FINANSMINISTERIET

The Law Model

May 2003

The Law Model, May 2003

1   The law model

A law model has two basic elements: A database and an act of law converted into computer language.

The database in the law model is normally a 3.3 per cent random sample of the Danish population, equivalent to approximately 179,000 individuals. A sample of 10 per cent equivalent to approximately 535,000 individuals is also available, though.

This database is referred to as a *model population* and contains a large number of pieces of information for each individual. These are anonymous in the sense that there are no Personal Identification Numbers and no address information on individuals in the model population.

An example of an act of law converted into computer language is the personal tax law. Based on the income information for each individual of the model population, the so-called tax model calculates the income tax for every individual.

The effect of amendments to the tax laws can be calculated as well. The tax model is adjusted to the new rules, and the income tax according to these new rules can be found. By comparing the income tax for every individual in the two calculations the *distributional effects* of the law amendment can be determined. By adding all individual changes in taxation, the change in *public sector revenue* can also be determined.

Law model calculations show the immediate effects from law amendments given the historically known behaviour in data. In other words, the calculations don't take into account possible changes in behaviour following a law amendment.

Sub-models have been created to cover a number of specific areas of legislation, e.g. an income tax model, a public pension model, a housing subsidy model and a model for payment to day care institutions. For each regulatory area, a model can be applied to calculate the effects of an amendment for each individual in the model population and the effect on the public budget.

Law model calculations can also be applied to determine *economic incentives to work*. By using the tax model it is possible to calculate the *marginal income tax* for individuals, i.e. the fraction of an increase in income that has to be paid in taxes, given the income in the initial situation. By combining calculations from the tax model with other models it is possible to calculate so-called *effective marginal tax rates*, which show the combined effect of increased income taxation and loss of means tested public benefits when income increases by a small amount. Finally it is possible to calculate the so-called *income gap*, which is defined as the difference between disposable income in full-time employment and disposable income in full-time unemployment.

The model populations are generally a very useful basis for a number of analytical purposes, especially analyses of the income distribution in Denmark. Detailed information on the composition of income and taxes makes it possible to perform in-depth analyses of for example the distributional effects of public income transfers and taxes. Furthermore one can analyse the development over time of disposable income for different groups of age in the population.

The annual publication *Income distribution and work incentives* from the Ministry of Finance shows updated analyses of the income distribution and the economic incentives to work. In effect, this publication carries on analyses on subjects that were previously treated in the Danish publications *Families and incomes* and *The Danish Economy – Medium term economic survey*.

The formation of the model populations takes place in Statistics Denmark while the development and maintenance of the law models takes place in the Ministry of Finance.

The use of the Law model is limited to the central administration only. Apart from the Ministry of Finance, the most frequent users are the Danish Ministry of Taxation, Danish Ministry of Economic and Business Affairs, the Ministry of Social Affairs and the Danish Ministry of Employment.

In order to comply with requests from NGO organisations, researchers and others of specific analyses using the law model, the Ministry of Finance may to a limited extend perform calculations for external requisitioners against charge. This arrangement does not comprise calculations on specific policy suggestions, though.

In accordance with certain agreements with Statistics Denmark it is also possible for institutions outside the central administration to gain access to some parts of the Law models' database against charge.

Please direct inquiries to:

The Ministry of Finance
Christiansborg Slotsplads 1
13th division
DK-1218 Copenhagen K
Denmark
Telephone: +45 33 92 33 33
E-mail: fm@fm.dk

2   Overview of the models

The existing law models cover the following regulatory areas:

Box 2.1. Existing models of specific regulatory areas

Model	Purpose
Income tax model	Calculation of labour market contributions, personal income taxes and property value tax
Public pension model	Calculation of public pensions
Housing subsidy model	Calculation of individual housing subsidies
Day care model	Calculation of payment for day care
Unemployment benefits model	Calculation of unemployment benefits
Cash benefit model	Calculation of cash benefits
Sickness benefit model	Calculation of sickness benefits
Land tax model	Calculation of municipal and county land tax
Motor taxes	Calculation of vehicle excise duty

The following models are presently under development:

Box 2.2. Model areas under development

Model	Purpose
Early retirement model	Calculation of early retirement benefits
Health and heating allowance model	Calculation of health allowance and heating allowance for pensioners
Multi-year tax model	Calculation of income taxes etc. over a 5-year period

The above-mentioned models each cover a specific regulatory area. When combining several models it is possible to analyse the interaction between different areas of legislation. At present the following combination models are available:

Box 2.3. Models combining several areas of legislation

Model	Purpose
Pension-tax model	To determine the interaction between tax laws and public pensions
Interaction model for pensioners	To determine the interaction between taxes, public pensions and housing subsidies including calculation of effective marginal tax rates for pensioners
Interaction model for working age population	To determine the interaction between taxes, housing subsidies and payments for day care institutions including calculation of effective marginal tax rates for workers
Income gap model	Calculation of difference between disposable income in full–time employment and in full-time unemployment

The law model includes furthermore certain models that are not linked to a specific area of legislation, and where the type of calculation differ somewhat from the models mentioned above:

Box 2.4. Other models

Model	Purpose
Family type model	Calculation of the economic situation for stylised family examples with certain predefined characteristics
Lifetime income model	Calculation of lifetime income using individual multi-annual information.

It should be noted, that the family type model don't utilize data from the model populations, but is instead based on a panel of stylised family examples. Hence, calculations with the family type model is of a rather different nature than calculations with other law models, see chapter 6 for further explanations.

3 The database

A precondition for working with law models is the access to detailed data on an individual level. Law models of specific regulatory areas require knowledge of all relevant information used for the individual calculation of public transfers or taxes in question.

3.1. Forming the model populations

The model populations are random samples constructed in the framework of Statistics Denmark. The law models' samples are referred to as model populations, since they are in fact miniature models of the Danish population.

Each year a number of model populations with different characteristics are formed. To begin with, it is important to distinguish between one-year model populations and multi-year model populations, *see box 3.1.*

Box 3.1. Overview of model populations, May 2003

Model population type	One-year model populations	Multi-year model populations (panel-data)
Year (s) included:	(1979)/1983-2001	1993-2001
Properties:	New sample every year drawn on household level. Representative on the household and the personal level. New set of persons every year.	Multi-annual information (panel-data) based on a random person sample drawn in 1993. Representative on the personal level each year.
Sample size:	1/10, 1/30, 1/100	1/10, 1/30

A new *one-year model population* is formed each year on the basis of a random sample of all Danish households on January 1. All persons living in the selected households are included in the model population. This method ensures that the model population is representative on the household level and on the personal level in the year in question. A new sample is drawn every year, hence each model population contains a new set of persons. One-year model populations have been formed on a yearly basis since 1979, but information before 1983 is scarce.

The *multi-year model population* is formed on the basis of a random sample of all persons in Denmark at the end of 1993. These persons are referred to as the *head persons* of the model population. In each of the preceding years the aim is to select the same persons as in the reference year, so as to form panel-data. Some have deceased or emigrated, though, and the sample is supplemented with randomly chosen newborns and immigrants, so as to ensure that the model population is representative on the personal level in each year. Each year the multi-year model population is augmented with all the persons sharing the same household as the selected head persons in the year in question. These persons are referred to as the *subordinate persons* of the model population.

For practical purposes different *sizes* of model populations are formed every year.

The largest available samples comprise 1/10 of the Danish population, corresponding to approximately 535,000 persons in 2001. The large samples are used only in special analyses concerning relatively small subgroups in the population, in which case smaller samples would contain to few persons, e.g. calculations concerning immigrants or persons who have retired early during a specific year.

The smaller samples comprise respectively 1/30 of the population, corresponding to 179,000 persons in 2001, and 1 per cent of the population, corresponding to 53,500 persons in 2001. In most law model calculations, e.g. changes in the tax system, which affect many taxpayers, the smaller samples are generally sufficient.

The formation of a new model population typically commences 2-3 months after the turn of the year, when Statistics Denmark has made the relevant population statistics register available.

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When the persons within the model population have been selected, all available information on income, social conditions, economical relationship with the public sector, demographic conditions, the use of day care centres, education etc. is added. Information on individual persons and households is found in a number of different registers primarily in Statistics Denmark.

When information has a certain reference date (status information), information as close to January 1. as possible is used. When the information relates to a certain period, the information from the year before is used. As an example, 2001 model population contains information on a persons age, marital status and dwelling on January 1. 2002, as this is status information, while information on e.g. income (from the yearly tax assessments) concerns the year 2001.

The addition of relevant information takes place successively as statistical registers become available. Normally a period of 1½ years elapses from the start of the formation of a specific model population until all relevant information is added to the model population. Thus, the model populations for 2001 are presently (in May 2003) the newest model populations available for normal law model calculations.

It is possible, though, to commence using a model population for some purposes, even though not all information is available. Information concerning e.g. housing subsidies can be made useful as soon as these data are added to the model population, even though information concerning e.g. incomes are not yet made available.

After forming the model population, the individuals in it are made anonymous, in the sense that addresses and Personal Identification Numbers are removed. Such information is therefore not available to the users of the law model.

3.2. Contents of the model populations

The model populations are formed, primarily by using statistical registers from Statistics Denmark. The model populations contain a large number of pieces of information, *see box 3.2.*

Most of the information comprised in the model populations is available due to the public administration of the different legislative areas. For example the income information is used for taxation purposes while information on pensioners is used in the calculation of public pensions.

Box 3.2. Data areas in the model populations

Data area	Source
Unemployment benefits	Unemployment benefit register (DUR)
Labour market organization	AMFORA
Labour market attachment	Register based Labour Force Survey (RAS)
Housing subsidies	Housing subsidy register
Child benefit	Child benefit register
Day care use	Day care register
Partial public pensions	Pensioners statistics register
Properties: Dwellings and owners	Property statistics register (BBR)
Property evaluation and taxes	Property register (SVUR)
Property value tax	Property value tax register (EVS)
Use of electricity, water and heat	The Municipal consumer register
Use of medication	Medication statistics register
Hospital services	Patient register (LPR) og DRG
Income and taxes	Income statistics register
Cash benefit	Cash benefit registers
Unemployment	Unemployment statistics register (CRAM)
Salaries	Salary statistics register
Motor vehicles	Vehicle register
Pension taxation	Register for Pension taxation (PAF)
Payments to pension schemes	Register for payments to pension schemes
Personal allowances to pensioners	Register for personal allowances to pensioners
Person- and family information	Population statistics register
Public pensions	Pension statistics register
Sickness and maternity benefit	Sickness benefit statistics register
Health insurance	Health Insurance statistics register
Education	Education statistics register
Adult education	Course registers

Information on yearly incomes originates from the Ministry of Taxation Central Customs and Tax Administration, information on unemployment comes from the National Labour Market Authority etc. Much of the information concerning legislation on various social benefits stems from the KMD-system (the IT centre of the National Association of local municipalities and the Association of County Councils in Denmark), e.g. information on calculation and payments of public pensions, housing subsidies, cash benefits and sickness benefit.

The gathered data is the foundation of Statistics Denmark's statistical registers, that are used in the official production of statistics. These registers are the basis of the model populations of the law model.

However, the law model also makes use of certain kinds of data that are not used in the official production of statistics and therefore are not gathered by Statistics Denmark. As an example, the Ministry of Finance gathers special data on the calculation of property value taxes and cash benefits as well as data on household consumption of electricity, water and heating.

A complete model population may in principle contain some 1,500 pieces of information (variables) on each person. However, the number of relevant pieces of information on a specific person is in fact far less, since no person is present in all registers.

It should be noted, that standard law model calculations don't utilize all the available information on each person. Many pieces of information are rarely used. It has been chosen, though, to include all available information in the model populations as to have the possibility of conducting analyses on all possible areas.

The law model calculations have to be based on two years old information, as the model populations are based on historical registers. Therefore it is typically necessary to update or project relevant information to the present time, e.g. information on incomes is typically projected.

Technically, the model population is partitioned into a number of data sets. The information on social pension constitutes one data set, information on incomes and taxes another, *see box 3.3 for an example.*

Box 3.3. Example of contents of a dataset in the model population

The data set concerning unemployment and unemployment insurance contains information on each individual in the random sample who either has registered as a member of an unemployment fund, or has been affected by unemployment. The data set contains the following information (variables):

Marking for leaving unemployment fund
Code for reason for leaving
Early Retirement Benefit Marking
Insurance Category (full-time/part time etc.)
Number of insured hours per week
Degree of Unemployment
Name of Unemployment Fund
Number of unemployed hours in year
Marking for unemployment at the beginning and end of the year
Number of unemployment periods
Unemployment Insurance Conditions

4 The substance of a law model

A law model is simply a computer program following the structure outlined in the following figure:

Figure 4.1. Schematic structure of a law model
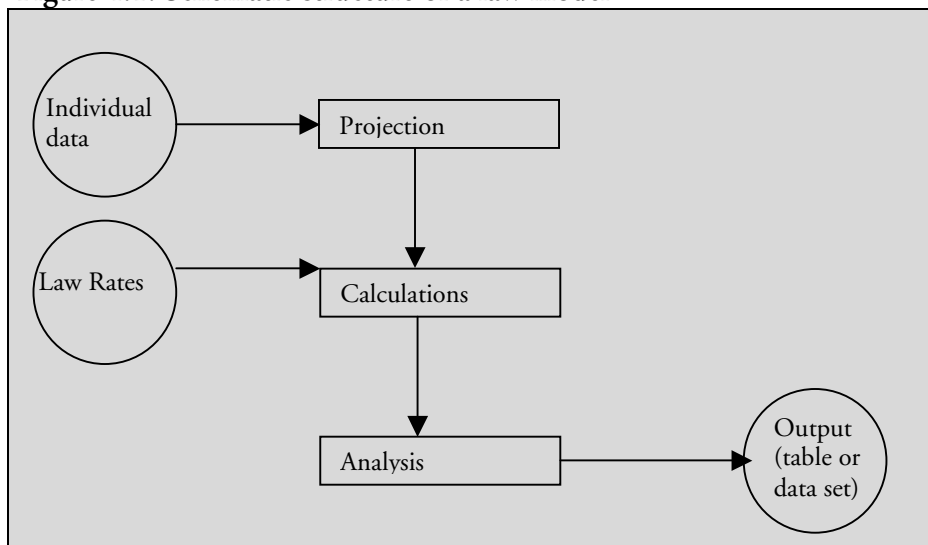
Personal data from the model population are the primary input to the specific calculation. As mentioned, available data are typically a couple of years older than the year of the analysis, and it is therefore necessary to make some adjustments to data. The standard adjustment is a projection of all amount variables to the price and wage level of the year of the analysis. The projections are based on official forecasts.

Relevant law rates are used, or, if the analysis concerns an amendment, the intended new rates. The basic calculations for each individual are then

performed. At this point in the law model, the official law text has been converted into "programming code".

When the law calculation has been completed, every person in the model population has been assigned a specific benefit or tax payment. The overall result of the calculation is either a set of result data for further analyses or a number of output tables illustrating the distributional effects or revenue changes due to the proposed amendment.

In a law model the official purview has been translated into computer programming code. *Box 4.1* shows an example from the housing subsidy model where the actual benefit is calculated as a function of both income and rent. The left column shows the relevant purview, while the right column shows the corresponding programming code. The example has been simplified, but it shows the basic principle of a law model.

Box 4.1. Example of a law calculation

Purview from Act on Individual Housing Subsidy	Same text in programming code
§21. Housing subsidy is calculated as the difference between, on the one hand, 75 per cent of the annual housing expense, cf. chapters 2 and 3, with an addition of DKK 4,000, cf. §72, subs. 1, item 10, and, on the other hand, 22.5 per cent of the household income after §8 above an income limit of DKK 95,000, cf. §72, subs. 1, item 11. If there is more than one child in the household, the income limit will be increased pursuant to the first clause by DKK 25,000, cf. §72, subs. 1, item 12, for each child in excess of one child up to and including four children.	*IF year $\geq$ 2004 THEN DO;* *Income limit = 95000 + 25000 * MIN[MAX(0, no. children - 1), 3];* *Rent allowance = MAX[0, ROUND ((75 * (dwelling expenses. + 4000) – 22.5 * (household income – income limit))/100, 12];* *END;*

Law model users have to connect to Statistics Denmark through a terminal. The models are programmed in the SAS programming language, and the model populations are stored as SAS databases.

It should be noted, that law model calculations only show the immediate effects of an amendment. Hence, possible behavioural changes due to an amendment are not included. A reduction in the transport allowance might lead to less transportation, or a change in the individual housing subsidy might lead to a change in the accommodation pattern. Such

dynamic effects are not taken into account in the results from the law model calculations.

However, some steps have been taken to augment standard law model calculations with estimates of derived behavioural effects from certain changes in legislation. In *Income distribution and work incentives 2002* a number of possible changes in the labour supply as a result of changes in the work incentives due to different changes in the tax system have been calculated, see further explanation in chapter 5.

The long-term goal is to utilize multi-year information in law model's database together with new results from the economical research to gradually strengthen and enhance the possibilities of estimating dynamic behavioural changes due to changes in legislation.

5 Results from a law model calculation

Most law models serves two main purposes: to produce estimates of the gain or loss of public sector revenue due to intended legislation and to determine the consequences for the income distribution and the work incentives.

5.1. Revenue calculations

Table 5.1 shows the revenue consequences of a comprehensive (hypothetical) tax reduction, using the income tax model.

Table 5.1. Revenues of a hypothetical change in the personal tax system

Tax	Before change	After change	Difference
	-------DKK million-------		DKK million
1. Lower-bracket tax	40,295	34,081	-6,214
2. Middle-bracket tax..............................	13,179	10,983	-2,197
3. Top-bracket tax	15,526	14,440	-1,086
4. Municipal tax	127,968	122,092	-5,876
5. County tax	59,652	54,642	-5,010
6. Church tax	4,336	4,336	0
7. Total income taxes............................. (=1+2+3+4+5+6)	260,956	240,573	-20,383
8. Real estate value tax	8,602	8,602	0
9. Total tax.. (=7+8)	269,558	249,175	-20,383
10. Labour market contribution................	53,963	53,963	0
11. Special labour market supplementary pension savings.......................................	7,232	7,232	0

In this hypothetical example all income tax rates are lowered by one percentage point (in the municipalities of Copenhagen and Frederiksberg, the municipal tax is lowered by 2 percentage points, though, because no

county tax is levied in the municipalities of Copenhagen and Frederiks-berg). The "tax ceiling" is lowered by 5 percentage points. The church tax rate, the real estate value tax rate, labour market contributions and special Labour Market Supplementary Pension savings are unchanged. Individu-al decreases in taxation vary between nearly 2 and nearly 5 percentage points, depending on the income level.

The law model calculation shows, that the hypothetical tax reduction will imply a loss of public sector revenue by approximately DKK 20 billion.

5.2. Distributional consequences

A reduction of taxes as described in section 5.1 would imply an increase in disposable income for all taxpayers. In most cases legislative changes imply that some groups gain while other groups lose, for example when revenue-neutral amendments are considered. A possible outcome could be a redistribution of income from households with high income to households with low income.

Law model calculations are very useful for illustrating the distributional consequences of a law amendment.

Table 5.2 below shows the distributional effects for pensioners given a hypothetical amendment to the Act on individual Housing Subsidy. The example shows the consequences of decreasing the maximum dwelling size eligible for subsidy from 65 sq. metres to 60 sq. metres for single pensioners and increasing the maximum dwelling size eligible for subsidy from 85 sq. metres to 90 sq. metres for pensioner couples.

Not very surprisingly, the losers due to the adjustment are the single pensioners who on an average lose DKK 1,060 in annual housing subsidy. Pensioner couples gain on average DKK 470. The net public revenue is estimated to increase by nearly DKK 200 million.

Table 5.2. Distributional effects from a hypothetical change in the housing subsidy rules

Household Income	Number of Households	Aver. Subsidy current rules	Aver. Subsidy, changed rules	Aver. Loss
			------------------DKK------------------	
Single Pensioners				
< 95,000	134,580	20,860	19,880	-980
95,000 – 150,000	61,280	19,760	18,560	-1,200
150,000 - 200,000	14,940	11,900	10,690	-1,210
200,000 – 300,000	3,230	6,000	4,990	-1,010
> 300,000	740	0	0	0
Total	214,774	19,630	18,570	-1,060
Pensioner Couples				
< 95,000	590	25,900	26,230	330
95,000 – 150,000	15,020	20,270	20,690	420
150,000 – 200,000	25,370	15,970	16,480	510
200,000 – 300,000	12,200	8,550	9,070	520
> 300,000	1,230	880	880	0
Total	54,410	15,260	15,730	470

Note: The calculations are based on the housing subsidy register for December 1999. All amounts are at 1999 level but with 2002 rules for calculation of housing subsidy. The table includes only rented housing subsidy for pensioners in ordinary dwellings. The changed rules constitute a hypothetical example of decreasing the housing size eligible for subsidy from 65 sq. metres to 60 sq. metres for single pensioners and increasing the level from 85 sq. metres to 90 sq. metres for pensioner couples.

5.3.   Interaction problems

Public benefits in the social system are generally aimed at low-income families. This is typically achieved by decreasing public benefits with increasing income of the recipient. Simultaneously, the increase in income is taxed. An increase in income for a recipient of public benefits will therefore often lead to a reduction in public benefits as well as an increase in income tax payment.

The simultaneous taxation and decrease in public benefits may lead to the so-called interaction problem – some times also referred to as the low-income trap – i.e. the phenomenon that some recipients of public benefits gain very little from an increase in wage income and hence have

very little or no economic incentives to seek employment or to work more.

The Law model is very useful for examining the interaction between the taxation system and the social legislation. By combining calculations from the tax model with other models it is possible to calculate the so-called effective marginal tax rate.

Initially all adults in the model population are given an increase in their wage income of 1,000 DKK. The law models are then used to calculate the increase in income taxes and the decrease in public benefits implied by this increase in income.

By comparing the increased taxes and the decrease in public benefits with the initial increase in income the effective marginal tax rate can be calculated. This rate shows the share of additional income that is lost due to increased income tax payment and reduced public benefits.

Some 3.2 million adults belong to the working age group (excl. persons in early retirement). About half of these persons – 1.6 million - have an effective marginal tax rate between 8 and 45, *see table 5.3*. It is assumed, that the 2004 tax reform is fully implemented (this happens in 2007).

Table 5.3. Effective marginal tax rates for working age population, 2007

Effective marginal tax rates	Family type								Total
	1 adult				2 adults				
	Number of children				Number of children				
	0	1	>=2	Total	0	1	>=2	Total	Total
	The number of families								
8-45.........	636,540	15,330	12,150	664,020	603,540	151,440	199,650	954,630	1,618,650
45-50.......	103,590	9,810	4,260	117,660	196,380	91,620	155,820	443,820	561,480
50-55.......	23,550	4,560	3,840	31,950	45,030	31,620	55,620	132,270	164,220
55-60.......	9,000	9,600	6,090	24,690	53,010	15,060	36,690	104,760	129,450
60-64.......	150,330	16,680	7,140	174,150	242,280	107,400	177,150	526,830	700,980
64-66.......	1,050	4,980	3,300	9,330	1,020	570	2,640	4,230	13,560
66-70.......	180	5,670	4,860	10,710	330	1,260	3,690	5,280	15,990
70-75.......		1,350	2,940	4,290	300	570	2,640	3,510	7,800
75-80.......	60	240	630	930	120	90	840	1,050	1,980
>80..........		150	540	690	120	60	90	270	960
Total.......	924,300	68,370	45,750	1,038,420	1,142,130	399,720	634,830	2,176,650	3,215,070

The highest possible marginal tax rate within the income tax system is a little less than 64 per cent. However, around 40,000 persons have an effective marginal tax rate that exceeds 64 per cent. Hence, the

interaction between taxes and the means testing of public benefits implies that these persons are effectively taxed at a higher rate than the highest income taxation rate. Relatively many single parents – 25,000 out of these 40,000 persons – have high effective marginal tax rates.

In recent years, however, the number of persons with high effective marginal tax rates has been substantially reduced. In 1996 some 75,000 persons had an effective marginal tax rate above than the highest income taxation rate (amounting to 66 per cent in 1996).

The calculations illustrate a fundamental dilemma in social policy: Considerations regarding income distribution and the size of public expenditures imply that social benefits are primarily aimed at families with relatively low incomes. On the other hand, means testing of social benefits leads to higher effective marginal tax rates, thereby reducing the economic incentive to actively seek to become self-supporting.

Apart from the interaction problems for working-age individuals, similar problems exist for pensioners. However, the means testing of pensioners' public benefits is based on incomes, which are typically more or less fixed and hence not liable to be considerably affected by current behaviour. On the other hand, interaction problems for pensioners may possibly affect the incentives to save among presently working persons.

5.4.   Incentives to work

The marginal tax rate affects total labour supply through the incentive to increase the number of working hours (the hours decision), while the participation rate reacts to changes in the income gap between public transfers and income from employment (the participation decision).

The income gap is a comprehensive measure that includes all relevant taxes and subsidies such as rent subsidies and subsidies for day care. Furthermore it includes expenditures for transportation between dwelling and work while employed and the value of labour market pensions. *Box 5.1* presents an example of an income gap calculation.

Box 5.1. Example of an income gap calculation

Estimation of the monthly income gap for a single parent in 1999:

	DKK
Gross wages-(Labour market contribution+ special contribution to pension fund)	19,858
- Unemployment benefits	-11,670
- change in tax	-3,439
- change in day care payment	-310
- change in housing subsidy	-1,377
- change in net transportation expenses	-258
+ change in net pension payment	800
- change in spouses public benefits/pension	0
- change in other expenses	0
= difference between salary and transfer income pr. month	=3,604

Source: Own calculations.

The example covers a single full time employee living in rentet accommodation with one child engaged in after school activities. Unemployment benefits are in this case the alternative to wage income. Unemployment benefits are below the yearly amount for the maximum unemployment benefit in 1999, which equals 143,520 DKK, because, the so-called SP-contribution and the share of own payment of the ATP-contribution is subtracted. Both are instead included in the calculations of change in net payments to pension schemes.

The majority of the fully employed obtain a significant economical gain by being employed rather than unemployed, *see table 5.4 below.*

Table 5.4. Income gap, 1999

Income gap (DKK)	Below 1,000	1,000-2,000	Above 2,000	Total	Average DKK
		1,000 persons			
Fully employed............	136	158	1,630	1,924	5,700
Part time employed	52	50	231	333	3,800
Unemployed	44	46	106	196	2,700
Early retirement reciepients[1]	6	25	95	126	3,600
Total	238	280	2,061	2,579	5,100

1)   The amount of difference is not calculated for individuals who started receiving early retirement benefits in the year 2000.
Source: Own calculation on the basis of a 3.3 pct. sample of the population.

Among the 1.9 million fully employed 136,000 have an income gap below 1,000 DKK monthly, while 294,000 have an income gap below

2,000 DKK. Hence approximately 85 per cent of the fully employed have an income gap exceeding 2,000 DKK monthly.

5.5.   Dynamic effects

As shown in the previous sections the Law model can calculate the direct effects on public finances, income distribution and economic incentives of a particular change in legislation. However the direct effects does not take into account that individuals adapt their behaviour to the changes in economic incentives. The change in behaviour in turn leads to further changes in public finances. These second order effects are called dynamic effects.

While the incentives to work can be precisely calculated the dynamic effects of changes in these incentives, such as effects on labour supply, unemployment and public finances, depend on a number of complicated factors that can not be quantified with a high degree of precision.

The average number of hours worked depends primarily on individual decisions regarding the choice between work and leisure. With specific assumptions about individual labour supply functions it is possible to estimate the hour effect of a particular policy change, see box 5.2.

The economic incentive to participate in the labour market depends on the difference in disposal income between working and receiving unemployment benefits. This difference is measured by the income gap.

In contrast to the hours decision, the participation effect does not solely depend on individual decisions, but on various institutional factors regarding labour market supply and demand. Therefore it is not necessarily appropriate to base estimates on participation effects on assumptions regarding individual behaviour. Instead so-called macro-elasticities can be used. They stipulate a fixed ratio between for instance changes in the average net compensation rate and the changes in the structural unemployment rate, *see box 5.2.*

Box 5.2. Calculating the labour supply effect

Effect on hours worked

The calculations are based on two different labour supply functions, one for men (M) and one for women (W). They describe how changes in marginal net wages and changes in *other income* affect the number of hours worked. *Other income* covers income from other sources than wages, i.e. interest income and transfer payments.

M: Working time= 17*ln(marginal wages) – 0.01*(Other income) + constant
K: Working time = 49*ln(marginal wages) – 0.04*(Other income) + constant

Working time is measured in hours pr. year, marginal wages in DKK pr. hour and other income in DKK pr. year. ln( ) is the natural logarithm.

Participation decision

In *Income distribution and work incentives 2002* the following macro elasticities were used:

A 10 percentage point decrease in the average net compensation rate for employed and unemployed individuals leads to a 0.7 percentage point reduction in the structural unemployment.

A 10 percentage point decrease in the average degree of compensation for people in the age group 60-64 years leads to a 1 percentage point increase in labour supply from this age group.

The table below shows the estimated effects from lowering the personal income taxes with 5bm DKK in 6 alternative ways.

Labour supply effects of different tax reductions

	Changes in the labour supply, % of the labour force		
	Changes in hours worked	Changes in participation rate	Total
Personal income tax allowance	-0.04	-0.02	-0.06
Lower tax rate......................	0.09	0.01	0.10
Medium tax limit	0.24	0.06	0.30
Medium tax rate.................	0.33	0.05	0.37
High tax limit.....................	0.35	0.02	0.37
High tax rate	0.28	0.01	0.29

When the labour supply effect has been estimated, the dynamic effects on the public finances can be calculated using the tax model.

6 The family type model

The purpose of the family type model is to produce illustrative examples of the economic situation for stylised families with certain characteristics concerning employment, salaries, dwelling, children and age etc. Calculations using stylised families include only information characteristic to the stylised family examples in question, i.e. representative data from the model populations are not applied. Hence the family type model is different from other law models.

Family type calculations are useful to illustrate the development of the economic situation over time for a specific family type and to compare the development for different family types. Family type calculations are simplified examples compared to the calculations based on representative data. However, the method of using stylised family examples has the advantage of making it rather easy to identify specific effects of economic policy measures and other exogenous factors, when the situation at a specific time is considered.

It should be noted, that a specific stylised family type has the same basic characteristics every year in the analyses. As an example, in a stylised family with two children, the children are respectively 5 years and 9 years old every year. Hence, family type calculations can't be used to illustrate the development for any individual family over time, but are useful to compare the economic situation between different families facing comparable situations at different times.

The model calculations are organized in an Excel spreadsheet containing a wide variety of possibilities of forming family types with different characteristics. However, the most frequently used family types are gathered in a standard panel, *see box 6.1*.

Box 6.1. Standard family types in the family type model

Type no.	Description	Income[1] DKK, 2000	Value of dwelling or rent DKK
Owners			*Year: 2000*
110	Couple: wage earners, 2 children, day care centre and after school activities	430,500	984,700
111	Couple: wage earners, no children	451,600	984,700
130	Publicly employed couple: 2 children, day care centre and after school activities	457,800	984,700
140	Privately employed couple: 2 children, day care centre and after school activities	633,900	1,202,900
121	Single wage earner, no children	232,900	766,500
157	Pensioner couple, 1 ATP pension scheme	166,200	765,200
158	Pensioner couple, 1 ATP pension scheme, 1 public servants pension scheme	281,700	983,900
Tenants			*Year: 1999*
115	Couple: wage earners, 2 children, day care centre and after school activities	336,100	44,600
117	Couple: wage earners, 2 children, day care centre and after school activities	430,500	44,600
118	Couple: cash benefits, 2 children, day care centre and after school activities	241,600	44,600
120	Single wage earner, no children	232,900	33,900
180	Single wage earner, no children, 35 % unemployed	175,800	33,900
171	Single, recipient of unemployment benefits	146,400	33,900
172	Single student, part-time job	90,600	24,200
181	Single wage earner, 1 child, 35 % unemployed	175,800	44,600
152	Pensioner couple, 1 ATP pension scheme	156,200	37,800
160	Single pensioner with personal supplements	98,600	37,800

1)   Personal income plus positive net capital income.

In *table 6.1* is shown an example of a family type calculation for the standard-family type no. *117. Tenants, couple, wage earners, 2 children in day care centre and after school activities.*

The wage income is approximately equivalent to the sum of the average income of a skilled male worker and an unskilled female worker. The family is furthermore assigned some public benefits, expenses to union membership and certain social contributions etc. using either information on statistical averages or common knowledge of a typical situation.

Tax payments are calculated using the average county, municipal and church tax rates. The housing expenses are in the specific example set equal to the average rent for families with children. The assigned payment for day care institution is the average rate.

Based on this stylised information, the family types disposable income before and after expenses for dwelling and day care centres can be calculated.

Table 6.1. Working couple in rented accommodation with 2 children, DKK

Years	1993	2001	2002	2003
Wage income incl. own AUD-contribution	375,768	465,511	478,733	491,556
Sickness Benefit..	12,011	14,874	15,281	15,739
Contribution to ATP..	4,511	10,218	10,356	10,490
Gross earnings..	392,290	490,603	504,370	517,785
Public child and family benefits............................	13,750	19,600	20,200	20,900
Transfer income	13,750	19,600	20,200	20,900
Income, total..	406,040	510,203	524,570	538,685
Contribution to unemployment insurance......................	6,922	9,756	10,020	10,324
AUD-contribution	2,666	0	0	0
ATP-payment...	4,511	10,218	10,356	10,490
Payment of union membership................................	9,388	12,752	13,023	13,296
Income taxes..	161,644	144,658	146,639	150,233
Labour market contribution	0	37,617	38,686	39,722
Disposable income..	220,908	295,202	305,846	314,621
Expenses for dwelling (tenants).............................	39,218	47,011	48,232	49,583
Available income net of dwelling	181,690	248,190	257,614	265,038
Payment for day care Institution(s)	14,945	22,818	23,922	25,050
Available income net of dwelling and day care expenses .	166,745	225,372	233,692	239,988
Index-real disposable income	100.00	112.17	113.78	114.83
Index-real disposable income net of dwelling	100.00	114.45	116.36	117.61
Index-real disposable income net of dwelling and day care expenses	100.00	113.24	115.02	116.04

A thorough description of the family type calculations is found in Danish in *Fordeling og incitamenter 2002 (Income distribution and work incentives 2002)*, chapter 4.