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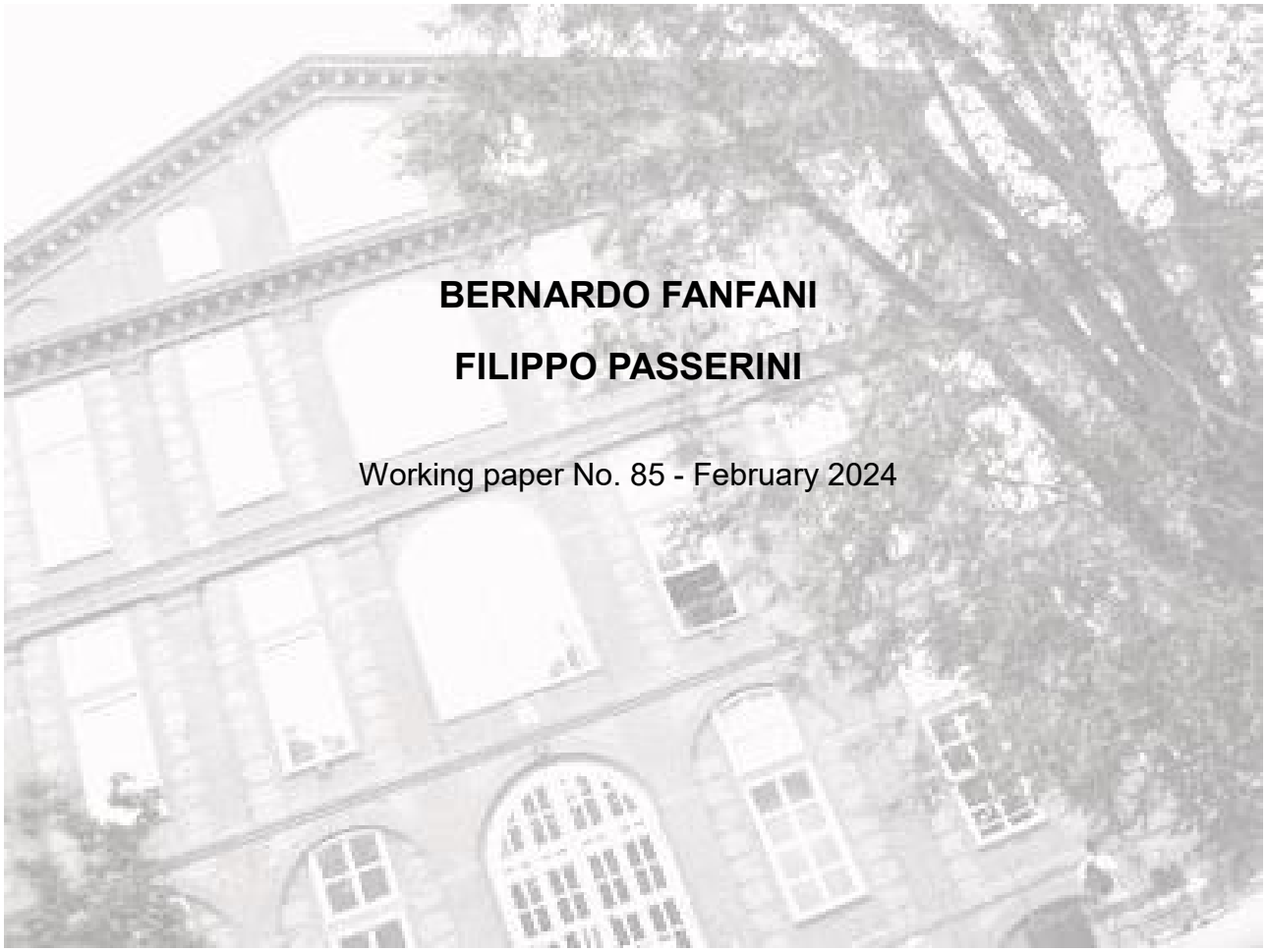

BERNARDO FANFANI

FILIPPO PASSERINI

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Do Alternative Work Arrangements Substitute Standard Employment? Evidence from Worker-Level Data*

Bernardo Fanfani† Filippo Passerini‡

Abstract

This study analyses the impact of an Alternative Work Arrangement (AWA) called "voucher" on earnings of atypical workers and on their alternative income sources using Italian administrative data. Specifically, we investigate whether this form of very flexible work substitutes income from more standard labor contracts and welfare transfers related to employment insurance (sick and parental leave and unemployment benefits). We estimate cross-income elasticities using fixed effects and diff-in-diff specifications that correct for sample selection of individuals in the labor market. Results show that vouchers increase overall labor income, but they also substitute earnings derived from other labor contracts. We do not find relevant associations between vouchers and welfare transfers. The positive effect of vouchers on total income is smaller in specifications that correct for sample selection bias, and the substitution effect with other labor income sources is substantially larger. Overall, our findings show that AWAs tend to substitute standard employment, with small positive net effects on earnings, which are larger for intensive users of vouchers, and in geographic regions with a more sizable informal sector.

Keywords: Alternative work arrangements, labor supply, cross-income elasticity, sample selection, difference-in-differences, event-study.

JEL codes: J24; J22; D12; C13; C21.

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† University of Turin, CRILDA and LABORatorio R. Revelli. Corso Unione Sovietica 218b, I-10132 Torino, Italy. E-mail: bernardo.fanfani@unito.it;

‡ University of Bologna and LABORatorio R. Revelli. Piazza Scaravilli 2, 40126, Bologna, Italy. E-mail: filippo.passerini7@unibo.it

1 Introduction

A well-developed literature has analyzed the effect of fixed-term employment contracts on various labor market outcomes.[1] Several Western 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 Europe and the USA 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 workers temporarily hired by employment agencies, solo self-employed with multiple or single clients, zero hours contracts, and workers with a highly flexible schedule. 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). AWAs are typically characterized by low bureaucracy and almost null firing costs, and they are usually more widespread in low-wage segments of the labor market (Boeri et al. 2020).

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; Auray and Lepage-Saucier 2021; Cockx and Picchio 2012; Farber 1999). 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 (Boeri et al. 2020; Datta et al. 2019; Glasner 2023).

In this study, we investigate the extent to which AWAs are substitute or complementary to 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

[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] Chen et al. 2019 show positive effect of schedule flexibility among ride-share drivers, although Cook et al. 2020 show that this system may give rise to a gender wage gap related to sex-specific preferences. Instead, Mas and Pallais 2017 suggest that most workers do not value flexibility, as they generally prefer a full-time working schedule.

estimates first-order effects. It addresses an important research question that is central to the public debate on atypical work, that is, its direct influence on the welfare of atypical workers.

For this purpose, we focus on a particular form of AWAs that has been introduced in the Italian labor market, the so-called *vouchers*. With this type of arrangement, employers purchase a given number of 10 euros vouchers from INPS (the Italian Social Security Institute), which they can use to pay workers without relying on a standard employment contract. 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. Vouchers are intended for occasional activities involving irregular working tasks with no fixed schedule. Compared to other types of labor contracts in Italy, vouchers involve considerably simplified bureaucracy and significantly lower firing costs. According to policy-makers' expectations, both characteristics could encourage employers to reduce the use of undeclared work 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. Figure 1, which describes the market size of vouchers over time, indicates a clear increasing trend following this liberalization process. 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.[4]

We combine two novel administrative datasets to estimate the elasticity of substitution between voucher income and 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. Relying on a standard labor supply model, we argue that, 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 latter scenario, AWAs could potentially distort workers from alternative and more protected forms of employment.

Using longitudinal data on the complete work history of voucher users during the period 2012-2014, we provide consistent results from 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,

[4]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.

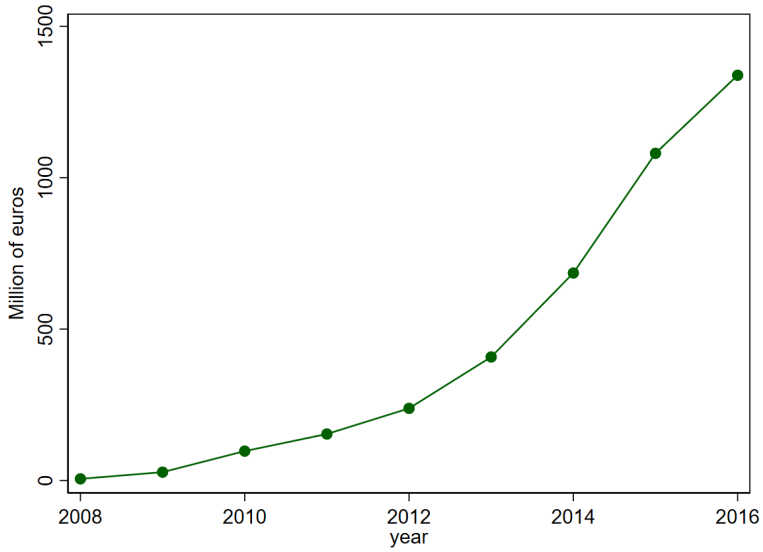

Figure 1: **Gross market size of vouchers by year between 2008 and 2016.**

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.

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 the 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. Using the pooled OLS and fixed effects estimators, we find that the elasticity of substitution between vouchers and income from standard contracts is close to zero. As a consequence, vouchers greatly increase overall income according to these results. However, when we correct for sample selection bias, the results are significantly different. The substitution elasticity of vouchers with income from standard labor contracts becomes quite negative, with an estimated level of -0.28, while the elasticity with overall income greatly reduces to 0.13. Ignoring general equilibrium effects, this latter estimate suggests that, on average, voucher users would lose only 13% of their earnings after the abolition of this form of employment, thanks to the availability of other formal sources of labor income.[5] We also show that income losses would be higher in Southern regions of Italy, which are generally characterized by a larger informal sector.

[5]This result can be considered an upper bound if part of the jobs offered through vouchers were transformed into different formal labor contracts as a result of the abolition of vouchers. Income effect would be more negative only if voucher abolition led to the disruption of additional complementary job opportunities to vouchers.

Results from the difference in differences approach show that, once workers reach their yearly cap, they experience a decrease in both voucher income and overall income. According to standard DiD estimators derived from both OLS and the De Chaisemartin and d'Haultfoeuille 2020 methods, welfare transfers and income from standard contracts remain stable and are mostly unaffected by the treatment. Thus, reaching the cap has strong negative effects on total income, and the implied elasticity of substitution of vouchers with total earnings is around 0.7. However, we also adapt the Semykina and Wooldridge 2010 Correlated Random Effect (CRE) estimator to the difference in differences specification, in order to account for sample selection. By using this latter method, we document that, consistently with the results obtained on the full sample, correcting for sample selection bias leads to a quite negative elasticity of vouchers with standard labor contracts. As a consequence the substitution elasticity between AWAs and overall earnings bcomes considerably closer to zero, although still positive. Overall, according to these latter estimates an abolition of vouchers would lead to a reduction in formal labor income of around 30% when considering a sub-sample of intensive voucher users.[6]

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. We also show that failing to correct for sample selection bias leads to an overestimation of the positive income effects of AWAs.

Due to difficulties in observing atypical forms of employment in standard labor force surveys,[7] 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

[6] We have defined intensive users as those that earn at least 5000 gross euros per year with vouchers. However, only around 2% of voucher users fall in this category considering the period 2012-2014.

[7] See for example Farina et al. 2021 for a discussion of difficulties related to measuring wages of AWAs.

on undeclared work and labor inspections.

The rest of the paper is organized as follows. Section 2 provides an institutional background on the legislation regarding vouchers in Italy. Section 3 provides a conceptual framework. 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 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. Each voucher is usually worth 10 euros, with 7.5 euros representing net earnings for the workers, while 2.5 euros representing the sum of pension contributions and employment insurance (which covers injury risk only).

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 was 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 1), and in the intensity of their use by individual workers (Figure A1, in the Appendix).

Figure 2 provides a timeline of the main legislative interventions regarding vouchers in Italy. In 2008, employers were allowed to use them up to a maximum of 5,000 euros net per year for each employee. Vouchers were restricted to students and retirees in the agricultural sector. The availability of vouchers was expanded to include all workers in the agricultural sector, not just students and retirees, and in 2009 they were made available in the retail, tourism, service, and housekeeping sectors. In 2010, the use of vouchers was completely liberalized to include all sectors and all workers. This emerges also in Table A1 in the Appendix, which shows that over-time the agricultural sector rapidly became relatively small compared to other sectors, despite a growth in the absolute number of vouchers used both in agriculture and other sectors.

The rapid growth of vouchers created concerns and opposition from trade unions. As a consequence,

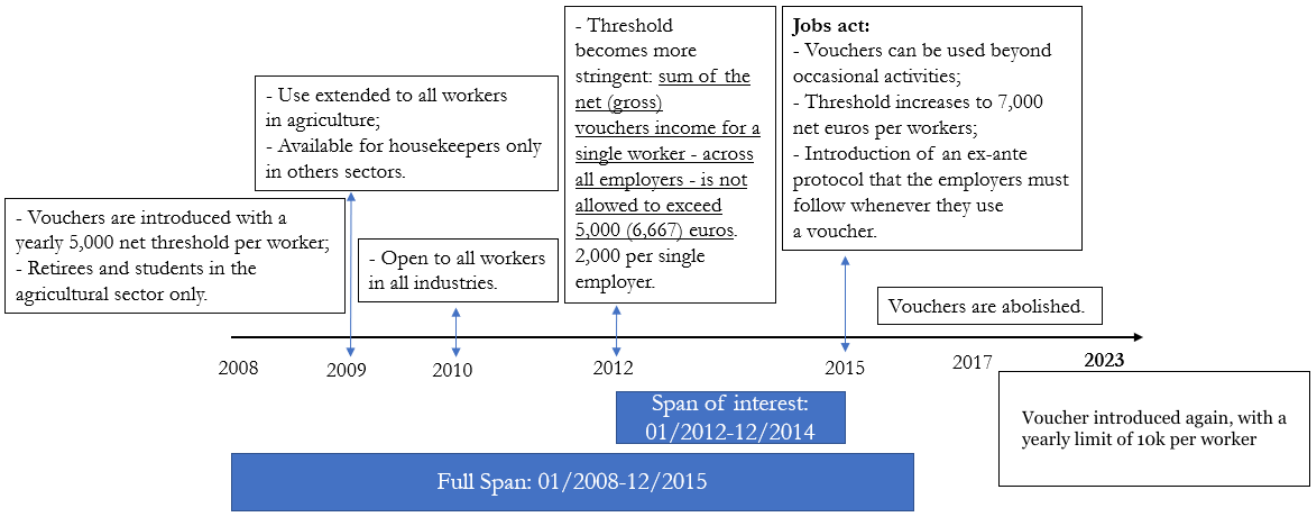

Figure 2: **Timeline of vouchers from the introduction to nowadays.**

Notes: Authors' realization.

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). The legislation on vouchers was then changed again with the so called "Jobs Act" reform, which was introduced in early 2015. This reformed allowed vouchers to be used for activities beyond occasional work, and it increased the yearly net limit per worker to 7,000 euros. However, it also introduced an ex-ante protocol for employers, which were required to declare to local labor inspector offices their intention of using AWAs before the actual start of the activity paid using vouchers.

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.

Our data covers the period from 2008 to 2015. However, the empirical analysis is focused only on the years 2012-2014 for 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. Second, our difference in differences analysis exploits the yearly cap of voucher earnings set at 5000 net euros during this period. In order to provide broadly comparable results using both the panel regression models and the difference in differences approach, we restrict also the former set of analyses on the same period.

3 Conceptual Framework

Before presenting the data and introducing our 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 under two alternative scenarios. First, when both AWAs and regular contracts are available for workers, then when only regular contracts can be found. This model aims to illustrate under which conditions workers' welfare can be improved by the presence of AWAs. It accounts for the possibility that atypical work is used to complement other sources of labor income, which seems quite realistic given that the vouchers considered in our analysis are meant to cover occasional and temporary activities.[8] Instead, the model abstracts from demand-side considerations, a choice motivated by the fact that our database is not representative of firms, nor of their entire workforce.

In the model, we assume that workers always prefer standard employment contracts to AWAs. This choice is motivated by the fact that vouchers were intended as a tool for firms to reduce firing costs and increase flexibility, thus they should entail a reduction in employment protection and potentially other amenities for workers. Workers maximize the following utility function, which depends on leisure (L) and 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 level available for the worker under a standard contract, while $\bar{H}$ is the maximum employment level under both types of contracts. 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

[8] In this regard, vouchers represent on average only 7% of total labor income in our sample.

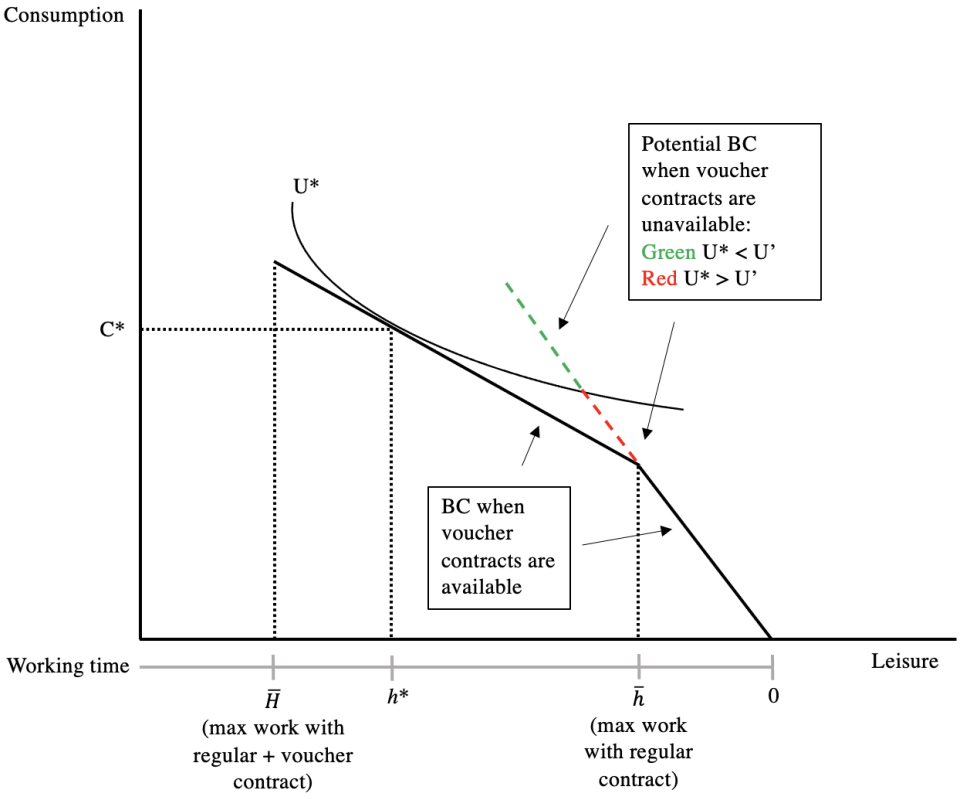

Figure 3: **Labor supply with regular contracts and vouchers, and relationship with contexts where AWAs are unavailable.**

Note: Authors' realization.

employment under a regular contract available. Figure 3 shows 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 now consider how the solution in Figure 3 is affected by the unavailability of alternative work arrangements. The dotted line in Figure 3 represents a potential budget constraint after that an unexpected labor demand shock occurs and alternative work arrangements become unavailable.[9] We can identify two segments of this potential budget constraint. The part below the indifference curve corresponding to the utility level U^*, which is highlighted in red, represents a budget constraint such that workers' welfare is reduced after the labor demand shock. 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. Let U'

[9]Similar considerations hold if the availability of alternative work arrangements only partially reduces, and/or the availability of standard contracts increases.

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 the unavailability of (or binding reduction in the availability of) AWAs is that total earnings obtained without relying (or relying less) on vouchers are higher than total earnings at the previous solution. That is, any consumption level greater than C^*, if obtained relying less on AWAs, is sufficient to guarantee that $U' > U^*$. More generally, workers' welfare always improves if, after a labor demand shock, total earnings increase in response to a reduction in earnings from AWAs.

Given this discussion, estimating the substitution elasticity between voucher income and total earnings allows to evaluate the impact of AWAs on workers' welfare. If this elasticity is negative, then workers' welfare systematically improves when the use of AWAs reduces. A similar result would suggests that abolishing these types of contracts could be beneficial for workers, given the abundance of better employment opportunities usually faced by them. However, the test on the sign of the substitution 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 income and vouchers is positive, but close to zero.[10]

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 exogenous 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.

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 random sample of voucher users between January 2008 and December 2015. Individuals are sampled using two days of birth in 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

[10] In Figure 3 this case is represented by solutions that lie on the green portion of the dashed budget constraint that lays below C^*.

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
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.

province and macro-industry of use, basic demographic characteristics and an univocal employer identifier.

We also exploit a second administrative dataset ("*estratti conto*"), which is also extracted from the INPS archives. It provides information on all labor income sources (excluding vouchers) and income derived from employment insurance programs (sick and parental leave and unemployment benefits)[11]. 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 reconstruct their

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

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 55% of the sample and Italians 77%. Thus, there is a significant representation of foreigners,[12] which is considerably higher than the national average. The average monthly income in the entire sample is just under 400 euros, which reflect 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 3, 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, attributing a welfare loss to the potential absence of a compensating wage differential for atypical work could be misleading, as

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

this approach does not take into account the possibility that AWAs may be complementary to standard employment. Instead, as discussed in Section 3, the welfare implications of AWAs effect on overall income are more easily interpreted.[13]

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, and the Semykina and Wooldridge 2010 estimartor to account for sample selection bias. The difference in differences analyisis is restricted on a sub-sample of intensive voucher 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:

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

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. We transformed both the outcomes and voucher income using the Inverse Hyperbolic Sine (IHS) function to deal with zero income cases[14]. 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

[13]In the conceptual framework of Section 3 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.

[14]The use of the IHS transformation allows for consistent estimation of elasticities even when variables are inflated with many zeros, as is the case in our dataset (Bellemare and Wichman 2020).

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. We estimate standard errors by clustering at the worker level.

The parameter of interest, denoted by θ, is the elasticity of substitution between voucher income and the income variable defined by Y. Since both variables are transformed using the IHS function, θ should be interpreted as an approximate elasticity. There are some nuances to consider in the interpretation of this parameter. When the outcome is total income, a negative elasticity implies that voucher earnings entail a more than proportional reduction in earnings from other standard labor contracts. However, even when the elasticity is positive, there could be a reduction in earnings from other types of contracts, although less than proportional to the growth in vouchers. A formal test on this hypothesis is provided by the sign of the substitution elasticity between vouchers and income from standard labor contracts.

As discussed in Section 3, 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.

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 elasticity of total income to vouchers, 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)[15].

A second identification problem is related to reverse causality. In particular, the size of income opportunities from standard contracts and from vouchers could be jointly determined. For example, Addison and Surfield 2007 have shown that AWAs are more common among workers segregated in low-productivity and low-value-added industries, which would generate a cross-sectional negative correlation between voucher income and standard labor income. In this regard, we assume that worker fixed effects can account well for individual market opportunities and earning potential.

[15]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.

Time fixed effects account for market-level fluctuations in the availability of job opportunities, while θ should capture how easy it is for workers to find alternatives to voucher income. For example, if vouchers tend to be intensively used when alternative employment opportunities are scarce, this should be reflected in a greater complementarity between vouchers and total income. However, an identification problem could arise if individual-specific shocks in the availability of vouchers and alternative employment contracts are systematically correlated due to unobserved dynamics in local labor demand. Thus, some caution is needed in the interpretation of these results. 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.

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. This is a classical problem of sample selection, which could lead to biased estimates of the population parameters of interest. 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.[16]

Semykina and Wooldridge 2010 have derived 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.[17] 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

[16] 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.

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

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

$$\forall q : W_{i,q} = \eta M_i + f(Age_{i,q}) + \gamma Sex_i + \delta Nat_i + \beta WE_{i,q} + \Theta WE_{i,q}^2 + \theta X_{i,q} + \epsilon_i \tag{2}$$

where W_{iq} is a dummy equal to 1 if the individual i works in quarter q, 0 otherwise. X_{iq} are earnings from vouchers (transformed with the IHS) 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, $WE_{i,q}$ denotes short-term working experience, defined as the cumulative months worked in the two years preceding quarter q. This explanatory variable is included only in the selection equation[18]. 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 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:

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

were 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

[18] 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.

θ provides the substitution elasticity.[19]. $IMR_{i,q}\beta_q$ 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 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.[20]

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 our sample, around 1000 workers per year reached or exceeded the yearly cap between 2012 and 2014. Figure 4 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 sharp drop in the density above it. This suggests that, to some extent, this limit was effective. However, around 30% of workers with earnings above 5,000 euros per year were not compliant with the threshold.

There are several reasons why compliance with the yearly cap was only partial. First, the reform was introduced in the summer of 2012, and only vouchers purchased after that date were relevant in computing the yearly limit. A second and more relevant reason likely driving partial compliance with the cap was 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. Providing a false declaration would qualify as a criminal offence by workers, but there is little anecdotal evidence suggesting that similar false declarations were systematically persecuted. 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

[19]For consistency with other specifications, both the outcome and the covariates are transformed with the IHS function and hence θ is an approximate elasticity.

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

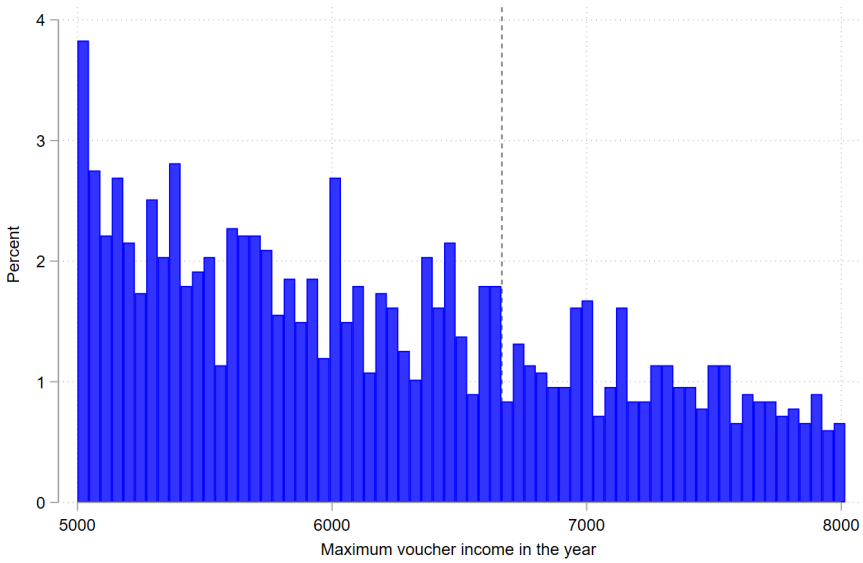

Figure 4: **Cumulative yearly voucher income among intensive voucher users**

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.

being exposed to strong sanctions for both, employers and workers.

To construct a difference in differences set-up, we compare the incomes of workers who reached the threshold in a given month of the year (the treated group), to those who reached the cap in a later month, or that were very close to reaching the cap by the end of the year. 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. Focusing on workers that are more likely to reach the yearly voucher income threshold provides insights into the potential impact of voucher 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 during the year. 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. Table A2 (in the Appendix) provides descriptive statistics for the sub-sample considered for the difference-in-differences analysis, which

is a monthly panel of 1,672 workers. As can be noticed, total income tends to be higher in this sample,[21] and vouchers represent around 52% of its composition. Moreover, this sample is older on average, and the proportion of Italians is higher.

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, a gender and a foreign dummy. 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 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 were transformed with the IHS function in order to provide a semi-elasticity while dealing with zero values.

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 presence of bias resulting from staggered treatment adoption in a difference-in-differences framework, which could be particularly relevant in the presence of treatment effect dynamics and heterogeneity[22]. To deal with this issue, we rely on the De Chaisemartin and d'Haultfoeuille 2020 estimator for the static difference-in-differences specification of

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

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

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.

Notice that the recent estimators developed for dealing with bias related to treatment effect heterogeneity in the context of staggered treatment designs, including De Chaisemartin and d'Haultfoeuille 2020 and De Chaisemartin and d'Haultfoeuille 2022, are not suited to address the problem of sample selection. In particular, if sample selection varies depending on treatment status, the problem of sample selection bias could potentially emerge also when adopting a difference-in-differences set up. For this reason, we have estimated the difference-in-differences model of equation (4) using also an adaptation of the Semykina and Wooldridge 2010 estimator presented in the previous section. Specifically, we used short-term work experience as an additional control for the selection equation, estimating a time-varying inverse Mills ratio. Then, we estimated the difference-in-differences treatment effect adjusting for sample selection.

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 substitution elasticity with voucher income for three outcomes: standard labor income, welfare transfers, and total income inclusive of vouchers.

In interpreting the size of each coefficient, notice that the sum of the standard income and welfare transfer elasticity need not to be equal to the total income elasticity. Indeed, a 1% increase in voucher income induces percentage effects on other income aggregates that depend on their relative size. For example, the elasticity of vouchers with total income should always be below 1, unless vouchers are the only source of earnings. Notice also that a negative elasticity with standard labor income is an evidence of substitution between vouchers and income from other types of contracts, while a positive coefficient is indicative of a complementary relationship.[23]

Estimates contained in the first column of Table 2 (pooled OLS) do not include individual fixed effects,

[23]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. The presence of substitution between vouchers and undeclared work would likely lead to a larger positive formal income effect of vouchers, as workers would be more constrained in their use of standard labor income.

Dependent variable	**OLS**	**FE**	**CRE**
Standard Labor Income	0.0225***	-0.0174***	-0.282***
	(0.0020)	(0.00121)	(0.00463)
Welfare Transfers	0.0083***	-0.00084	0.0078***
	(0.0010)	(0.000816)	(0.0029)
Total Income	0.80***	0.766***	0.126***
	(0.00151)	(0.00176)	(0.00177)
Observations	970,470	970,470	970,470
No. of workers	82,005	82,005	82,005
$f(Age_{i,q})$	√	√	√
Quarter 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. The dependent and independent variables are all transformed with the Inverse Hyperbolic Sine (IHS) function, and hence the parameters should be interpreted as approximate elasticities.

and they show all positive and significant coefficients. This indicates that vouchers are complementary with respect to all other sources of income, as they even allow workers to increase their reliance on other types of labor contracts. However, this elasticity is quantitatively close to zero (a 1% growth in voucher income would increase standard labor income by 0.02% only). Given this result, the pooled OLS model is associated to the most positive elasticity of vouchers to total income, which amounts to 0.8. Finally, welfare transfers are positively affected by vouchers, but this effect is extremely small from a quantitative perspective.

Taken at face value, these results would support the hypothesis that AWAs are a tool used for workers at the margins to enter the labor market and access alternative sources of income. However, this model may suffer from omitted variable and sample selection bias, as it uses the full variation available in the sample without accounting for time-constant individual heterogeneity and selection.

In the second column of Table 2 (FE), where a full set of individual fixed effects is included, the elasticity with respect to standard labor income becomes negative and significant, but it is still quite close

to zero (-0.02). Moreover, the difference in size across OLS and FE estimates is quite limited, given that the elasticity of vouchers to total income implied by the latter estimator is still quite close to 0.8.

Given this evidence, two considerations are in order. First, accounting for individual fixed effects has only a limited influence on the results, given the small quantitative differences between the OLS and FE models. Second, the findings derived from these OLS-based regression methods suggest that vouchers have strong positive effects on workers' quarterly income, and thus their abolition would likely induce a substantial negative effect on their earnings. However, these models do not take into consideration the bias arising from selection into the labor market. For this purpose, we employ the Semykina and Wooldridge 2010 regression model, whose results are reported in the third column of Table 2 (CRE).

In this latter specification results change substantially. Estimates point out to a considerable substitution between vouchers an standard labor income. This, in turn, strongly reduces the positive contribution of vouchers to total income, as the corresponding elasticity goes down to 0.13. Instead, the relationship between welfare transfers and vouchers remains extremely weak from a quantitative perspective. This last result is not surprising, considering that the use of vouchers was compatible with the receipt of unemployment benefits, while at the same time the only employment insurance coverage provided by vouchers consisted of disability benefits derived from injuries at work.

The evidence derived from the CRE model indicates that heterogeneity in workers' selection in the labor market does play a relevant role.[24] Hence, failing to account for sample selection bias results in an overestimation of the benefits of vouchers, as their substitution with other income sources is systematically underestimated. Overall, the CRE estimates suggest that the abolition of vouchers would lead to a reduction of overall income of around 13%, and by a growth in the reliance of income from standard labor contracts of about 28% that would mitigate this negative effect. The influence on welfare transfers would be quantitatively very close to zero, even if positive and significant.[25]

We have also explored the heterogeneity in these results relying on the CRE model. Figure B1 show split-sample results by gender, which point to the presence of negligible differences in the size of each substitution elasticity between men and women. Fiugres B2 and B3 show instead heterogeneity by immigrant status and age group, respectively. Also in this case differences in the results are small, even if a small gradient emerges. In particular, vouchers and standard labor income are less substitutes for immigrants and relatively older workers. This could be driven by a greater use of vouchers as an

[24] A formal check for the presence of selection bias can be carried out by Wald tests on the joint significance of the inverse Mills ratios. Results, not attached, show that the IMR are always significant and show that selection bias is a relevant issue.

[25] Noitce that 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.

alternative to informal or illegal work for these two groups.[26]

The most clear gradient in our results emerges in Figure B4, where we estimate the CRE model interacted by geographic area of employment. As can be noticed, in this case for workers using AWAs in Southern Italian regions the substitution of vouchers with standard labor contracts is quantitatively smaller. As a consequence, in Southern regions AWAs tend to have more positive effects on total income. This may reflect the fact that employment opportunities are generally meager in Southern regions, while the size of the informal economy tends to be larger (see for example Le Moglie and Sorrenti 2022). As a consequence, the possibility of substituting voucher with other standard employment arrangements could be more limited, resulting in a more positive effect of AWAs on formal labor income.

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 5 show the results from the dynamic specification of this model, as given by equation 5. This specification allows to test for parallel trends. 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 reached the cap during the year, we have adopted the De Chaisemartin and d'Haultfoeuille 2022 estimator to correct for the potential bias related to treatment effect heterogeneity. Considering a 10-months window around the event, this estimator is based on a weighted average of long-term differences between not-yet treated and first-time treated units in each period.[27]

The top-left panel of Figure 5 shows that treated and control workers have similar growth rates in their use of vouchers before reaching the yearly cap (top-left panel). 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 other sources of labor income, (top-right panel of Figure 5), there is only a marginally significant and temporary drop in work attachment in the short-run. However, differences in standard

[26] Older workers already receiving a pension could be a group more likely to work informally, and they were a target group for vouchers when they were originally introduced.

[27] In the current application, there are only first-time treated or never treated workers, given the perfectly staggered treatment adoption design.

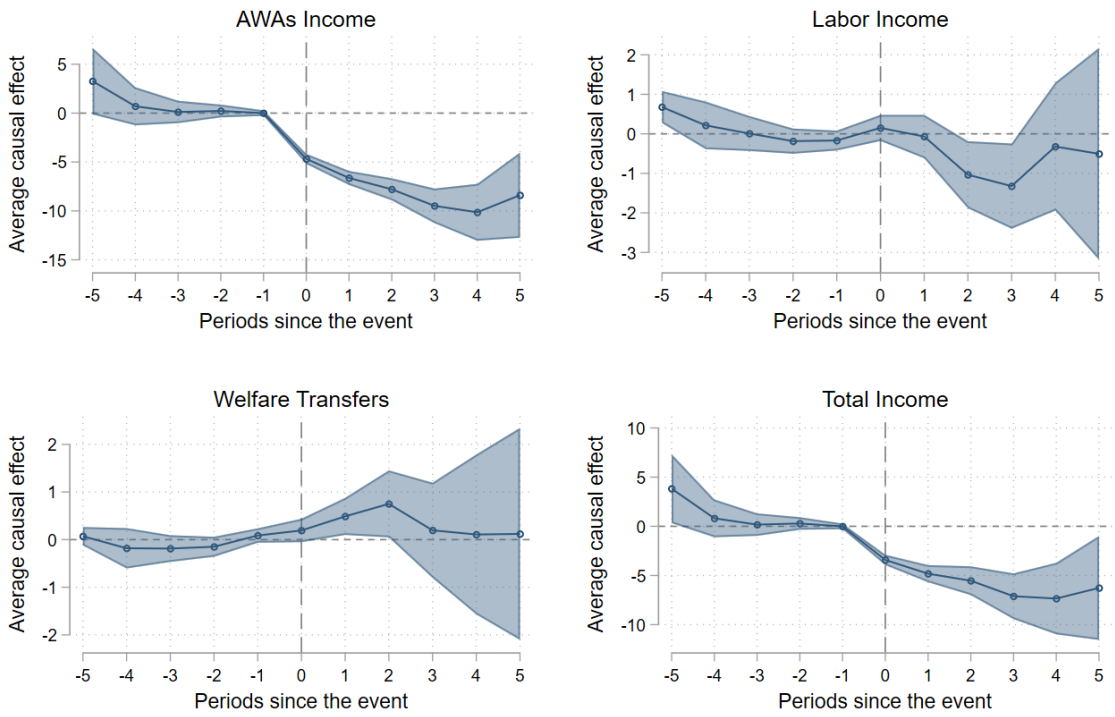

Figure 5: Treatment effect estimates of the model of equation 5 based on De Chaisemartin and d'Haultfoeuille 2022. 500 bootstrap replications.

labor income between treated and control workers seem to be fairly close to zero. As a consequence, total workers' income (bottom-right panel) is negatively affected by the reduced reliance on vouchers, given the low substitution with other sources of labor income. Reliance on welfare transfers is mostly not affected by the cap (bottom-left panel), although a small and marginally significant positive effect emerges only in the short-run. Finally, for all outcomes the parallel trend assumption seem to hold, with the only exception of a small positive difference in standard labor income growth between treated and control workers five months before the treatment. Overall, the results of Figure 5 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, suffers from some limitations. In particular, adapting this model to correct for sample selection bias is rather challenging, given the large number of time-specific parameters that have to be estimated. For this reason, in the reminder of the section we turn our attention on the static difference-in-differences specification of equation (4), which provides a single (cumulative) treatment effect parameter. Moreover, we focus on comparing the results obtained from alternative estimators. Indeed, this static model is much easier to estimate relying also on methods that

Dependent variables	(1) TWFE	(2) Staggered DiD	(3) CRE
AWAs income	-3.84***	-6.39***	-2.39***
	(0.200)	(0.263)	(0.278)
Labor income	0.287*	-0.179	2.086***
	(0.154)	(0.255)	(0.274)
Welfare transfers	0.129	0.387	-0.196
	(0.123)	(0.225)	(.172)
Total income	-2.652***	-4.61***	-0.746***
	(0.202)	(0.314)	(0.091)
Implied labor income elasticity	-0.075	0.028	-0.873
Implied welfare transfers elasticity	-0.034	-0.061	0.082
Implied total income elasticity	0.690	0.721	0.312
Observations	20,064	20,064	20,064
Workers	1,672	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 model (column 1), the De Chaisemartin and d'Haultfoeuille 2020 estimator (column 2), and the Semykina and Wooldridge 2010 estimator (column 3). Standard errors clustered at the worker level in columns (1) and (3), and bootstrapped with 200 replications in column (2).

correct for sample selection, and in particular the estimator developed by Semykina and Wooldridge 2010.

Table 3 provides the treatment effects obtained using three alternative estimators: the two-way fixed effect estimator (column 1), the De Chaisemartin and d'Haultfoeuille 2020 estimator that corrects for heterogeneity bias (column 2), and the Semykina and Wooldridge 2010 estimator (column 3). The latter estimator does not include a worker fixed effect, but it controls for time-constant individual heterogeneity using a parametric specification. Moreover, it is a two-stage estimator, as time-varying Inverse Mills Ratios are recovered using time-specific first-stage probit models.

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. The lower part of the table provides the implied elasticity of substitution between vouchers and other income sources, obtained as the ratio between each treatment effect and the treatment effect on vouchers. The treatment effect on the use of vouchers is negative and qualitatively similar among the three estimators, although the size of this reduction is largest when using the De Chaisemartin and d'Haultfoeuille 2020 estimator. Also when considering welfare transfers, the results are qualitatively similar across estimators, with treatment effects that are always not significant,

and an implied substitution elasticity close to zero.

Results are instead qualitatively different across estimators when considering the effect of the reduced reliance on vouchers on standard labor income. According to the two-way fixed-effects and the De Chaisemartin and d'Haultfoeuille 2020 estimators, the reduction in the use of vouchers does not lead to a noticeable increase in the reliance on other forms of labor income, a result that is in line with the evidence of Figure 5 and with the OLS-based evidence in Table 2. Instead, when sample selection bias is accounted for in column (3) of Table 3, the substitution of voucher with standard labor income increases substantially. For a 1% reduction in income from AWAs, there is a 0.8% increase in reliance on income from other contractual arrangements according to these estimates. As a consequence, the reduction of total income implied by a complete cease in voucher use would amount to a reduction of only 31% in total income, compared to the 69% and 72% reductions implied by the corresponding models in column (1) and (2).

Overall, the evidence of Table 3 bears several similarities with the results obtained from longitudinal estimators on the full sample and presented in Table 2. In particular, in both cases the benefits of vouchers in improving workers' earning opportunities tend to be over-estimated whenever sample selection bias is not accounted for. Once bias related to selection in the labor market is corrected for, it appears that workers using vouchers have more alternative earning opportunities relying on alternative contractual arrangements. Notice however that the elasticity of vouchers to total income is larger in the CRE model of Table 3 than in the full sample estimates presented in Table 2. Apart from differences in the source of variation that is used for identification, part of this difference in the size of the parameter may reflect the sample coverage. Indeed, the evidence of Table 3 is based on a sub-sample of intensive voucher users, which may have limited opportunities to rely on alternative formal employment arrangements. For this reason, an abolition of voucher appears to be more harmful for this group of workers than in the general population of voucher users.

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. Relying on an Italian case study, we have shown that atypical employment tends to substitute more standard and protected forms of work. However, the vouchers considered in our analysis also allowed workers to increase their overall formal income, as they usually face limited

employment opportunities under more standard employment arrangements.

The study exploited high quality information on income sources derived from administrative data. It provided coherent evidence based on two alternative identification strategies, supporting the robustness of our findings. From a methodological perspective, the substitution elasticity across income sources should be estimated correcting for sample selection bias. Indeed, while results were not much sensitive to the inclusion of individual fixed effects, or to the identification strategy adopted, they were quantitatively different when differences in sample selection were controlled for.

The evidence shows that the welfare effects of AWAs on atypical workers are ambivalent. While vouchers allow workers to increase their formal income, and this effect is stronger among intensive users and in geographic regions characterized by a larger informal sector, the size of this positive effect is not particularly large. Ignoring general equilibrium effects, such as employers' substitution of AWAs with other types of formal employment, according to our estimates abolishing vouchers would lead to a 13% reduction in formal income in the population of atypical workers.

The institutional setting analysed in this study has some peculiarities. Vouchers bear several similarities with other AWAs that have been introduced in other Western countries, such as UK's zero hour contracts. However, our results could be partly influenced by the characteristics of alternative employment opportunities in the Italian labor market. Extending our approach to other case studies could help improving our understanding of the welfare effects of atypical and flexible work.

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Appendix

A Additional Tables and Figures

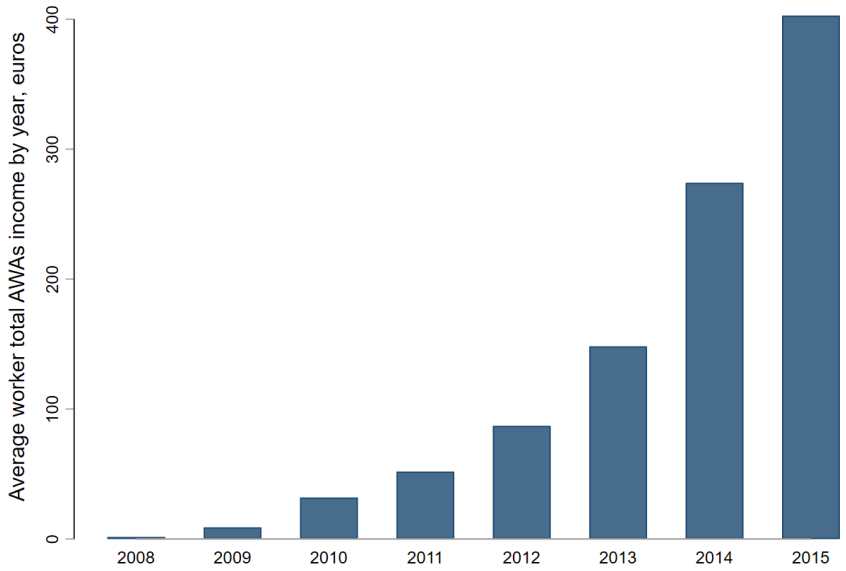

Figure A1: **Average worker voucher income, by year**.

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.

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.

B Heterogeneity Analysis on the Full Sample

This section presents the heterogeneity in the results derived from the Semykina and Wooldridge 2010 model estimated on the full sample of voucher users during the period 2012-2014.

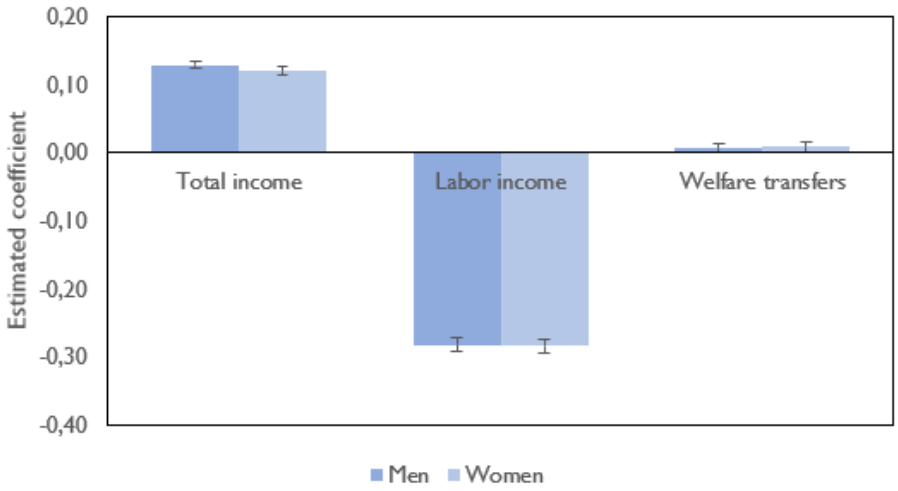

Figure B1: **CRE estimates of the elasticity of voucher income, by sex.**

Notes: The specification is estimated on individuals ranging in age from 16 to 64 years and using at least one voucher in 2012-14. The sample is split by gender groups. Estimates are obtained with the CRE estimator. The dependent and independent variables are all transformed with the inverse hyperbolic sine function, and should be interpreted as approximate elasticities.

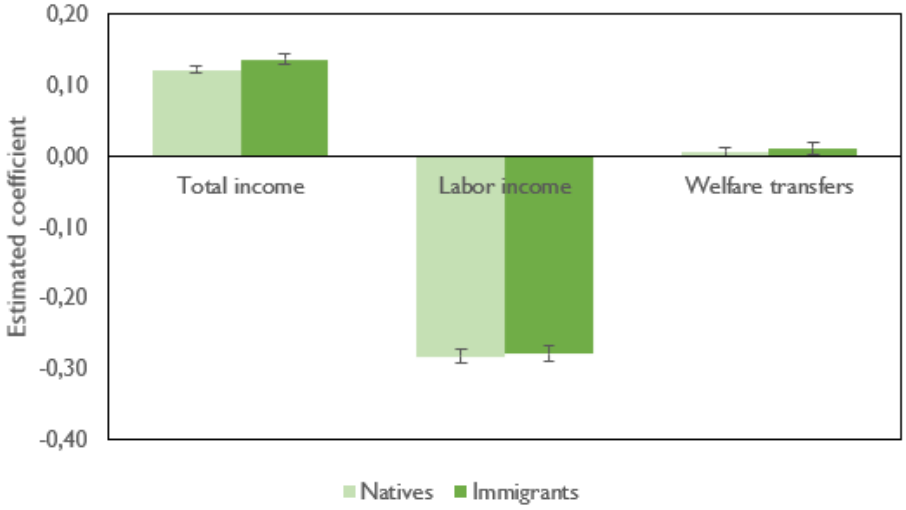

Figure B2: **CRE estimates of the elasticity of voucher income, by nationality.**

Notes: The specification is estimated on individuals ranging in age from 16 to 64 years and using at least one voucher in 2012-14. The sample is split by natives of Italy and non-natives (defined as immigrants). Estimates are obtained with the CRE estimator. The dependent and independent variables are all transformed with the inverse hyperbolic sine function, and should be interpreted as approximate elasticities.

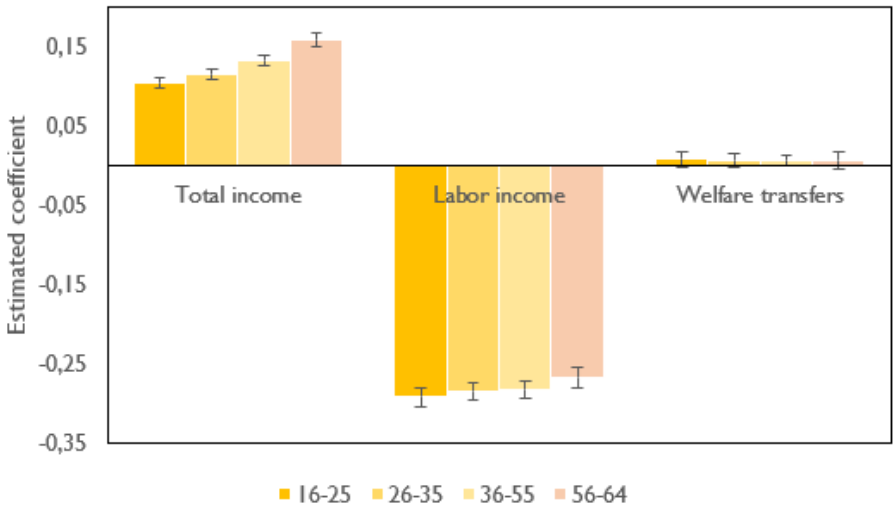

Figure B3: **CRE estimates of the elasticity of voucher income, by age cohorts.**

Notes: The specification is estimated on individuals ranging in age from 16 to 64 years and using at least one voucher in 2012-14. The sample is split by age groups. Estimates are obtained with the CRE estimator. The dependent and independent variables are all transformed with the inverse hyperbolic sine function, and should be interpreted as approximate elasticities.

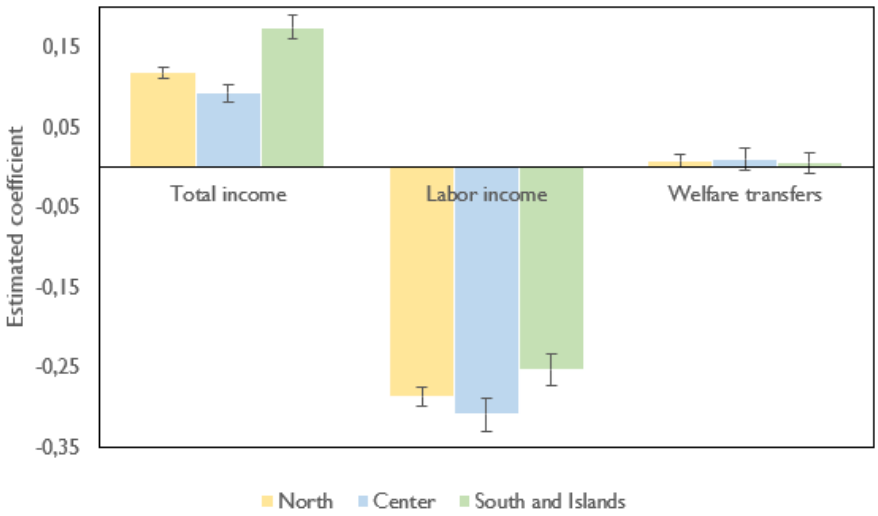

Figure B4: **CRE estimates of the elasticity of voucher income, by macro area of the working spell.**

Notes: The specification is estimated on individuals ranging in age from 16 to 64 years and using at least one voucher in 2012-14. The sample is split by macro area of voucher use, relying on information on the province were vouchers have been used. Workers that use vouchers in more than one geographic area are assigned to the place where the majority of their vouchers have been used. Estimates are obtained with the CRE estimator. The dependent and independent variables are all transformed with the inverse hyperbolic sine function, and should be interpreted as approximate elasticities.