

Tax Liability Side Equivalence in Gift-Exchange Labor Markets

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Tax Liability Side Equivalence (tax LSE) claims that the statutory incidence of a tax is irrelevant for its economic incidence. Tax LSE is predicted to hold in gift-exchange labor markets if workers' effort choices exclusively depend on the net wage, but breaks down if they partially depend on the gross wage paid to workers. This is the case if the tax is perceived to be external to the gift-exchange relationship. We experimentally test tax LSE in a gift-exchange labor market and find that it holds very well.

Keywords: Tax incidence, Efficiency wages, Gift exchange, Experiments.

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1. Introduction

This paper experimentally investigates Tax Liability Side Equivalence (tax LSE)¹ in gift-exchange labor markets. Tax LSE is a basic tenet of public economics. It claims that the statutory incidence (i.e., who legally pays a tax) is irrelevant for economic incidence (i.e., who bears the tax burden). In the words of Musgrave (1959: 351), “it is a matter of indifference whether a general tax on transactions is assessed on the seller’s or on the buyer’s side of the market” (see Stiglitz 1988: Ch. 17). However, public debate in the media and the political arena is often much concerned with statutory incidence (see Borck et al. 2002 or Ruffle 2004 for examples of such public concern). This is particularly true for debates about who should pay social security contributions in labor markets. Blinder (1988: 12) pointed to this discrepancy between economic theory and public concern by stating:

“... consider what may be the most basic theorem of public finance: the irrelevance of the side of the market on which a tax is levied. We all had fun explaining to our beginning students why it doesn't matter whether the payroll tax is levied on employers or employees. Then why, perhaps we should wonder, do Congress, labor and management all think the decision so momentous? Sheer lack of understanding? Maybe. But maybe not.”

One plausible reason for this discrepancy is that the assumptions on which the theoretical prediction of tax LSE hinges are not met in reality. In particular, tax LSE is predicted to hold in labor markets only if gross wages adjust to the changes in taxation and if market participants are exclusively concerned with net (i.e., after-tax) profits and wages. Accordingly, tax LSE does not hold, for example, if wages cannot freely adjust due to exogenous reasons (e.g., when minimum wages are binding), if income taxation is non-

proportional (e.g., is progressive, see Lockwood and Manning 1993), or if unemployment benefits are related to workers' gross wages (Goerke 2002, Picard and Toulemonde 2001).

Besides these exogenous (“institutional”) reasons for this discrepancy, *endogenous* wage rigidity provides another potential explanation for public concern with statutory incidence. If wages are endogenously rigid, adjustment to the new equilibrium levels after a change in statutory incidence is sluggish. In this case, tax LSE does not hold in the short run, but may hold in the long run. This is also the explanation Blinder (1988: 12) provides for the apparent discrepancy:

“I submit that part of the answer is ... that we economists insist on thinking long-run equilibrium while everyone else lives in short-run disequilibrium. The truth of the matter is that the incidence of the payroll tax may differ dramatically in the short and long runs.”

Efficiency wages have been suggested as a prime explanation for endogenous real wage rigidity (Bewley 1999). Yet, tax LSE is predicted to hold in efficiency-wage labor markets, as long as all market participants base their decisions on net wages and profits (e.g., Pisauro 1991).

This paper focuses on tax LSE in efficiency wage markets of the gift-exchange type (Akerlof 1982). The motivation for doing so is twofold. First, gift exchange has been identified as a particularly relevant reason for why efficiency wages are paid (e.g., Campbell and Kamlani 1997). Second, social norms play an important role in gift-exchange markets, and these social norms may cause tax LSE to break down if they induce market participants to take gross wages into account. This will be the case if workers perceive the tax to be external to the gift-exchange relation between the firm and the worker. Workers might evaluate the

¹ Tax liability side equivalence is sometimes also called “Dalton's Law” (after Hugh Dalton 1922) or

generosity of the gift according to the wage paid by the firm if they deem it fair that the market side that is legally liable to pay the tax also ought to bear the tax. This explanation has been suggested by Kerschbamer and Kirchsteiger (2000) who provide a model in which such a norm leads to the breakdown of tax LSE. The resulting effect is partial tax shifting, i.e. a tendency for taxes to “stick where they hit”.

An ideal test for whether tax LSE holds meets two criteria. First, market outcomes in two theoretically equivalent tax regimes must be compared under otherwise unchanged economic conditions. Second, to test for the importance of endogenous wage rigidity, none of the “institutional” reasons given above must apply. For example, wages must be completely free to adjust. These criteria are unlikely to be met in the field. Therefore, we use an experimental approach to test tax LSE. While laboratory experimentation cannot be a substitute for conventional empirical research, it is a useful complement because it has important advantages. For example, changes in tax regimes can be implemented in a controlled manner and relevant market outcomes can be observed over time under otherwise constant market conditions in the laboratory. This allows for investigating whether tax incidence does indeed “differ dramatically in the short and the long runs” (see second quote above). What constitutes the short and long run in the field is debatable and depends on the institutional details of the labor market under consideration. In our experimental setting a distinction will simply be made between impact adjustment and adjustment over time.

The experimental gift-exchange markets we investigate are institutions combining competitive markets with bilateral bargaining. In such institutions, fairness concerns are important because market outcomes depend on the perceived fairness of the rent distribution (Fehr, Kirchsteiger and Riedl [henceforth FKR] 1993, 1998). Investigating an institution that combines aspects of competitive markets and bargaining is particularly relevant because the

“Invariance of Incidence Proposition”.

empirical literature provides no definite answer to the question whether tax LSE holds in these markets. On the one hand, studies that have experimentally tested tax LSE in competitive experimental goods markets tend to find that tax LSE holds.² In stark contrast to these studies, Kerschbamer and Kirchsteiger (2000) find that tax LSE does not hold in a simple bargaining experiment.³ Their main finding is that the side that legally pays the tax also bears a higher economic burden. The authors suggest that tax LSE holds in competitive goods markets but was found not to hold in their experiment because fairness norms play a much more important role in bargaining than in competitive markets. Since fairness norms have been shown to be important in competitive gift-exchange labor markets, it is an open question whether tax LSE holds in such markets.

Our study, to the best of our knowledge, is the first to investigate how wages, efforts and rents are affected by statutory incidence in efficiency-wage labor markets. It builds on FKR (1993) who investigate the gift-exchange hypothesis experimentally and find strong support for it. The main finding is that firms persistently pay wages above the reservation wage and that there is a strong positive correlation between wages paid and efforts provided. We adapt FKR (1993) to test tax LSE in gift-exchange markets and find that tax LSE holds very well. In particular, we find that a change in tax regimes does not significantly affect relevant market outcomes like the distribution of incomes between workers and firms, even in the short run.

² Kachelmeier et al. (1994) compare the effects of ad valorem and value-added taxes in competitive double auction markets and conclude that tax LSE cannot be rejected. Borck et al. (2002) investigate tax LSE of specific taxes in a posted-offer market and find clear support for tax LSE. Ruffle (2004) examines tax and subsidy LSE in pit markets, and finds strong support for LSE. Taken together, these studies clearly indicate that tax LSE holds in competitive goods markets, independent of the precise price formation mechanism.

³ The authors test tax LSE in the ultimatum game by comparing treatments in which either the proposer or the responder has to pay a specific tax upon acceptance of the offer.

We proceed as follows. Section 2 explains the experimental design, section 3 presents the experimental results, and section 4 concludes.

2. Experimental Design and Procedures

2.1. General description

The basic idea of this study is to implement a gift-exchange market with pronounced efficiency-wage characteristics, and to assess a tax either on the supply side (i.e., on workers) or on the demand side (i.e., on firms). Our design has two treatments with two tax regimes each. The treatments differ solely with respect to the sequencing of tax regimes. In the tax regime called ToF (Tax on Firms) the tax is levied on firms, while in the regime called ToW (Tax on Workers) it is levied on workers. Each tax regime constitutes a phase, consisting of 16 trading periods each. The sequence of tax regimes is either ToF in phase 1 and ToW in phase 2 [treatment ToF/ToW], or vice versa [treatment ToW/ToF], see table 1.

** Table 1 about here **

This design allows us to test tax LSE along two dimensions and to control for experience and sequencing effects. First, we can compare the two tax regimes across treatments in a given period. By comparing tax regimes ToF(1) with ToW(1), and ToF(2) with ToW(2), we test for tax LSE while holding the experience of subjects with the market institution constant. Because each subject participates in one treatment only, the comparison across treatments is also a comparison across subjects. Second, we are able to compare the two tax regimes within a given treatment. By comparing tax regimes in a given row of table 1, we analyze the effect of a *change* of taxation while holding everything else (e.g., the identity of market participants) constant. This comparison tests whether tax LSE holds in the short run or the long run by observing whether tax shifting is instantaneous or takes some time. In

addition, we compare the same tax regime across treatments and phases. By comparing diagonal cells in table 1, we test for sequencing and experience effects. For example, it may be the case that workers feel entitled to the wage previously paid, and that, as a consequence, the equilibrium wage in a particular tax regime depends on the market wages in the previous tax regime.

2.2. Procedures and Parameters

Each period of the experiment has the following two-stage structure. In the first stage, each firm simultaneously chooses one integer wage offer of $W \in \{1, \dots, 100\}$ points (100 points correspond to €3). These wage offers are posted on participants' computer screens such that all firms and all workers see all wage offers. Wage offers are ordered from high to low, but offers are anonymous. That is, a particular wage offer cannot be related to a particular firm. In the second stage, each worker can at most accept one wage offer. Workers are randomly arrayed in a queue and can choose from the remaining offers. Workers who have accepted an offer choose an effort $e \in \{1, \dots, 10\}$.

At the end of each period, all participants are shown an outcome screen summarizing the interaction results of the current period and of all previous periods. In particular, each participant obtains information about the accepted wage, the effort provided and the corresponding earnings in one's own firm-worker pair, and the average market wage.

Monetary payoffs depend on the tax regime. In both regimes, a specific tax of $TAX = 20$ is levied on each transaction.⁴ If the tax is levied on firms (ToF) payoffs in case a wage offer is accepted are:

⁴ The level of taxation must satisfy two requirements. First, full tax shifting must in principle be possible in both tax regimes. The maximum tax level having this property is determined by the range of admissible gross

$$\text{For firms: } \pi = 30 - W + 10e - TAX \quad (1)$$

$$\text{For workers: } U = W - e . \quad (2)$$

If the tax is levied on workers (ToW) payoffs in case a wage offer is accepted are:

$$\text{For firms: } \pi = 30 - W + 10e \quad (3)$$

$$\text{For workers: } U = W - e - TAX . \quad (4)$$

Workers who do not accept an offer get a payoff of $U_0 = 4$ points, and firms who do not hire a worker get zero profit ($\pi_0 = 0$).⁵

Written instructions are distributed before each phase, and subjects have to correctly answer a series of control questions at the beginning of a new phase.⁶ At the beginning of phase 1, subjects are informed that phase 1 has 16 periods, and subjects know that there is going to be a second phase. However, subjects do not know at the beginning of phase 1 the proceedings of phase 2. In particular, they do not know that the other market side will be taxed in phase 2. Subjects are provided with a pocket calculator during the experiment. In the instructions, we use a neutral wording. In particular, instructions speak of buyers (firms), sellers (workers), price (wage) and quality (effort). However, the tax is simply called tax.

As in FKR (1993), all markets had an excess supply of at least 40 percent (there were either 7 workers and 5 firms or 6 workers and 4 firms). Therefore, at least 2 workers remain unemployed in each period. We chose this considerable excess supply to make the market

wages (1 to 100) and the equilibrium wage. Since we expected the equilibrium wage to be in the range from 40 to 60, the tax level is constrained to be at most 40. Second, the effect of the tax on gross wages must be noticeable, i.e. statistically distinguishable from noise. The chosen tax level of 20 satisfies both requirements.

⁵ A firm also earns zero profits if its wage offer was accepted but the worker provided an effort which would have resulted in a loss for the firm.

⁶ Instructions can be downloaded at <http://www1.fee.uva.nl/creed/pdffiles/InstrRawData2TaxLSE.pdf>

competitive. Since we are particularly interested in short-run and long-run adjustment of wages and market rents we run each tax regime for 16 periods (stationary replication).

Our design differs from FKR (1993) in two respects. First, we use linear payoff functions (as in Brandts and Charness 2004). Our parametrization involves relatively large potential gains from gift-exchange which is known to forward efficiency wage characteristics (see Hannan et al. 2002, Engelmann and Ortmann 2002). Note that providing a higher effort increases firm profits (by 10 points per unit) but is costly (1 point per unit) to workers.

The second and crucial difference to FKR (1993) is that our design involves taxation. We use a specific transaction tax because specific taxes are cognitively easier to understand and to implement than ad valorem taxes. Note that by holding the range of admissible posted wages W constant (at 1 to 100), the range of admissible net wages w (i.e., after-tax wages) is different in the two tax regimes. That is, the net wage is $w = W - TAX$ in ToW, but is $w = W$ in ToF. As a consequence, w is in the range 1 to 100 in the regime ToF but is in the range -19 to 80 in ToW. The reason we decided to hold the range of admissible posted wages constant is to avoid a possible experimenter demand effect. Changing the range of admissible posted wages may, for example, induce the belief among firms that we (the experimenters) expect them to post lower wages, and among workers that we expect them to accept lower wages in ToF.

2.3. Predictions and hypotheses

The theoretical predictions under the standard assumptions of fully rational agents who are strictly interested in their own material well-being can be found by backward induction. In the second stage of the game, a worker will never provide effort above the minimum level $\underline{e} = 1$ because it is costly to do so. Note that there are no long-term considerations, like reputation formation, to be taken into account because of the anonymity of market interaction. In equilibrium workers accept any net wage in excess of $w_0 = 5$ because this guarantees earnings in excess of $U_0 = 4$. In the first stage, firms anticipate workers' second-stage behavior and

offer $\underline{w} = 6$, the lowest possible net wage inducing workers to accept for sure. Hence, given the standard assumptions, the equilibrium prediction is a net wage $\underline{w} = 6$ and an effort level $\underline{e} = 1$.

In ToF, the firm has to pay a specific tax of $TAX = 20$ and the wage paid by the firm is equal to the net wage. This results in an equilibrium profit of $\underline{\pi} = 30 - \underline{w} + 10\underline{e} - 20 = 14$ for the firm and an equilibrium payoff of $\underline{U} = \underline{w} - \underline{e} = 5$ for an employed worker. According to tax LSE, the predictions are exactly the same in case the worker has to pay the specific tax (ToW), except that the wage paid by the firm is now a gross wage $\underline{W}(\text{ToW}) = 26$.

However, theoretical considerations based on Akerlof (1982) and the experimental evidence in other gift-exchange markets (FKR 1993, 1998, Fehr et al. 1998, Brandts and Charness 2004) leads us to expect efficiency wages $w^* > \underline{w}$ and a positive relation between net wages and efforts provided [$de/dw > 0$]. Consequently, we hypothesize that employed workers and firms earn rents $U^* > U_0$ and $\pi^* > \pi_0$, respectively. These predictions depend on subjects' willingness to give and reciprocate gifts. Since the actual intensity of this willingness is not known ex ante, it is impossible to provide point predictions for w^* , e^* , and rents. The qualitative relationships are clear and testable, however. Additionally, as long as workers base their effort decisions only on the net wage, tax LSE should hold. In particular, net wages, efforts, and the after-tax income distribution are predicted to be the same in both tax regimes.

If taxation is perceived to be exogenous to the gift-exchange relation, workers' effort choices do not exclusively depend on the net wage but also on the gross wage. To illustrate, consider a change of statutory taxation from workers to firms. According to tax LSE, this induces an offsetting reduction of the gross wage. However, if workers reduce effort provided in response to falling gross wages, a profit maximizing firm has an incentive to continue to pay relatively high gross wages. Therefore, the alternative hypothesis claims that tax shifting

is only partial, and that the tax tends to “stick where it hits”. In particular, net wages are predicted to increase in response to a change in the tax regime from ToW to ToF, and to fall in response to a change in taxation from ToF to ToW.

3. Results

We conducted 6 markets in treatment ToF/ToW and 6 markets in treatment ToW/ToF in the computerized CREED laboratory at the University of Amsterdam. In total, 136 undergraduate students from various disciplines participated in our experiment. Each subject only participated in one market. Subjects earned €29.70 (US\$ 30, approx.) on average in about 130 minutes. Section 3.1 presents the results with respect to gift-exchange, section 3.2 discusses the effect of taxation on net wages, and section 3.3 explains how taxation affected workers’ and firms’ rents.

3.1. Gift-exchange

Our first result is that the experimental markets under study in general do exhibit *pronounced and stable efficiency wage characteristics*. That is, net wages are clearly above reservation wages, efforts are above the minimum level, efforts are positively related to wages, and both workers and firms earn rents. To show that this is the case, we now take a broad look at the markets in the two tax regimes. In this section, we aggregate observations over all periods and both phases of each regime, and analyze more disaggregated data in the sections below.

First, net wages are far above the minimum acceptable wage ($\underline{w} = 6$) in both tax regimes. In fact, net wages (averaged over all markets, periods and phases) are 48.2 if the tax is on firms (ToF), and 45.7 if the tax is on workers (ToW). Second, average efforts are clearly

above the minimum level ($\underline{e} = 1$) in both tax regimes. In particular, efforts (again averaged over all markets, periods and phases) are 5.4 in ToF and 5.2 in ToW. Third, there is a clear positive relation between the efforts provided and the net wages. Figure 1 provides support for this claim. The figure shows average efforts for different ranges of average net wages in the two tax regimes. The figure indicates, for example, that average efforts in contracts in which the net wage is below 20 was only 1.3 in both tax regimes (see leftmost bars). In contrast, if the net wage is above 60 the average effort is 7.5 in ToF and 7.6 in ToW (see rightmost bars).

Fourth, workers and firms earn positive rents. Employed workers have average net earnings (i.e., net wages minus effort costs) of 42.2 in ToF and of 39.8 in ToW, which is far above the workers' outside option ($U_0 = 4$). Firms pay efficiency wages because it is profitable for them to do so. In particular, average profits are 22.1 in ToF, and 22.4 in ToW. This is above what firms would have earned in the absence of the gift-exchange relation ($\underline{\pi} = 14$).

** Figure 1 about here **

Taken together, these results clearly indicate that our parametrization creates ideal preconditions to test tax LSE in gift-exchange markets since the markets under investigation do indeed exhibit pronounced efficiency-wage characteristics. At the same time, the discussion above also provides a first indication for the main result of this study that *tax LSE holds very well* in the efficiency wage market. Whether the tax is levied on the firms or the workers does neither seem to substantially affect average net wages nor efforts nor the relation between the two (see figure 1).

3.2. Testing net wages for tax LSE

In this section, we test net wages for tax LSE along two dimensions. It will be shown that tax LSE impressively holds for net wages across treatments and within treatments even on impact. In addition, we test for sequencing effects. Table 2 summarizes the results.

Figure 2 shows net wages (i.e., after-tax wages) averaged over all sessions in the respective treatments over time. The thin line shows the evolution of average net wages in ToF/ToW and the thick line indicates the same time series for ToW/ToF. Consider first tax LSE across treatments (comparison of tax regimes in a given column of tables 1 and 2). As can be seen, average net wages are almost exactly the same already in period 1 of phase 1 irrespective of whether the tax is levied on firms (41.2) or on workers (42.7). Net wages remain fairly stable throughout the first phase of the experiment (periods 1-16). While net wages averaged over the entire first phase are somewhat higher if firms are taxed (48.8) than if workers are taxed (42.3), there is no statistical difference in any single period between ToF and ToW (Mann-Whitney tests, $p > 0.24$ for each period) or over all periods jointly (Mann-Whitney test, $p = 0.70$), when taking the average market wage as a unit of observation.

The same picture emerges if we compare across treatments in phase 2 (periods 17-32). Averaged over all periods of phase 2, net wages are now slightly lower if firms are taxed (47.5), than if workers are taxed (49.1). However, average net wages are not statistically different in a period-by-period comparison (Mann-Whitney tests, $p > 0.24$) or in a comparison over all periods jointly (Mann-Whitney test, $p = 0.70$). We conclude that net wages were the same in both treatments, holding experience with the market institution constant.

** Figure 2 about here **

Second, we test tax LSE within treatments across different tax regimes (comparison of regimes in a given row in tables 1 and 2). There are no significant differences when comparing the two tax regimes period by period (e.g., period 1, 2, ... in ToF/ToW with period 17, 18, ... in ToF/ToW) in both treatments⁷ or if we compare all periods jointly (Wilcoxon tests, ToF/ToW $p = 0.75$, ToW/ToF $p = 0.17$, see rightmost column of table 2). Tax LSE even holds *on impact* after a change in the tax regime. Tax LSE predicts that net wages should not change in a market if taxation is changed from workers to firms, or vice versa. In contrast, the partial shifting hypothesis holds that net wages should fall when workers instead of firms are taxed, and vice versa. In line with this partial shifting hypothesis, net wages indeed do fall (from 47.5 to 40.8) when the workers instead of the firms are taxed (compare periods 16 and 17 in figure 2, thin line), and net wages slightly increase (from 46.7 to 49.2) when taxation is shifted from the firms to the workers. However, these impact effects are not statistically significant. The hypothesis that average net wages are the same in periods 16 and 17 cannot be rejected for either change in tax regime (Wilcoxon tests, for ToF/ToW $p = 0.35$, for ToW/ToF $p = 0.75$).

** Table 2 about here **

Third, efficiency wages are rather stable throughout the experiment, and there are no significant effects of sequencing. In particular, average net wages are not different for a given tax regime across phases according to Mann-Whitney tests (ToF(1) vs. ToF(2): $p = 0.39$, ToW(1) vs. ToW(2): $p = 0.49$). Comparing each of the corresponding periods yields no significant differences either [e.g., period 1 in ToF(1) with period 17 in ToF(2)]. In both tax regimes $p > 0.24$ in any comparison (Mann-Whitney tests).

⁷ The single exception is period 6 in ToW(1) with period 22 in ToW(2), which is significant ($p = 0.04$) according to a Wilcoxon test.

3.3. Testing rents for tax LSE

Tax LSE implies that the post-tax distribution of rents is the same irrespective of which side of the market is taxed. In this section, we test rents for tax LSE along the same dimensions as for net wages in the previous section. We refrain from an extensive discussion of effort choices to save on space and because, given the wage, effort choices linearly translate into worker earnings and firm profits. Since we have already shown in the previous section that tax LSE holds with respect to net wages, and since this section is going to demonstrate that tax LSE also holds with respect to rents, the reader should be easy to convince that tax LSE also holds with respect to effort choices (see also table 2).

**** Figure 3 about here ****

Figure 3 shows average earnings for workers (broken lines) and average firm profits (solid lines) over time for agents who trade. Worker earnings seem higher in both tax regimes throughout all periods. Note, however, that in the figure in each period (at least two) workers are excluded who only earn their outside option.

First, tax LSE holds for workers' earnings in an across-treatment comparison. In period 1, worker earnings are very similar (36.4 in ToF, 39.0 in ToW). Figure 3 seems to indicate that, along with the partial tax-shifting hypothesis, worker earnings are higher if firms are taxed throughout the first phase. However, the differences are statistically not significant; neither in a period-by-period comparison (Mann-Whitney tests, $p > 0.13$ in each period), nor when considering all periods jointly (Mann-Whitney test, $p = 0.59$). In the second phase, worker earnings are very similar in the two tax conditions [no significant differences for period-by-period comparisons ($p > 0.18$) and for all periods jointly ($p = 0.70$)]. Second, a within-treatment comparison yields the same conclusion with respect to a change of taxation. Average worker earnings fall from 42.3 in period 16 to 35.5 in period 17 in the regime change ToF/ToW (see fine dotted line), and increase from 41.7 to 44.0 in the regime change

ToW/ToF (see heavy dotted line). However, these differences are not significant according to a Wilcoxon test (ToF/ToW $p = 0.21$, ToW/ToF $p = 0.60$). A period-by-period comparison yields significant differences in only two cases.⁸ Third, there is no significant effect of sequencing (Mann-Whitey tests, ToF $p = 0.49$, ToW $p = 0.59$).

Firm profits are much more sensitive to effort choices than worker earnings. In particular, a marginal change in effort choice affects worker earnings by 1 point while it affects firm profits by 10 points. Despite this fact, firm profits are neither different in an across-treatment comparison, nor in a within-treatment comparison, nor are there any sequencing effects. For example, firm profits are very similar in the first period of the experiment in both regimes (19.1 in ToF, 15.9 in ToW), and the same holds throughout all periods of the experiment, irrespective of the tax regime. In fact, there are no significant differences in an across-treatment comparison for any single period (Mann-Whitney tests, $p > 0.13$) or for all periods of phase 1 jointly (Mann-Whitney test, $p = 0.82$). The same holds for phase 2 (Mann-Whitney tests, each period $p > 0.09$, all periods jointly $p = 0.82$). Furthermore, there are no significant differences in a within-treatments comparison, neither are there significant sequencing effects (see table 2).

In summary, we conclude that tax LSE holds with respect to worker earnings and firm profits.

4. Concluding remarks

Tax LSE is a fundamental proposition of economics. It claims that who bears the tax burden (economic incidence) is independent of who legally pays the tax (statutory incidence). Standard theory suggests that tax LSE holds in gift-exchange labor markets as long as workers

⁸ Significant differences occur in period 6/22 ($p = 0.02$) and in period 7/23 ($p = 0.05$), Wilcoxon tests.

make their effort choices exclusively dependent on net wages. However, if workers make their effort provision contingent on wages paid by firms and consider taxation as exogenous to the gift-exchange relation, tax LSE breaks down.

We implement a gift-exchange market known to exhibit pronounced efficiency-wage characteristics, and impose a specific tax either on workers or on firms. We test tax LSE and find that it holds well across treatments, within treatments, and even on impact after a change in the tax regime.

Despite the clarity of our experimental results we would not like to interpret our finding as implying that it never matters how, for example, social security contributions are assessed in labor markets for at least three reasons. First, we find that tax LSE holds in a fairly competitive gift-exchange market with an excess supply of 40 percent. Whether actual labor markets in the field are as competitive as that or whether (in particular collective) bargaining elements are more important depends on the actual market under consideration. Second, we did not allow for long-term relations between workers and firms in our experiment. Yet, such relations are quite typical in naturally occurring labor markets. Since long-term relations have been shown to cause price rigidity in experimental markets with quality uncertainty (Renner and Tyran 2004), it is likely that long-term relations also affect tax LSE. Third, information about the tax regime was prominent in our experiment. For example, both firms and workers exactly knew that firms had to pay the tax. However, questionnaire studies indicate that the general public is often ill-informed about statutory incidence (see Boeri et al. 2001). One may therefore speculate that workers find falling gross wages less acceptable if such information is less prominent, and that the alternative hypothesis may have more explanatory power in this case.

Our finding that tax LSE holds in gift-exchange markets is novel and surprising in our view. While previous experimental studies have shown that tax LSE holds in competitive

goods markets, tax LSE has also been shown to clearly fail in a bargaining experiment in which fairness considerations are paramount. Given that fairness considerations are known to be important in the gift-exchange labor market we study, one might legitimately expect that tax LSE does not hold at least in the short run, and that market forces may eventually drive net wages towards tax LSE over time, if at all. Yet, we find that the "most basic theorem of public finance" (see first quote) holds even in the short run in gift-exchange labor markets.

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Table 1: Experimental treatments

	Phase 1 (periods 1-16)	Phase 2 (periods 17-32)
Treatment ToF/ToW	Tax on Firms ToF(1)	Tax on Workers ToW(2)
Treatment ToW/ToF	Tax on Workers ToW(1)	Tax on Firms ToF(2)

Table 2: Summary of results

		Phase 1 (Averages over all markets, periods 1-16)	Phase 2 (Averages over all markets, periods 17-32)	<i>p</i> -values for Wilcoxon tests, comparisons within treatments
Treatment ToF/ToW	net wage:	48.8	49.1	0.75
	effort:	5.6	5.7	0.53
	worker earnings	42.6	42.7	0.92
	firm profits	21.9	23.5	0.25
Treatment ToW/ToF	net wage:	42.3	47.5	0.17
	effort:	4.8	5.1	0.46
	worker earnings	36.9	41.9	0.17
	firm profits	21.4	22.2	0.60
<i>p</i> -values for Mann- Whitney tests, comparisons across treatments	net wage:	0.70	0.70	F/W: 0.35, W/F: 0.75
	effort:	0.39	1.00	F/W: 0.46, W/F: 0.35
	worker earnings	0.59	0.70	F/W: 0.21, W/F: 0.60
	firm profits	0.82	0.82	F/W: 0.25, W/F: 0.25

Note: All tests are two-sided and take market averages as the unit of observation. The lower right cell tests for short-run effects by comparing market averages in period 16 and 17 within treatments. F/W shows the *p*-value of Wilcoxon tests for a change of taxation from firms to workers (treatment ToF/ToW), W/F the corresponding value for a change of taxation from workers to firms.

Figure 1: Relation of efforts and net wages in the two tax regimes

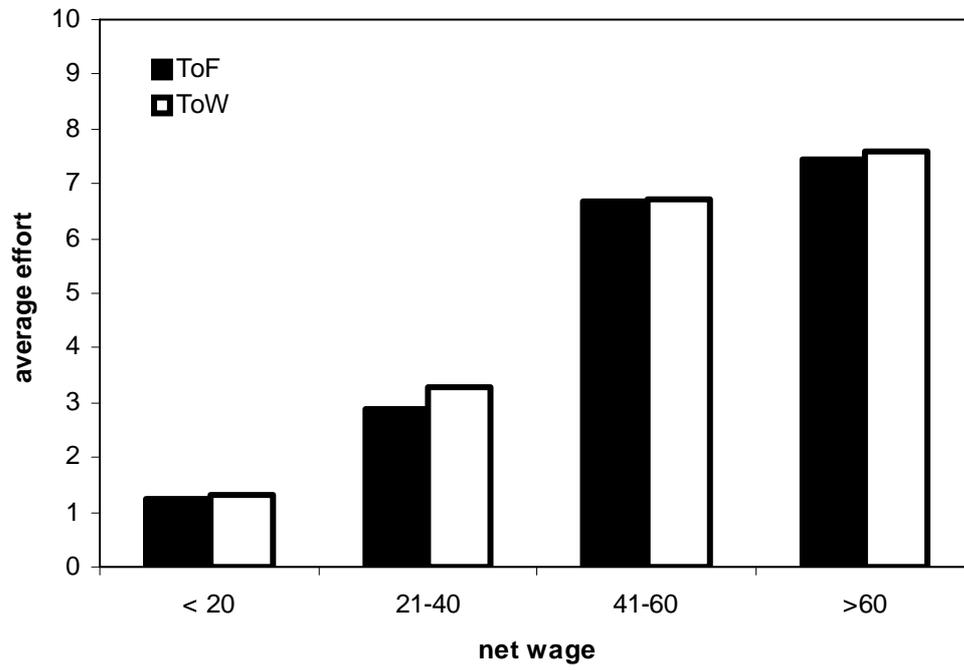


Figure 2: Average net wages over time

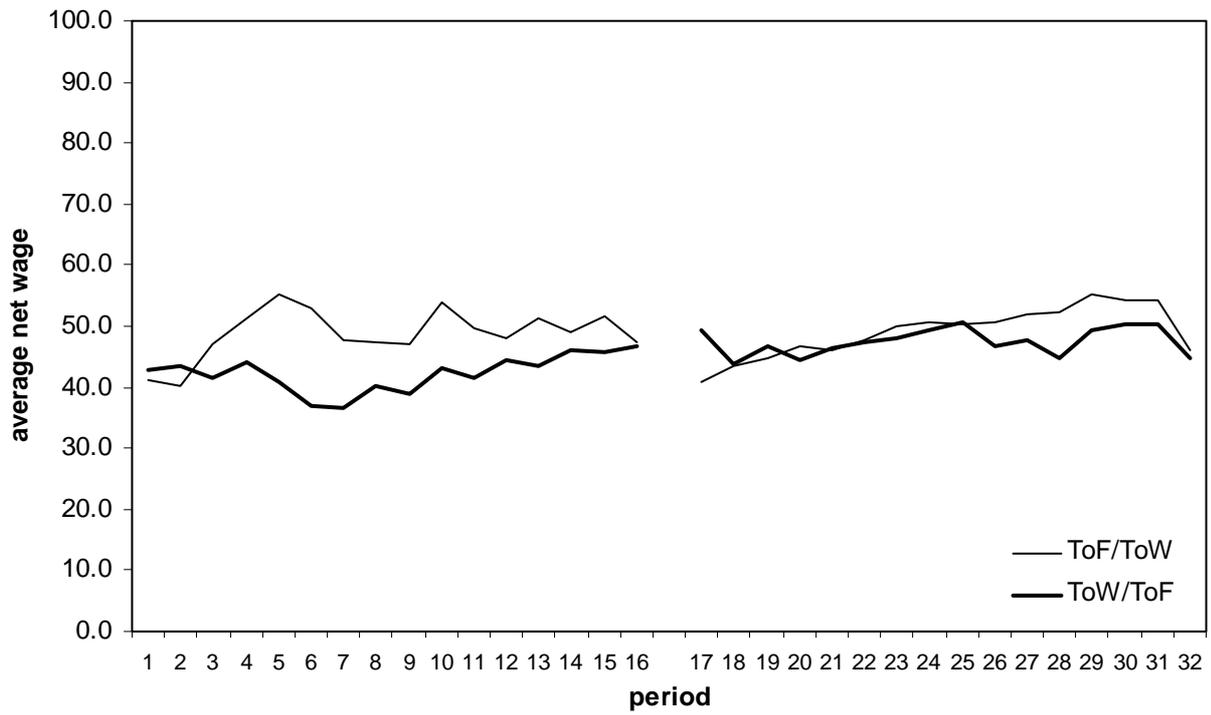


Figure 3: Average firm profits and hired worker earnings

