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ESSAYS ON TAXES
AND WAGE FORMATION

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ABSTRACT: The essays in this collection approach taxation as a group of policy instruments, and study how their use is connected to and affected by wage formation in the economy. In the first essay taxation acts as an automatic stabiliser in the face of different shocks. The study combines two theoretical models from previous literature. It shows that earlier results, concerning both income tax indexation and the role of openness in deciding the optimal degree of wage indexation, do not hold under more general assumptions. In the second essay the aim of policy is to cure an acute inflation problem. The instrument is a conditional threat to increase taxes. The study develops a one-shot game describing the determination of the threat and the decisions of the unions. The article gives one possible rationalisation for the use and success of tax threat policies, and discusses reasons why this instrument is not used more often. In the third essay the aim of policies is to increase efficiency and welfare in the economy. Households and firms have fully adjusted their behaviour to the tax and transfer structure. Wages are set by majority-voting in a centralised monopoly union. The essay extends a well-known general equilibrium simulation model to include a trade union. Taxes and transfers are shown to affect the economy through dynamic channels and in a way depending significantly on wage formation.

Key words: taxation, wage formation, trade unions

TIIVISTELMÄ: Kokoelman esseissä verotusta tarkastellaan talouspolitiikan instrumenttina ja tutkitaan sen käytön vuorovaikutusta talouden palkanmuodostuksen kanssa. Ensimmäisessä esseessä verotus toimii automaattisena vakauttajana shokkien kohdatessa taloutta. Tutkimuksessa yhdistetään kaksi aiemmassa kirjallisuudessa esitettyä teoreettista mallia. Essee osoittaa, että aiemmat tuloverotuksen indeksointia ja talouden avoimuuden vaikutusta optimaaliseen palkkaindeksointiin koskevat tulokset eivät päde yleisempien oletusten vallitessa. Toisessa artikkelissa verojen korotusuhkauksella pyritään torjumaan palkkainflaatiota. Tilanne kuvataan kertaluontoisena pelinä, jossa sekä verouhkaus että ammattiliittojen päätökset muotoutuvat. Tutkimus esittää yhden mahdollisen perustelun verouhkauksen menestykselliselle käytölle, ja siinä pohditaan myös syitä tämän keinon käytön harvinaisuuteen. Kolmannessa esseessä tutkitaan verotuksen ja tulonsiirtojen vaikutusta talouden tehokkuuteen ja hyvinvointiin. Kotitalouksien ja yritysten oletetaan täysin sopeuttaneen toimintansa verorakenteeseen. Palkat määräytyvät jäsenten enemmistöpäätöksillä työmarkkinat kattavassa monopoliliitossa. Tutkimus laajentaa tunnettua

yleisen tasapainon numeerista simulointimallia ammattiliitolla. Tulosten mukaan verotuksen ja tulonsiirtojen vaikutukset talouteen riippuvat merkittävästi palkkojen määräytymistavasta.

Asiasanat: verotus, palkat, ammattiliitot

TAXES AND WAGE FORMATION: An introductory essay

Taxation and wage formation are intertwined in a multitude of ways. The three essays in this collection approach taxation as a group of policy instruments, and study how their use is connected to and affected by wage formation in the economy.

In the essays, taxation is used to achieve three different targets. In the first essay the role of taxation is to act as an automatic stabiliser in the face of different shocks. The time span is a business cycle, a few years. Wage formation is uninstitutional. The policy instrument is the degree of indexation of income taxes to prices. The essay combines two theoretical models from previous literature. Both models were small and analytic, and so is their mix.

The second essay was originated by the tax threat experiment in Finland in the late 1980s. The aim of policy is to cure an acute inflation problem. Thus the time horizon is one bargaining round, say a year. Several trade unions take part in wage bargaining. The policy instrument is a conditional threat to increase taxes. The study develops a one-shot game describing the determination of the threat and the decisions of the unions, and studies its solution.

In the third essay the aim of policies is to increase efficiency and welfare in the economy. The time span is several decades, long enough for households and firms to have fully adjusted their behaviour to the tax and transfer structure. Wage setting is done by majority-voting by life-cycle optimisers in a centralised monopoly union. The whole structure of taxes and transfers is the policy instrument. The essay extends a well-known dynamic general equilibrium simulation model to include a trade union.

In this introductory essay we first relate the three essays to other studies and then describe each essay in more detail.

Related literature

The first essay studies the effects of income tax indexation in an open economy context. Bruce (1981) studies income tax indexation in connection with wage indexation in a closed economy. He defines income taxes as indexed if the real amount of income taxes depends only on real income and not on the price level. Bruce claims that income tax indexation makes output more sensitive to demand shocks but less sensitive to supply shocks. These are precisely the opposite results as under wage indexation. Prices, however, become more sensitive to both kind of shocks under both income tax and wage indexation.

Aizenman (1985) studies how optimal wage indexation is affected by the degree to which domestic output is exposed to the prices of internationally traded goods. His main finding is that, under flexible exchange rates, the more open the economy is, the higher is the optimal degree of wage indexation. Aizenman's model does not include taxation explicitly, but it may interpreted to include proportional income taxes.

Both Bruce and Aizenman get clear, unambiguous results concerning indexation, but their models are very specific. This raises the question of generality. A natural direction is to merge the two models. The questions then are: What are the effects of income tax indexation in an open economy? How does optimal wage indexation depend on tax progressivity? How are wage indexation and income tax indexation related? These are the issues examined in Essay 1.

Another aspect of generality is also raised in the essay. In his analysis, Bruce allows only one transmission mechanism for taxation, through disposable income to expenditure. But even in a very aggregated model, taxation may have other important effects. Holmes and Smyth (1972) and Mankiw and Summers (1986) argue that disposable income affects the demand for money. If this is the case, then tax cuts may not be expansionary. Mankiw and Summers argue that consumer demand affects the demand for money more than other components of demand do. This makes the sign of the effect of a tax reduction on output unclear a priori. If the interest rate elasticity of the demand for money is sufficiently low, tax reductions are contractionary. Mankiw and Summers present empirical evidence concerning the U.S. economy that supports the view that both consumer demand and disposable income are better explanatory variables in a money demand equation than total GNP. The first essay studies how this affects the role of income tax indexation as a policy tool.

Income tax indexation is an alternative to wage indexation for stabililizing an economy subject to various kinds of shocks. As shown in the first essay, it is equally efficient in minimizing the loss function as wage indexation. Bar-Ilan and Zanello (1996) note that this "redundancy result" is one example in the fiscal policy context, the other being the public debt indexation analysis of Bar-Ilan and Zanello (1994). They also mention analogous results in monetary policy analysis and in an exchange rate policy context (Bar-Ilan and Zanello , 1996, p. 698).

Tax threats, the subject of the second essay, have been both a research subject and a practical policy tool in the Nordic countries. The literature is scarce. The idea of using tax threats to make trade unions accept lower wage levels was first presented by Hansen (1958, in Swedish 1955), who suggested a method where `the State makes a declaration of its plans concerning future fiscal and monetary policy for the realization of full employment and a stable value of money with alternative future money wage rates. This declaration will include a promise that fiscal and monetary policy will be constructed in such a way that at one certain money wage rate, namely the one that the State considers suitable, wage earners will achieve the highest real disposable income, whereas at both higher and lower money wage rates their real disposable incomes will be lower' (Hansen, 1958, p. 358).

The idea was later developed using game theoretic methods by Johansen (1977). In practise the idea was experimented in Norway in the mid-70s and in Finland in 1989. There have also been other more informal attempts to affect wages through tax threats and promises.

The Anglo-Saxon counterpart to tax threats is tax-based incomes policy, where the idea is to influence employers, instead of trade unions, with financial incentives to follow a given wage norm. Jackman and Layard (1990), e.g., study a scheme where a firm which pays more than the norm will pay a tax equal to t times the excess wage bill. With lower wages this tax can be negative. The key requirement is a wedge between labour costs and earnings that increases faster than either of those.

Jackman and Layard mention three reasons why mandatory attempts to impose wage norms fail (and why incentive policies may be worth trying): `First, of necessity they involve interferences with (or even suspension of) free collective bargaining between individual employers and their workers. Neither individual firms nor local union leaders like this. Second, they rigidify the wage structure, which can lead to labour shortages that are undesirable and generate huge pressures on wages. Third, the policies are typically too crude to contain earnings drift, through regrading of staff, bonuses and other evasive tactics.' Jackman and Layard do not, however, consider the possibility that policies offering incentives to follow wage norms, or threatening to penalise deviations, may also suffer from these drawbacks.

Calmfors (1989) argues that tax relief is perhaps not a good instrument in a many-union economy, because tax cuts cannot be tailored differently for different unions (in practise). Conditional tax policies, however, include other elements besides actual tax rates, and are thus potential policies also in a many-union economy. Tailoring may concern the conditions under which certain tax rates might be chosen, and not the tax rates themselves.

The previous literature thus provided a very deficient coverage of tax threat policies. The second essay here aims to provide a framework for analysing tax threats in an economy with many trade unions.

The third essay analyses the effects of pensions and taxation. The relevant literature covers four different areas: pension and tax analysis, wage bargaining, overlapping-generations models, and median voter decision making.

The effects of pensions on the economy are usually studied in an overlapping-generations framework and assuming that labour markets clear. Research has increasingly used simulation methods such as dynamic computable general equilibrium (CGE) models since the pioneering work of Auerbach and Kotlikoff (1987). This model type can be adapted rather easily to different institutional structures and other country-specific features (see e.g. the articles in Broer and Lassila, 1997) while ensuring that the analysis is explicitly based on optimising behaviour by economic agents. Both pension benefits and pension contributions are included in these analyses, which often deal with the incentive effects of benefit rules and possible pre-funding on labour supply and saving. The overlapping-generations framework has also been widely used in tax analysis. Labour income taxes, consumption taxes and capital income taxes automatically have different dynamic roles. For examples, see e.g. Broer and Westerhout (1993), Feldstein (1998), Siebert (1998) and Valkonen (1999).

Another widely used approach in tax analysis is based on trade union behaviour and bargaining. Pension contributions are present in the models as part of payroll taxes, but pension benefits are usually absent. These models usually yield ambiguous results, unless specific restrictions are put on, e.g., the union's objectives or parameter values. The results may also depend on the details of the tax system, as e.g. Koskela and Schöb (1999) show concerning the composition of wage and payroll taxes. One result is theoretically well established: tax progression is good for employment if wages are set by bargaining, but bad for employment if wages adjust to clear the supply of and demand for labour (see e.g. Koskela and Vilmunen, 1996). However, even this might not hold if hours of work are included.

Wage bargaining models have seldom incorporated an overlapping generations structure. Huizinga (1990) considers efficient bargaining, where both wages and employment are agreed upon. In his model, the union utility is the sum of the utilities of the members. Modifying the Solow-Swan growth model, Hawtrey (1990) combines trade unions and capital formation in an overlapping generations framework. Workers live and work for two periods, and positive population growth ensures that the median voter belongs to the younger generation. There are no taxes and no pension system. Capital is owned by a separate group of people, capitalists. Hawtrey emphasizes the dynamic interaction between the union's decisions and capital formation.

Intertemporal CGE models usually assume that labour markets clear: wages adjust to equate the supply of and demand for labour. A notable exception is Jensen et al. (1996). Their model includes a Blanchard - Kiyotaki (1987) type labour market, and a household sector where the probability of death is independent of age.

The median voter approach in trade unions is not new. Layard, Nickell and Jackman (1991, p. 86) state as one of their stylized conclusions that 'Union democracy means that unions maximize the welfare of the median member'. Applications are scarce, though. Blair and Crawford (1984) give a critical assessment of some applications in the 1970s. They stress that the conditions for the existence of a voting equilibrium are extremely stringent in models with choice spaces of dimensionality two or larger. Renström and Roszbach (1995) study employee share ownership in an economy with one monopoly union for each firm. Booth (1995) gives a short overview of the median-voter approach to wage bargaining. She has used the approach herself to explain the individual decision to join a union. Outside trade union models, there are several applications of majority voting to taxation, from the 1970s onwards, and to pensions, see e.g. Lassila and Valkonen (1995) and Azariadis and Galasso (1996).

The third essay is motivated by the fact that recent pension and tax analysis, which stresses the importance of intergenerational issues, has been done almost entirely with models that do not include wage bargaining. Thus two types of questions emerge: How do the bargainers take these intergenerational issues into account, and how do the results concerning tax and pension policy effects change. To study these questions, the essay incorporates a trade union with median-voter wage setting into an overlapping-generations framework of the Auerbach-Kotlikoff (1987) type.

Essay 1: **Income tax indexation in an open economy**

The starting point of the first essay is the model by Aizenman (1985). It describes a two-sector economy where the country is small in the traded goods sector and large in the nontraded sector. The relative price of traded to nontraded goods is endogenous. The more open the economy is, the smaller is the relevance of this relative price. The model differs from Aizenman's model with respect to taxation. Aizenman's model may be interpreted as one with proportional taxation, which makes all tax parameters vanish from the analysis. As in Bruce (1981) our model has progressive taxation.

In the essay, taxation brings three different ingredients into the analysis. Firstly, progressivity means that real income surprises affect real disposable income even though taxation may be indexed. Secondly, tax indexation or its absence determines whether price surprises have direct effects on real disposable income. Thirdly, there is an option of modeling money demand to depend on real disposable income, instead of conventional total real income. The essay focuses primarily with the second of these points, but its inclusion requires nonproportional taxation and the results turn out to be sensitive with respect to the third option.

The essay shows that earlier results, concerning both income tax indexation and the role of openness in deciding the optimal degree of wage indexation, do not hold under some more general assumptions.

Income tax indexation may provide an alternative or a complement to wage indexation for stabililizing an economy subject to various kinds of shocks. It is an alternative, because it turned out to be equally efficient in minimizing the loss function studied here as wage indexation. In this respect, either one indexation rule is redundant. Income tax indexation can nevertheless also be a complement, because the optimal values for wage indexation alone or tax indexation alone are not necessarily in the range between zero and one, but there may be a combination of optimal values that fulfills this condition.

There is, however, much more theoretical ambiguity concerning income tax indexation and its effects than there is concerning wage indexation. Especially, the demand for money specification is crucial for tax indexation results but not for wage indexation results. If we accept the specification where disposable income rather than total income affects the demand for money, then it is possible that we get results that are exactly the opposite to those of Bruce (1981). The more open the economy is, the more likely this reversal of results is.

Moreover, the presence of progressive taxation makes qualitative results concerning the effects of wage indexation more complex. If the variance of productivity shocks is large, compared to other variances, it is possible that the optimal degree of wage indexation is a decreasing function of the openness of the economy, not increasing as in Aizenman (1985).

Essay 2: **Tax threats and wage formation**

The starting point for the second essay was the centralized wage negotiation process that took off in autumn 1989 in Finland and led to the so-called Kallio agreement. A tax threat was a part of the process: if a vast majority of unions did not accept Kallio's proposal, income taxes would have been increased. The credibility of the threat was increased by printing the extra tax percentages into personal income tax withholding cards in advance. Some unions forsook the proposal. A majority accepted, however, and the tax threat was not executed.

The objective of the essay is to set out a framework which rationalizes a tax threat policy from the government's point of view, and allows the effects of the policy to wage formation to be analyzed. The tax threat policy is modelled as a sequential game describing one bargaining situation. This is justified by the fact that in practise tax threats, although at least seemingly successful, have been very rarely used. Several possible reasons for why threat policies are best suited for temporary policy packages are sketched in the essay.

The threat game played in this article is a reversed Stackelberg game. There is a specific order of play, consisting of four phases.

1. The government calculates the wage and price outcome that is to come if no intervention is made. It also calculates the optimal threat, in a way shown in the essay, and decides whether or not to use the threat.

2. The unions make their wage decisions, taking the possible threat into account. If no threat was made, the game ends.

3. If a threat was made, the government audits the outcome. If the conditions of the proposal are met, taxes are not increased and the wage decisions of the unions are realized, and the game ends. If the conditions are not met, the threatened tax increase is put into force.

4. If the tax increase is executed, all the unions make new wage decisions, taking the increased tax rate into account.

The solution to the game, as Pohjola (1985) notes, is subgame perfect only under precommitment or credibility. Pohjola points out that reputation building through repetitions of the game is a possible way to obtain credibility. Hansen did not put forth his proposal in a game setting, but he pondered about credibility, and his views seem to precede the reputation building approach. Johansen (1977, pp 96-97) mentions `the serious problem of credibility' as the reason why a `policy using conditional statements is therefore not an easy and simple policy, but often something of a gamble'. The policy is successful only if the other players believe the government's declarations.

The credibility of the tax threat is a key issue. The government tries to achieve a lower level of wages using a threat which, if executed, will lead to higher wages and lower employment than would have resulted without the threat in the first

place. In the essay, credibility is obtained by introducing costs of cheating. This makes credibility depend on the size of the threatened tax increase. By limiting the size of the threat the distributional effects of the policy and the necessity to tailor the threat become apparent.

The word `threat' itself has strong negative connotations. A government which in normal times systematically threatens a group in the society is seldom very popular, unless the motives of the government are generally thought important. Making a threat thus has some direct cost attached to it. For the government, it costs popularity points. Even if a threat is totally credible after it is presented, this does not mean that it is a good instrument. Its presentation costs may be such that it is advantageous only on rare occasions. But in some cases the cost may be negative: if the economic situation is bad or worsening rapidly, the government is expected to do something. A threat policy may be cheered by the public, even though in normal times it would be received with dismay.

After a threat is made, and the possible popularity cost is paid, there may be another kind of cost. If the threat has not had the desired effect, the government has to decide whether to execute the threat or not. The government clearly has a strong incentive to cheat. In the model the essay uses, the tax increase would trigger more wage increases and make the situation worse than it would have been without the threat intervention.

But there is also an opposing factor. A cheater gets a bad reputation. Thus cheating has direct costs. In the essay, these costs are included in the utility calculation of the government. This way of modelling makes minor threats more credible than major threats. Threats are executed if the cheating costs are greater than the costs from worsening unemployment. Doubling the tax rate would probably drive the economy into chaos, and such a threat would hardly ever be believed to be executed. A small increase in taxes, on the other hand, would not collapse the economy. Such a threat might be considered credible if the government is thought to value its own word. In the Norwegian and Finnish experiences the threatened measures have been rather small.

The framework presented in the essay gives a theoretical basis for successful tax threat policies. The two practical applications mentioned, in Norway and in Finland, have also been successful, at least in the sense that the governments' proposals have been accepted by the unions. Why, then, are these policies not used more often?

A simple explanation might be that the cost of making the threat is usually very high. Interference, especially in the form of a threat, may make the government so unpopular that it cannot offset that with the gain from higher employment. Only under exceptional circumstances may the cost be low enough to warrant the threat. Another reason is that systematic threat policies by the government may become anticipated, and in time create counter-threats.

Jackman and Layard (1990) mention three reasons, cited earlier, why attempts to impose wage norms fail. All these reasons also discourage using tax threats. The first, interfering with the free collective bargaining between employers and workers, is especially important due to the tailoring feature of tax threats. Any threat considered in the essay can be interpreted as a threat tailored towards some unions, irrespective of whether that was the aim of the government or not.

Jackman and Layard's second point, rigidifying the wage structure, applies directly also to tax threats. The third point is also relevant: tax threat policies may in reality have been ineffective, because the wage limits have been dodged in various ways. Union-wise wage contracts are rarely transparent to anyone except, perhaps, the negotiators themselves, and in addition wage drift is an important part of wage formation.

Although tax increases or cuts cannot in practise be tailored differently for different unions, as Calmfors (1989) noted, the essay shows that conditional tax policies are possible. Even though the threat is expressed as a conditional increase in taxation that is the same for all unions, the setting of the threat is done by tailoring it to those unions which, when accepting the proposal, would lower their wage demands so that the effects were maximal. The key word is `conditional'. Tailoring concerns the conditions under which the threat might be executed, not the tax rate that would then result.

Essay 3: **Wage Formation by Majority Voting and the Incentive Effects of Pensions and Taxation**

The third essay aims to analyse the effects of pensions and taxation so that both the overlapping-generations dynamics and trade union decision making are included. A novel feature in this study is to incorporate a trade union with median-voter wage setting into an overlapping-generations framework of the Auerbach-Kotlikoff (1987) type. The model used in simulations is an open economy model and has been used previously to analyse pension policies, other social transfers, taxation, globalisation and ageing in Finland (see references in the third essay). It is a dynamic general equilibrium model with an overlapping-generations structure, and is modified to include a trade union.

The median voter approach is almost directly applicable to a numerical OLG model. Workers differ in age, and their gains and losses from higher wages differ also, because the length of remaining working years, wealth, accumulated pension rights etc. differ. The median voter approach has the advantage of exactly defining the target of the trade union: no additional assumptions are needed as all relevant information is included in the households' utility functions. The approach also defines the dynamic aspects of the trade union's decision: the horizon is that of the median voter. One feature needs to be added to the model, namely a mechanism or rule stating how employment is divided among households. In the essay, employment is divided equally among all households.

If there were no trade union, each household would make its own decisions concerning leisure and consumption. Here the trade union makes the leisure-consumption choice for the households. Furthermore, its decision affects the terms of the choice, the trade-off that there is between leisure and consumption in each period. The current trade-off is affected by the previous choices, and the current choice will affect the trade-off of the current and future periods. There is a dynamic element: by increasing the wage, the trade-off is better for the union today but worse tomorrow. The combined effect is what counts.

The essay shows that there is an equilibrium wage level in our model which the majority of workers wants neither to increase nor decrease. This wage is higher than the market-clearing equilibrium wage, and, correspondingly, employment is lower. How big this difference is depends on many features of the economy, such as the substitutability of labour and capital in production, price elasticities between foreign and domestic goods in consumption, investment, intermediate use or in the export markets, and individual preferences between leisure and consumption. The difference is smaller when taxation and the pension system discourage individual work incentives. When, e.g., the pension benefits and the corresponding payroll tax are increased, the voting equilibrium wage level approaches the market equilibrium wage. Similar results are obtained with respect to labour and consumption taxes.

Our analysis stresses the importance of intergenerational aspects. For example, the higher is the earnings-related PAYG pension benefit level, the lower is the wage the median voter chooses, for two reasons. Firstly, if the voter claims high current wages his lifetime wage income falls, which will lead to lower pensions, and the advantage of lower pension contributions goes to future working generations. Secondly, the median voter has to pay higher contributions both because the current wage bill falls and because current pensions may increase due to indexation. Both these generational transfer effects lead the median voter to choose lower wages, which leads to higher employment. Thus, the incentive effects of, e.g., pension policies can be drastically different in a unionised economy from the effects in an economy with non-union labour markets.

Concluding comments

The three essays reflect the diverse approaches used in economic research of taxation and wages. This diversity in itself demonstrates something essential about taxes: if even in these simplified partial settings the analysis usually becomes complicated, and unambiguous results are scarce, then it must be difficult to achieve desired policy targets using taxes as instruments. Table 1 presents some central features of the essays.

Income tax indexation clearly works as a policy instrument, at least in the simplified workhorse model used. But it seems to be a difficult instrument. It can reproduce the same effects as wage indexation, but requires much more knowledge. Even the signs of the effects depend on many parameter values.

Tax threats are seemingly efficient. Both cited empirical applications, in Norway during the 1950s and in Finland in the late 1980s, were successful. The article gives one possible rationalisation for the use and success of such policies. Why, then, is this instrument not used more often? The article lists some features that are missing from the analysis. Some are of a political economy nature, such as the inappropriateness of constantly threatening others. The non-use of this seemingly efficient instrument reveals that policymakers attach costs to its use. It is like a strong medicine, for exceptional circumstances only.

In the third essay, the structure of taxation is really the instrument. And not only taxation but also the transfers that the tax revenues are used to pay, and the rules related to those transfers, such as pension benefit determination. The tax and transfer structure affects the efficiency and welfare of the economy, through complex dynamic channels, and how it affects also depends significantly on wage formation.

Table 1. Central features of the three essays

Essay	Income tax indexation	Tax threats	Majority voting wage setting
Model type	Workhorse model, analytic	One-shot game, analytic	Optimisation model, simulation
Main actors	Markets, government	Government and trade unions	Households, firms, trade union
Time span	Business cycle, shock and adjustment	A bargaining round	Human lifespan
Policy target or point of view	Shock adjustment, automatic stabilisation	Acute inflation problem	Efficiency and welfare
Main contribution	Demonstrates that previous unambiguous results do not hold under more general assumptions	Provides rationalisation of the use of tax threats	Combines overlapping generations and trade union in tax and pension analysis

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