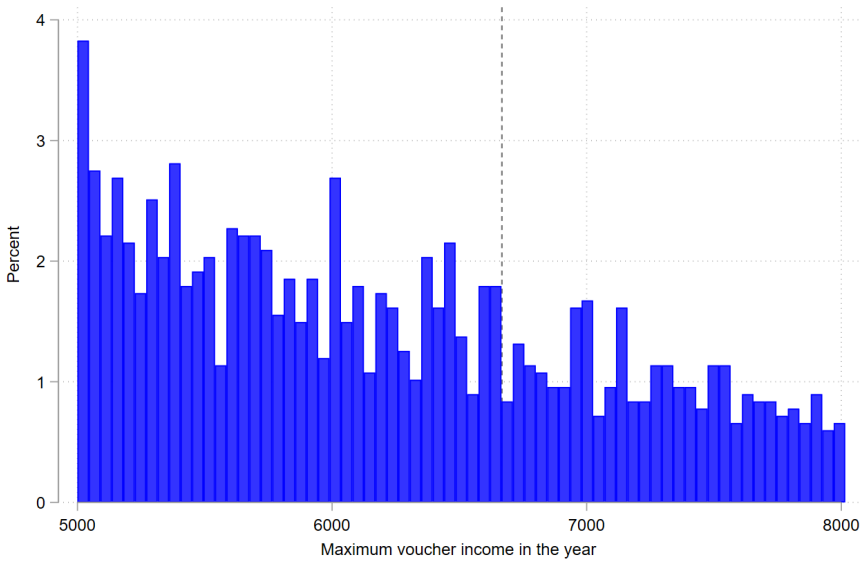

Figure A3: **Cumulative yearly voucher income among intensive voucher users**

Notes: The population is composed of workers earning between 5,000 and 8,000 euros per year using vouchers during 2012-2014. Obs. are 20,064 worker-year tuples and 1,672 workers. The dotted vertical line represents the legal threshold set by*INPS* of 6,667 yearly cumulative gross voucher income.

Variables	**Observations**	**Mean**	**St.Dev.**
No. workers	1,672	-	-
Labor Income	20,064	372.6825	801.991
Voucher Income	20,064	515.946	633.8319
Welfare Trasnfers	20,064	97.78317	462.6335
Total Income	20,064	986.4117	1079.487
Total Income (> 0)	15310	1292.708	1063.57
Total Income (less voucher)	20,064	470.4657	943.5459
Age	20,064	47.32715	13.79168
Italians	20,064	39.77%	
Male	20,064	69.14%	

Source: Authors's calculation on *INPS Estratti Conto* archive.

Table A2: **Summary Statistics at the monthly-level in the DD sample.**

Notes: Regarding the variable age some values are extreme as we fill the panel with all missing months in the period 2008-2015. Several workers appear thus in our dataset even though they do not have any income at all. Data have been previously cleaned to delete all workers above 99^{th} percentiles in vouchers and labor earnings, and for this reason the number of workers is lower than in the original data source. We select only the workers who at least once earn between 5,000 and 8,000 gross euros with vouchers between 2012 and 2014. The unit of observation is a worker-year-month tuple, as the individual is now a worker-year tuple.