



# Redistribution and market efficiency: An experimental study<sup>☆</sup>

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## ARTICLE INFO

### Article history:

Received 24 November 2010

Received in revised form 1 December 2012

Accepted 4 February 2013

Available online 21 February 2013

### JEL classification:

H23

D41

D72

D73

### Keywords:

Redistribution

Double auction

Market efficiency

Elections

Lobbying

## ABSTRACT

We study the interaction between competitive markets and income redistribution that reallocates unequal pre-tax market incomes away from the rich to the poor majority. In one setup, participants earn their income by trading in a double auction (DA) with exogenous zero or full redistribution. In another setup, after trading, they vote on redistributive tax policies in a majoritarian election with two competing candidates. This results in virtually full redistribution, even when participants have the opportunity to influence taxes by transferring money to the candidates. We find that the high redistribution reduces trading efficiency, but not as much as predicted if market participants trade randomly. This is because, rather than capitulating to the much lower trading incentives, many participants respond to redistribution by asking and bidding more conservatively in the DA, and in this way help to prevent further efficiency losses.

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## 1. Introduction

A major concern of modern democracies is to implement an optimal degree of redistribution that reallocates income away from the well-to-do to the relatively poor. This is a delicate balancing act between the people's taste for equality and the potentially negative consequences of redistribution for economic efficiency. Citizens generate wealth by participating in a variety of different markets. Usually, this wealth is distributed unequally (e.g., due to differences in individual productivities). However, a majority of relatively poor citizens have, in principle, the opportunity to counteract the often dramatic inequality by determining the degree of income redistribution in elections. In the present paper, we study one important aspect of the balancing act between the fundamental conflict of the principles of markets ("one dollar, one vote") and elections ("one person, one vote"), namely, the effects of redistribution on market trading behavior and efficiency. This is very different to the previous literature in which redistribution influences wealth through various other channels (e.g., Alesina and Giuliano, 2009), such as the people's labor-leisure choice (e.g., Meltzer and Richard, 1981; Romer, 1975).

<sup>☆</sup> Financial support from the GEW Foundation Cologne and the German Science Foundation (DFG) is gratefully acknowledged. We would also like to thank the Economics Laboratory of the University of Cologne for their help and hospitality.

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So far, experimental markets and (redistribution in) elections have been studied in isolation. Many laboratory markets – in particular Smith's (1962) double auction (henceforth DA) – reliably clear at approximate equilibrium prices and quantities, and in this way generate close to the maximum possible wealth, or trading efficiency (for surveys, see Davis and Holt, 1993; Kagel and Roth, 1995). Similarly, median voter preferences are reflected reliably by outcomes of laboratory two-candidate elections with compulsory majority voting (for a survey, see McKelvey and Ordeshook, 1990). While these literatures have substantially contributed to our understanding of how markets and elections function independently, they shed little light on how they interact and perform when they coexist. Given that trading efficiency can be negatively affected if there are interdependencies between the earnings of traders beyond those implied by market transactions (e.g., Dufwenberg et al., 2011; Goeree and Zhang, 2012; Rostek and Weretka, 2010), it is important to ask: do lower trading incentives due to redistributive taxation result in lower trading efficiency? And if so, does the poor majority respond by reducing their tax demands in order to prevent a lower tax revenue base?

In our experiment, citizens first earn their – unequally distributed – income in a DA. To mimic the prevalent income inequality observed in democracies around the world, we chose the market parameters such that, in equilibrium, the pre-tax income of a majority of citizens is below the average. As this is the first experimental study of the effects of redistribution on trading efficiency, we believe employing the DA is

appropriate because it is the predominant market used in laboratory studies (and is often used in actual financial and commodity markets) and poses a challenge to our research question as we know that, without income redistribution, it reliably generates the maximum possible wealth.

On the surface, introducing redistribution in a DA in the form of lump sum transfers financed with linear income taxes à la Meltzer and Richard (1981) and Romer (1975) does not change market prices and quantities. Without any redistribution, each transaction gives the two involved traders a purely *private* return. By contrast, their private return is smaller with redistribution (i.e., the untaxed share of their pre-tax income), but they and everybody else also receive a *public* return (i.e., a lump sum transfer from the taxed share).<sup>1</sup> Specifically, the marginal trading incentive is non-negative and decreasing in the tax.<sup>2</sup> Therefore, in equilibrium, the maximum trading efficiency is obtained even with full redistribution. Nevertheless, redistribution might affect trading behavior in different ways, and it is not obvious that the effort necessary to achieve high trading efficiency can be maintained. In particular, the lower marginal incentive to trade and bargain over prices might result in unpredicted price volatility, transactions, and efficiency losses. For example, even in games where variations in marginal incentives do not change equilibrium predictions, a bulk of laboratory studies show that people do respond to such variations (e.g., Goeree and Holt, 2001; McKelvey and Palfrey, 1995). In the DA, this can manifest in careless pricing, which gives rise to substantial inefficient trading.<sup>3</sup> Even more dramatic, if the most efficient traders perceive the degree of taxation as unfair, one could imagine they abstain from market activity altogether. Indeed, as many bargaining experiments suggest, depriving people of their fair share of a surplus can trigger negative emotions that provoke them to destroy their pre-tax income (Bosman and van Winden, 2002; see also Camerer, 2003). Therefore, it is reasonable to conjecture that too much redistribution decreases trading efficiency. We study whether this is the case by comparing experimental DAs with exogenous zero and full redistribution.

We also examine two setups with endogenous redistribution in which, after citizens have earned their unequal incomes in the DA, two candidates compete via redistributive taxes in a majoritarian election. In one of the setups, prior to policymaking, citizens also have the opportunity to influence tax policies by transferring money to the candidates.<sup>4</sup> Compared to exogenous redistribution, these setups allow us to draw more general conclusions about the interaction of markets and elections via income redistribution, because now market efficiency and income equality are the outcome of a balancing act between the rich and the poor. First, candidates might attempt to woo the poor majority with drastic redistribution, but if this lowers the trading efficiency then the poor may in fact support more moderate taxes. Second, if transfers to candidates are possible, the rich might attempt to lower their tax burden by compensating them for taking the electoral risk of choosing low tax policies, which can in turn trigger counteractive transfers by the poor.<sup>5</sup> If candidates respond to money transfers, the high

concentration of pre-tax market income among the well-to-dos might work in their advantage in the rent-seeking race (see also Karabarbounis, 2011). However, as in everyday politics where *quid pro quo* is generally banned and thus not contract-enforceable, candidates are not bound to return any favors and the success of money transfers depends on their willingness to reciprocate. In addition to gaining better knowledge of the influence of favors on redistribution, the transfer levels give us valuable insights on the preferences for redistribution in our experiment.

By keeping our laboratory democracy simple, we obviously abstract from a variety of other phenomena related to income redistribution.<sup>6</sup> However, for policymaking to be effective it seems vital to understand how redistribution impacts the basic functioning of coexisting markets and elections. Therefore, our paper can be seen as a first step toward a more basic understanding of the interaction of the two institutions. To this end, laboratory studies are ideal since in the field we generally cannot observe how they work together without them being confounded by various other influences. Naturally, in experiments specific procedures and parameters must be chosen. We want to stress, however, that our choices are nonetheless representative of many of the incentives people face outside of the laboratory.

In the following, we discuss some of the important studies that are relevant to ours, starting with the DA and continuing with empirical work on voting and preferences for redistribution. In laboratory DAs prices and quantities quickly and reliably converge toward predicted outcomes, even when participants have minimal information about overall supply and demand. To understand this important result, trading behavior has been modeled and experimentally tested in more detail. For example, Cason and Friedman (1996) perform a systematic analysis of inefficiencies in experimental DAs and compare trading behavior to various theoretical benchmarks (see also Friedman, 1991; Gjerstad and Dickhaut 1998; Gode and Sunder, 1993). As benchmarks for trading behavior in the DA with income redistribution, we formulate a simple model that builds upon Gjerstad and Dickhaut's *rational* traders who form subjective beliefs about the DA environment and we run simulations with Gode and Sunder's *zero-intelligence* traders.

A growing literature investigates more thoroughly the origins of preferences for redistribution (Alesina and Giuliano, 2009). In the present paper, office-seeking candidates have an incentive to woo the poor majority by selecting full redistribution. Of course, such extreme policies are not observed in the field, and a variety of explanations have been offered why median voter preferences for redistribution are more moderate. For example, Alesina and Giuliano (2009) find that the taste for redistribution differs in personal traits (such as age, gender, race, and socioeconomic status), social traits (such as history, culture, and ideology), and fairness concerns (as in Fong, 2001); and see also footnote 6. Moreover, in reality the rich have other options to avoid high taxes such as migrating or indulging in leisure, which are not available in our study and would limit the poor's desire for maximal redistribution. In short, our interest lies in the effects of redistribution on trading behavior and efficiency per se, and how these effects influence the interplay between competitive markets and elections.

The laboratory studies of Durante and Putterman (2009), Esarey et al. (2012), and Tyran and Sausgruber (2006) are related to ours in that they too analyze income redistribution derived from citizens' choices. Their results often agree with those in observational studies, supporting the notion that redistributive preferences revealed in experiments are externally valid. In the first two experiments mentioned,

<sup>1</sup> Hence, transactions have a public good character because everyone gets a public return. This is different to trading 'common value' goods, where only the respective traders earn money. See also Balafoutas et al. (2010), who systematically vary private and public returns in a public goods experiment with unequal endowments.

<sup>2</sup> We assume that a transaction's after-tax income exceeds its costs (e.g., the cost of foregone leisure).

<sup>3</sup> See Davis and Holt (1993) and Kagel and Roth (1995) for market experiments with low marginal incentives that are not caused by taxation.

<sup>4</sup> As in many rent-seeking models (e.g., Tullock, 2005), in our study, money transfers to the candidates are sunk costs, i.e. are not conditional on policy choices, and cannot be used otherwise such as for campaigning (e.g., Campante, 2007). Moreover, all pre-tax incomes are public information, which is different to signaling models of lobbying (e.g., Ainsworth, 1993; Grossman and Helpman, 2001; Potters and van Winden, 1992).

<sup>5</sup> With counteractive lobbying (Austen-Smith and Wright, 1994) the net effect of transfers on tax policies will depend on the difference in overall transfers between the rich and poor.

<sup>6</sup> For example, we do not consider the relationship between redistributive politics and economic growth (Alesina and Rodrik, 1994; Benhabib and Rustichini, 1996; Persson and Tabellini, 1994), social mobility (Alesina and La Ferrara, 2005; Bénabou and Efe, 2001), economic inefficiencies such as leaky buckets (Browning, 2002), outside options such as tax migration (Epple and Romer, 1991), the survival of democracy (Benhabib and Przeworski, 2006), and imperfect credit and insurance markets (Bénabou, 2000). For extensive discussions, see Browning (2002), Persson and Tabellini (2000), and Rosen and Gayer (2007).

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