



General Equilibrium Model of the ministère des Finances du Québec (GEMFQ): Characteristics and Structure of the Model

Bernard Decaluwé
André Lemelin
Véronique Robichaud
David Bahan

RESEARCH PAPER 2003-002

General Equilibrium Model of the ministère des Finances du Québec (GEMFQ): Characteristics and Structure of the Model

Bernard Decaluwé¹
André Lemelin¹
Véronique Robichaud¹
David Bahan²

With contributions from:
Brian Girard²
Éric Genest-Laplante²
Xavier Brosseau²

The views expressed herein are those of the authors and do not necessarily reflect the opinions of the ministère des Finances.

This is an English version of the original French paper.

1 Centre interuniversitaire sur le risque, les politiques économiques et l'emploi (CIRPÉE).

2 Ministère des Finances du Québec.

Published by
Direction des communications du ministère des Finances
12, rue Saint-Louis, RC.01
Québec (Québec) G1R 5L3

General Equilibrium
Model of the ministère des Finances
du Québec (GEMFQ):
Characteristics and Structure of the Model

ISBN 2-550-41624-4
Legal deposit, March 2003
Bibliothèque nationale du Québec
© Gouvernement du Québec

ACKNOWLEDGMENTS

General equilibrium models, because of the complexity of the effects taken into account and their influence on the behaviour of economic agents, are powerful tools for analyzing economic and fiscal policy.

In the spring of 2000, the ministère des Finances du Québec decided it needed such a tool and turned to the Centre de recherche en économie et finance appliquées (CREFA) of Université Laval to develop a general equilibrium model adapted to the specific features of the Québec economy. The Institut de la statistique du Québec (ISQ) contributed to the project by agreeing to participate actively in the development of the model and assumed the task of formulating the related social accounting matrix.

To meet the needs of the ministère des Finances du Québec, the work of CREFA, led by Bernard Decaluwé, André Lemelin and Véronique Robichaud, and that of ISQ, led by Camille Courchesne, David Bahan and Danielle Bilodeau, were carried out in cooperation with staff of the ministère des Finances, in particular Brian Girard, Éric Genest-Laplante and Xavier Brosseau.

The computable general equilibrium model is an analytical instrument that the ministère des Finances du Québec can apply to better understand the implications of fiscal and economic policy and hence make informed decisions.

The authors wish to thank Éric Fournier, Raymond Fournier, Hervé Lohoues, André Martens and Gilles Paquin for their views and comments on this paper.

SUMMARY

The general equilibrium model of the ministère des Finances du Québec (GEMFQ) is a computable static multi-sector general equilibrium model adapted to reflect the characteristics and special features of Québec, in a Canadian and global context. As a part of Canada, Québec is subject to the fiscal and monetary policies of the federal government and the rules of free movement with Canada's borders.

Since Québec is a component of Canada, the model is accordingly a bi-regional model where not only Québec's economy, but also that of the Rest of Canada (ROC) are explicitly modelled, while taking into account their mutual relations and relations with the Rest of the World (ROW). This makes it possible to incorporate feedback effects between the two economies. In addition, as well as representing the direct effects of federal and provincial policies, the model takes into account, because of its bi-regional nature, their indirect effects, i.e. those that affect Québec through the effects of these policies on the ROC and vice versa.

This paper describes the structure of the model in detail, in particular:

- Production and the link between supply and demand of each region
- Interprovincial trade flows
- Revenue and expenditure of economic agents
- Price determination

TABLE OF CONTENTS

Part I.	OVERVIEW	1
Part II.	DISTINCTIVE FEATURES	3
	2.1 A bi-regional model	3
	2.2 The supra-regional level.....	3
	2.2.1 <i>Interest and dividend accounts</i>	3
	2.2.2 <i>The Rest of the World account</i>	4
	2.2.3 <i>Consolidated federal government accounts</i>	4
	2.2.4 <i>The accumulation account</i>	6
	2.3 Producer prices and consumer prices	6
Part III.	STRUCTURE OF THE MODEL	9
	3.1 Industries (production)	9
	3.2 Households.....	14
	3.3 Firms.....	17
	3.4 Governments	18
	3.5 Investment	23
	3.6 Demand by product of each region	24
	3.7 External trade and Québec-ROC trade	25
	3.8 Price formation	30
	3.9 General equilibrium	37
	CONCLUSION	39
	LIST OF DIAGRAMS	41
	APPENDIX A - DIAGRAMS	43
	APPENDIX B - Description of the parameters and variables of the model	53
	REFERENCES.....	83

PART I. OVERVIEW

The general equilibrium model of the ministère des Finances du Québec (GEMFQ) is a static multi-sector computable general equilibrium model adapted to reflect the characteristics and special features of Québec, within a Canadian and global context. As a part of Canada, Québec is subject to the fiscal and monetary policies of the federal government and the rules of free movement within Canada's borders.

Since Québec is part of Canada, the model is accordingly a bi-regional model where not only Québec's economy, but also that of the Rest of Canada (ROC) are explicitly modelled, while taking into account their mutual relations and relations with the Rest of the World (ROW). This makes it possible to incorporate feedback effects between the two economies. In addition, as well as representing the direct effects of federal and provincial policies, the model takes into account, because of its bi-regional nature, their indirect effects, i.e. those that affect Québec through the effects of these policies on the ROC and vice versa.

In the model, economic agents are divided into four categories: firms, households, governments and the rest of the world. All agents take prices as given, in accordance with the postulates of competitive general equilibrium. However, while the first two exhibit optimization behaviour, the last two do not. Nonetheless, they all remain within their budgetary constraints.

This is a very detailed large-scale model in which the classification of activities and goods and services is similar to aggregation M of the Statistics Canada input-output accounts. It should be pointed out that the ROC is modelled with the same degree of detail as Québec, except for governments. In the case of governments, no account is taken of the division of the ROC into provinces and territories, so that the governments of the nine other provinces are combined into a single agent, as are all local and regional governments outside Québec. Each of the two regions has 56 productive sectors, 48 personal consumption expenditure categories and 121 products (categories of goods and services). Investment is divided among 13 categories. There are 150 types of households in Québec and 155 in Canada³, defined by household composition, income level and age group. This very fine classification of households makes it possible to assess the social impact of fiscal policy using the representative agent approach in which all agents of the same category are deemed to have the same characteristics and behave identically (in particular, this implies that the

intra-group variance of household income is zero). Demand for labour in each region distinguishes between 11 types of labour; this nomenclature is an aggregation of the major groups of the 1980 Standard Occupational Classification. Lastly, there are two types of capital in the model corresponding to two firm agents: corporations and unincorporated business. Appendix B provides the list of variables, parameters and sets of the model; sets are defined on the basis of the classifications of the model.

The model pays no attention to the accumulation of factors (change in the stock of capital, demography and change in the labour force). Dynamic and inter-period phenomena are not incorporated into the behaviour of agents.

The model is based on a social accounting matrix (SAM) that describes the structure of the Québec-Canada economic system for reference year 1996. The dependent parameters of the model are calibrated on the basis of this matrix, so that the model reproduces this initial state.

The Institut de la statistique du Québec directed the construction of this matrix, with the active support of CREFA consultants. Data for the matrix were developed so as first to comply with the broad aggregates of national accounting, then to the data of the input-output tables produced by Statistics Canada, while satisfying internal consistency rules. The working paper 2003-003 *Une matrice de comptabilité sociale birégionale pour le modèle d'équilibre général du ministère des Finances du Québec* describes the method used by the Institut de la statistique du Québec for its construction and describes the structure of the matrix schematically. The aggregate schematic matrix has 21 accounts or groups of accounts divided into three sets: the accounts of Québec, those of the ROC and so-called supra-regional accounts.

3 There are five categories without households in Québec. The age group is defined by the age of the "reference person", using the terminology of Statistics Canada.

PART II. DISTINCTIVE FEATURES

Some distinctive features of the model appear in the structure of the matrix. We will comment on three: the bi-regional nature of the model, the introduction of so-called supra-regional accounts, and the recording of expenditures at prices paid by the purchaser.

2.1 A bi-regional model

The bi-regional nature of the model appears clearly in the social accounting matrix. Two parallel series of accounts represent Québec's economy on the one hand and that of the ROC on the other. Exchanges between Québec and the ROC appear in sectors of the matrix where the columns of Québec accounts intersect the lines of the ROC accounts and vice versa. Two types of non-zero cells are found there:

- net wages paid to residents of the other region;
- imports of each region from the other region that, by definition, are identical to the exports of the latter to the former.

2.2 The supra-regional level

One of the original features of the model is the introduction of supra-regional accounts that include transactions between agents that cannot be linked to a notion of regional territoriality. Supra-regional accounts are interest and dividend accounts, the ROW account, the accounts of the consolidated federal government and the accumulation account. A brief explanation of each of these accounts follows.

2.2.1 Interest and dividend accounts

During the construction of the social accounting matrix, it emerged that the available data could be used to estimate the interest and dividend income received by households in each region and the interest and dividend payments made by the firms of each region, but that it was impossible to convincingly estimate the source region of interest and dividends received or the destination region of interest and dividends paid. These shortcomings of the data clearly reflect the highly integrated nature of financial markets in Canada. To take this situation into account, a decision was made to create two supra-regional accounts that are not associated with any region, one for interest payments and the other for dividends. All interest and dividends paid are paid into the

corresponding supra-regional account and all interest and dividends received originate in one of these two accounts. Clearly, in view of the method of construction of the social accounting matrix, amounts of interest and dividends paid are equal to the amounts of interest and dividends received by all agents.

2.2.2 The Rest of the World account

There is only one agent account for the ROW from which all imports, both for Québec and for the ROC, are purchased. Reciprocally, all of Québec's exports and those of the ROC are sold to this single agent account. However, the ROW demand for exports from Québec and from Canada are represented by separate functions. In addition, these demand functions are not infinitely elastic with respect to world prices. This formulation reflects a number of inescapable realities:

- Québec and the ROC share the same currency and, internationally, only the current account balance of Canada as a whole matters.
- Demand for international imports by Canada (including Québec) is not sufficiently large to influence world prices. This corresponds, for imports, to the "small country" hypothesis in international trade theory: as importers, Québec and the ROC act on world markets as perfectly competitive buyers with no influence on prices and facing supply that is perfectly elastic to existing equilibrium prices. At these prices, they will find suppliers that can offer any quantity demanded.
- On the other hand, Québec and the ROC cannot be considered "small countries" when it comes to exports. Particularly because of the specialization of their exports and their relative concentration on certain markets, export growth normally requires a competitive effort, reflected in demand that is not perfectly elastic with respect to world prices. To increase their market share, Canadian and Québec exporters must therefore agree to lower prices.
- In addition, even if Canada as a whole were considered a "small country", producers in Québec and those in the ROC would be on international markets in a situation of imperfect competition among themselves, so that each of them would face international demand for its products that would not be perfectly elastic in relation to world prices.

2.2.3 Consolidated federal government accounts

In the model, the federal government fulfills three essential functions of any government: it produces goods and services, both in Québec and in the ROC, it

levies taxes on the various agents and, lastly, it makes transfers among agents. In its function as producer of services, it is important to some degree to be able to distinguish the federal government's activity in Québec from its activity in the ROC. However, the fact that it is one and the same agent must be taken into account. That is why we decided not to have two perfectly distinct agents to represent the federal government, one in Québec and the other in the ROC. Instead, the federal government in Québec appears separately in the matrix, but as a subsidiary, so to speak, of the "consolidated federal government".

The "federal government in Québec" agent receives the proceeds of federal taxes collected within Québec and is charged for the expenditures made by the federal government in Québec.⁴ The balance of the operations of the federal government in Québec (positive or negative) is then assumed by the consolidated federal government (see working paper 2003-003 *Une matrice de comptabilité sociale birégionale pour le modèle d'équilibre général du ministère des Finances du Québec*).

The accounts of the consolidated federal government represent all the other transactions of the federal government. The savings of the consolidated federal government (including the balance of its operations in Québec) are paid into the supra-regional accumulation account.

4 Accordingly, the distribution between Québec and RC of federal expenditures is *territorial*. Such distribution does not allow for an allocation of benefits received by individuals. For instance, the salaries of federal public servants in Québec are attributable to the "federal government in Québec" agent, regardless of the beneficiaries of the activity of these public servants. The same is true of military expenditures made in Québec. In this, the Québec model deviates from that of Finance Canada, where households consume the services of public administrations.

2.2.4 *The accumulation account*

In view of high degree of mobility of capital within Canada, the creation of separate accumulation accounts for Québec and the ROC serves no purpose. Accordingly, all savings are paid into the supra-regional accumulation account, which is the source of all investment spending both in Québec and in Canada.

Nonetheless, savings flows from Québec and investment flows realized in Québec are perfectly separate from their equivalents for the ROC, so that it is possible to calculate *ex post* a balance of the Investment-Savings equation for Québec. A surplus in Québec of investment over savings should correspond to a deficit of the same amount in the current account of exchanges of Québec with the ROC. Inversely, surplus savings in Québec should correspond to a surplus in the current account with the the ROC. We say “should correspond” because some flows between supra-regional accounts cannot be allocated to any region in particular. These are foreign investment income (interest and dividends) paid by the ROW, international transfers by the consolidated federal government as well as interest and dividends paid to foreigners.

2.3 Producer prices and consumer prices

The *design* of the SAM is conditioned from the outset by the choice between two ways of recording expenditure flows. In the GEMFQ, expenditures are recorded at *consumer prices*, i.e. at the prices paid by purchasers, including taxes and margins, rather than at *producer prices* (prices received by producers, more generally by suppliers, excluding taxes and margins). This choice determines the treatment of indirect taxes and trade and transport margins.

In the Québec Input-Output model of the ISQ, expenditures are recorded at consumer prices. In Statistics Canada’s input-output tables, on the other hand, expenditures are recorded at producer prices. That means, in particular, for purchases of inputs by industries, that indirect taxes associated with these purchases are collected at the branch level. The same would also apply, *mutatis mutandis*, for margins. Having said that, Statistics Canada’s input-output tables are completed by tax tables used to allocate indirect taxes paid on inputs among the corresponding goods. Accordingly, indirect taxes associated with intermediate inputs are collected at the level of domestic demand for products at the same time as indirect taxes associated with other purchases of domestic demand.

DISTINCTIVE FEATURES

Why this preference? Because in general, indirect tax rates depend more on the nature of the product than the identity of the buyer. The approach we have adopted is accordingly well adapted to the simulation of tax changes in which certain categories of products are exempt from a tax or taxed at a different rate. On the other hand, Statistics Canada's method is better adapted to simulations of tax changes in which some activities or agents are exempt from paying a tax or are subject to it at different rates. To incorporate some of the possibilities offered by Statistics Canada's method into the model without foregoing the advantages of the other approach, it is stipulated that indirect tax rates can differ among the three broad categories of purchasers: consumer households, investors, production industries (intermediate consumption).

PART III. STRUCTURE OF THE MODEL

While it draws on traditional general equilibrium modelling approaches, the structure of our model is much more complex, since the bi-regional aspect of the economy and its federated nature must be taken into account. It is therefore important to fully grasp its special features to be able to understand how it operates.

The structure of the model is described in a series of diagrams given in the appendices:

- Diagram 1: Production and demand flows
- Diagram 2: Interprovincial and international trade
- Diagram 3: Income, savings and expenditures of agents
- Diagram 4: Price formation

Some parts of these diagrams are reproduced within the following description. These partial diagrams are identified by the number of the full diagram from which they are taken, followed by a letter. To help locate within the full diagram the items contained in the partial diagrams, the disposition of these items within the partial diagrams is, as far as possible, the same as in the full diagram. Lastly, to make the paper easier to read, the equations are reproduced in the text.

3.1 Industries (production)

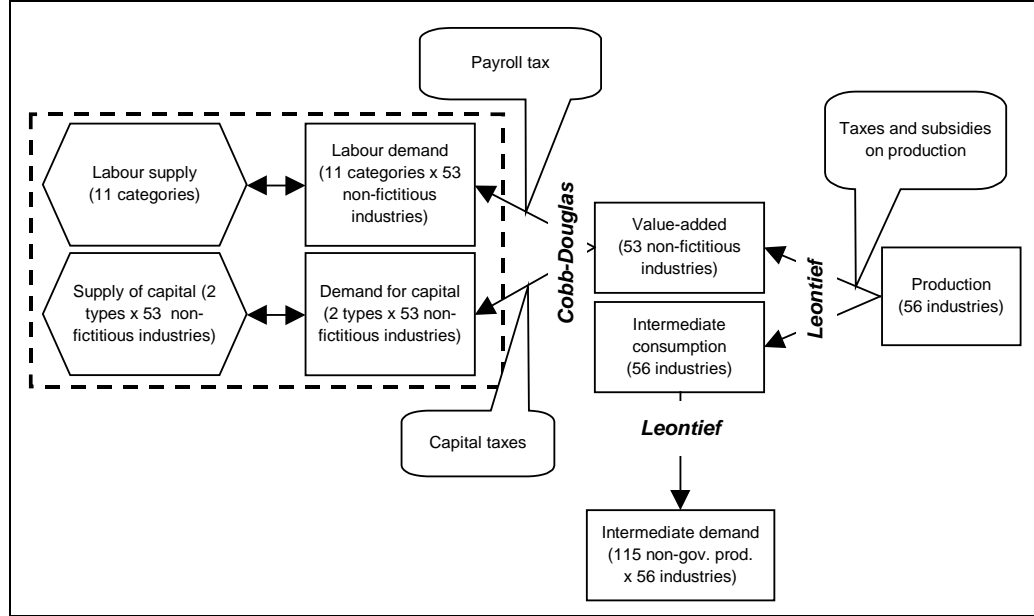
In each region there are, within a given branch, a large number of firms whose behaviour is represented by a representative firm. This firm is assumed to maximize its profits by choosing optimal levels of utilization of factors of production, given prices on factor markets, and by directing its production toward the domestic market or inter-regional or international exports depending on the market prices for local and foreign products.

In each branch, the production technology, at constant returns of scale, uses capital, labour and intermediate inputs. Production is represented by a two-level process: at the first level, value-added is produced according to a Cobb-Douglas function using capital and various categories of workers (equation [03]);⁵ in the

⁵ "Fictitious" branches do not generate value-added. They are an artifact of input-output tables to consolidate demand for certain eclectic categories of goods and then allocate it among the products from which they are made. They are: *Operating, office, cafeteria and*

second, value-added and intermediate consumption are combined according to a Leontief function to obtain output (equation [01], equation [02], equation [04]). Total intermediate consumption of each branch consists of goods and services according to a Leontief function (equation [05]).

DIAGRAM 1a - Production (inputs)



$$XS_{ifc,rg} = VA_{ifc,rg} / v_{ifc,rg} \quad [01]$$

$$XS_{ifc,rg} = A_{ifc,rg}^{FC} CI_{ifc,rg} \quad [02]$$

$$VA_{ifc,rg} = A_{ifc,rg} \prod_l (LD_{l,ifc,rg})^{\alpha_{l,ifc,rg}} \prod_k (KD_{k,ifc,rg})^{\alpha_{k,ifc,rg}} \quad [03]$$

$$CI_{ifc,rg} = i_{o,ifc,rg} XS_{ifc,rg} \quad [04]$$

$$DI_{png,i,rg} = a_{ij,png,i,rg} CI_{i,rg} \quad [05]$$

laboratory supplies; Travel and entertainment, advertising and promotion expenses; and Transport margins.

Demand for labour is derived from the Cobb-Douglas value-added production function (equation [06]). In the basic model, workers in each labour category are mobile among the various industries within the same region. On the other hand, they are not mobile between the regions (equation [77]). Capital is specific to each production branch of each region and is fixed (equation [78]). This assumption regarding capital is realistic from a short-term perspective because adjustment costs reduce the mobility of this factor among industries and between regions. The static nature of the model also argues in favour of this approach because once installed, it is generally not easy to move productive capital.

$$w_{l,rg} \left(1 + \sum_{gvt} \sum_{ttw} tw_{gvt,ttw,infc,rg} \right) LD_{l,infc,rg} = \alpha_{l,infc,rg} PVA_{infc,rg} VA_{infc,rg} \quad [06]$$

$$LS_{l,rg} = \sum_{infc} LD_{l,infc,rg} \quad [77]$$

$$KS_{k,infc,rg} = KD_{k,infc,rg} \quad [78]$$

The return on capital is derived from the Cobb-Douglas value-added production function (equation [07], equation [08]); it is then allocated using an exogenous rule (diagram 3). Firms receive the largest part of the return on capital paid by industries (equation [13]), after depreciation expenses are paid directly to savings (equation [09]). The share of the return on capital that corresponds to royalties on natural resources is paid to governments (equation [30]).

$$r_{KSOC,inf,rg} \left(1 + \sum_{gvt} \sum_{ttk} tk_{gvt,ttk,inf,rg} \right) KD_{KSOC,inf,rg} = \alpha_{KSOC,inf,rg} PVA_{inf,rg} VA_{inf,rg} \quad [07]$$

$$r_{KIND,inf,rg} \left(1 + \sum_{gvt} \left(\sum_{ttk} tk_{gvt,ttk,inf,rg} \right) + tki_{gvt,inf,rg} \right) KD_{KIND,inf,rg} = \alpha_{KIND,inf,rg} PVA_{inf,rg} VA_{inf,rg} \quad [08]$$

$$AMT_{k,rg} = \left(1 - \sum_{ag} \lambda_{ag,k,rg}^K \right) \sum_{inf} r_{k,inf,rg} KD_{k,inf,rg} \quad [09]$$

$$YE_{ent} = \sum_{rg} \sum_k \lambda_{ent,k,rg}^K \sum_{inf} r_{k,inf,rg} KD_{k,inf,rg} + eTRAW - \sum_{rg} \sum_i de_{ent,i,rg} \sum_{bs} PP_{i,bs,rg} XSP_{i,bs,rg} \quad [13]$$

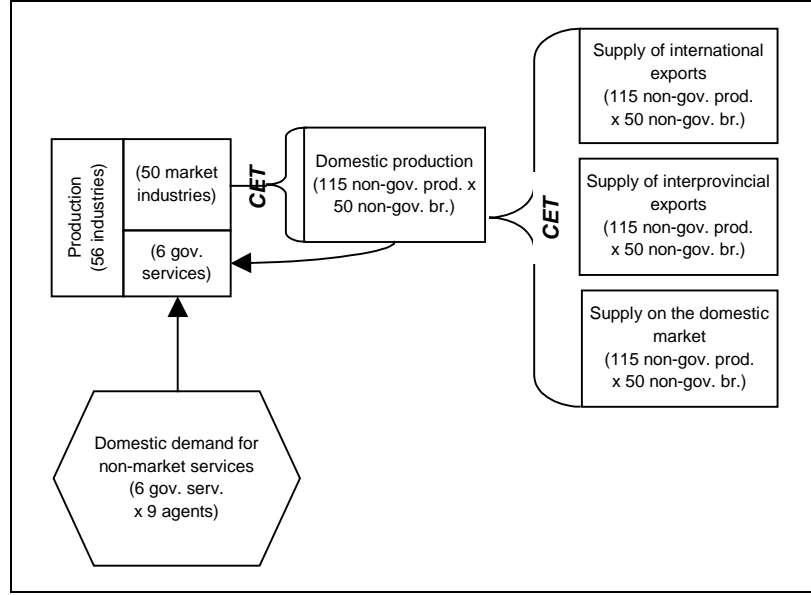
$$YG_{gvt} = \sum_{ang} TD_{gvt,ang} + \sum_{rg} \sum_{png} \left(\sum_{ttx} TI_{gvt,ttx,png,rg} + TIM_{gvt,png,rg} + TIE_{gvt,png,rg} \right) \quad [30]$$

$$+ \sum_{rg} \sum_{inf} \left(TEI_{gvt,inf,rg} + \sum_{ttp} TNP_{gvt,ttp,inf,rg} + \sum_{ttw} TWL_{gvt,ttw,inf,rg} + \sum_{ttk} TRK_{gvt,ttk,inf,rg} \right) + TY_{gvt}^{RDM} + \sum_{civ} PERI_{gvt,civ}$$

$$+ \sum_{rg} \sum_{dp} PERD_{gvt,dp,rg} + \sum_{rg} \sum_k \lambda_{gvt,k,rg}^K \sum_i r_{k,inf,rg} KD_{k,inf,rg} + \sum_{ag} TR_{gvt,ag} + eTRAW_{gvt} + \eta_{gvt}^D DIV + \eta_{gvt}^I INT$$

Production is an aggregate of various products of the branch, intended for the domestic market and for export, to the other region or the ROW. Except for the six government service industries, nested two-level constant elasticity of transformation (CET) functions capture the imperfect substitutability, from the production standpoint, first among the various products and then between products produced for the domestic market and those for export to the other region or to the ROW. At the first level, the composite production of the branch is therefore a combination of its various products (equation [56] and equation [57]). At the second level, each product is an aggregate of goods of the same category intended for each of the three destination markets (equation [60], equation [61] and equation [62]): the domestic market, the export market to the other region (ROC for Québec and vice versa) and the international export market. At each stage, the composition of the aggregate is determined so as to maximize the income of the representative firm on the basis of the component prices.

DIAGRAM 1b - Production (supply)



$$XS_{ing,rg} = B_{ing,rg}^P \left[\sum_{bs} \beta_{ing,bs,rg}^P XSP_{ing,bs,rg}^{K_{ing,rg}^P} \right]^{\frac{1}{K_{ing,rg}^P}} \quad [56]$$

$$\frac{XSP_{ing,bs,rg}}{XSP_{ing,bsj,rg}} = \left[\left(\frac{PP_{ing,bs,rg}}{PP_{ing,bsj,rg}} \right) \left(\frac{\beta_{ing,bsj,rg}^P}{\beta_{ing,bs,rg}^P} \right) \right]^{\tau_{i,rg}^P} \quad [57]$$

$$XSP_{ing,png,rg} = B_{ing,png,rg} \left(\beta_{ing,png,rg}^1 EXS_{ing,png,rg}^{K_{ing,png,rg}} + \beta_{ing,png,rg}^2 EXNS_{ing,png,rg}^{K_{ing,png,rg}} + \beta_{ing,png,rg}^3 DS_{ing,png,rg}^{K_{ing,png,rg}} \right)^{\frac{1}{K_{ing,png,rg}}} \quad [60]$$

$$EXS_{ing,png,rg} = \left[\left(\frac{PE_{png,rg}}{PL_{png,rg}} \right) \left(\frac{\beta_{ing,png,rg}^3}{\beta_{ing,png,rg}^1} \right) \right]^{\tau_{sng,png,rg}} DS_{ing,png,rg} \quad [61]$$

$$EXNS_{ing,png,rg} = \left[\left(\frac{PEN_{png,rg}}{PL_{png,rg}} \right) \left(\frac{\beta_{ing,png,rg}^3}{\beta_{ing,png,rg}^2} \right) \right]^{\tau_{sng,png,rg}} DS_{ing,png,rg} \quad [62]$$

In the case of government services, the specification is simpler. The production of each branch is the sum of its products (equation [58]). The supply of each product of government services by all the industries is equal to the government demand (equation [76]). The SAM data show that the industries of government services also produce small quantities of non-governmental products; the supply of these other products is equal to the sum of the quantities offered on the three markets, which are exogenous (equation [59]).

$$XS_{isg,rg} = \sum_{bs} XSP_{isg,bs,rg} \quad [58]$$

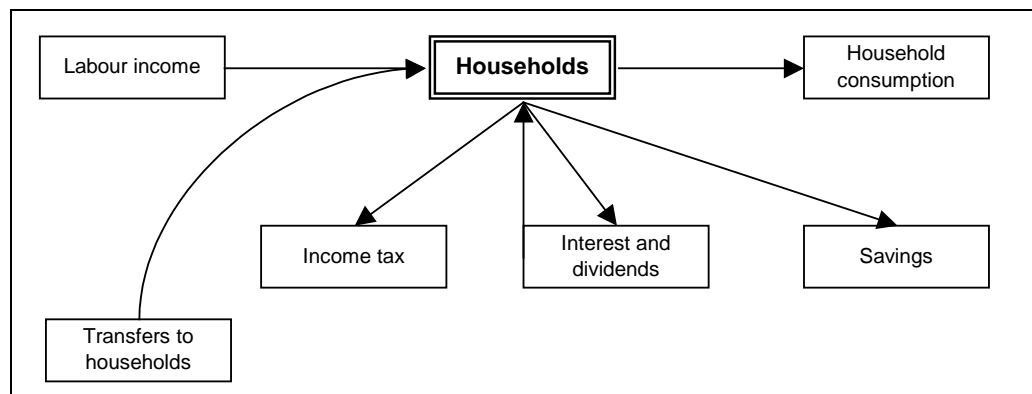
$$XSP_{isg,png,rg} = DS_{isg,png,rg} + EXS_{isg,png,rg} + EXNS_{isg,png,rg} \quad [59]$$

$$\sum_i XSP_{i,psg,rg} PP_{i,psg,rg} = \sum_{gvt} G_{psg,gvt,rg} \quad [76]$$

3.2 Households

Households derive their income from wages, dividends and interest, from net transfers from the government and from abroad (equation [10]). Labour income generated by production is allocated among categories of households in fixed shares. However, even if households own firms, they do not directly receive the return on capital: their share is first paid to firms, which pay dividends and interest to the corresponding supra-regional accounts. Investment income is then distributed, in fixed shares, among categories of households from these supra-regional accounts.

DIAGRAM 3a - Households



$$\begin{aligned}
 YM_{men} = & \sum_{rg} \sum_l \lambda_{men,l,rg}^L w_{l,rg} \sum_{inf} LD_{l,inf,rg} + \sum_{gvt} \sum_{pr} v_{men,pr,gvt} TRP_{pr,gvt} \\
 & + \sum_{ag} TR_{men,ag} + eTRAW_{men} + \eta_{men}^D DIV + \eta_{men}^I INT
 \end{aligned} \tag{10}$$

A representative household is used to represent the behaviour of each category of households in each region. A multi-level model is used to represent how households dispose of their income:

- The income of households of each category is allocated among income tax, savings, consumption and transfers.
- Households pay income tax to governments according to fixed proportions of total income after deducting non-taxable transfers received (equation [17]). They also pay taxes on the goods they consume, but these indirect taxes are included in the amounts of consumption spending of each good (transactions recorded at consumer prices).

$$TD_{gvt,men} = ty_{gvt,men} \left[YM_{men} - \sum_{gvtj} \sum_{prni} v_{men,prni,gvtj} TRP_{prni,gvtj} \right] \tag{17}$$

$$YDM_{men} = YM_{men} - \sum_{gvt} TD_{gvt,men} \tag{11}$$

$$SM_{men} = \psi_{men} YDM_{men} \tag{12}$$

- Once income tax is collected, a fixed portion of disposable income (equation [11]) is allocated by each category of households to savings (equation [12]).
- Transfers paid by households, including the transfer portion of interest on consumer debt, are fixed exogenously.
- For each category of households, the remainder constitutes the amount of its total consumption spending (equation [34]).

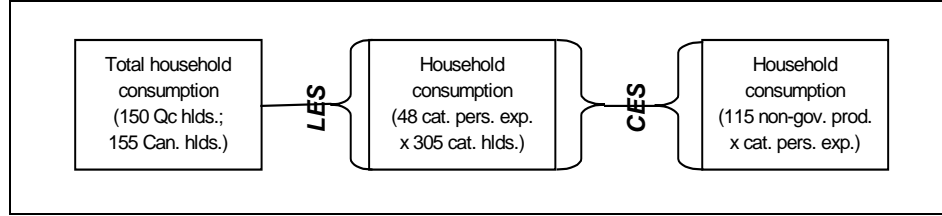
$$CTM_{men} = YDM_{men} - SM_{men} - \sum_{ag} TR_{ag,men} - TRWA_{men} - ICS_{men} \tag{34}$$

- Each representative household then allocates its spending so as to maximize its utility, among 47 categories of personal expenditure. The utility function chosen is a Stone-Geary linear expenditure system (LES) (equation [35]). The 48th category of personal expenditures, “net foreign expenditures”, is treated separately: their volume is fixed, so that consumption is equal to minimum consumption.

$$C_{dp,men,rg} PCT_{dp,rg} = C_{dp,men,rg}^{MIN} PCT_{dp,rg} + \gamma_{dp,men,rg}^1 \left(CTM_{men} - \sum_{rgj} \sum_{dpj} C_{dpj,men,rgj}^{MIN} PCT_{dpj,rgj} \right) [35]$$

Lastly, for each category of personal expenditures (except “net foreign expenditures”), the expenditures of all households of a given region are totalled and these expenditures are then optimally allocated among the various goods and services according to a constant elasticity of substitution (CES) function (equation [36], equation [37]).

DIAGRAM 1c - Consumption



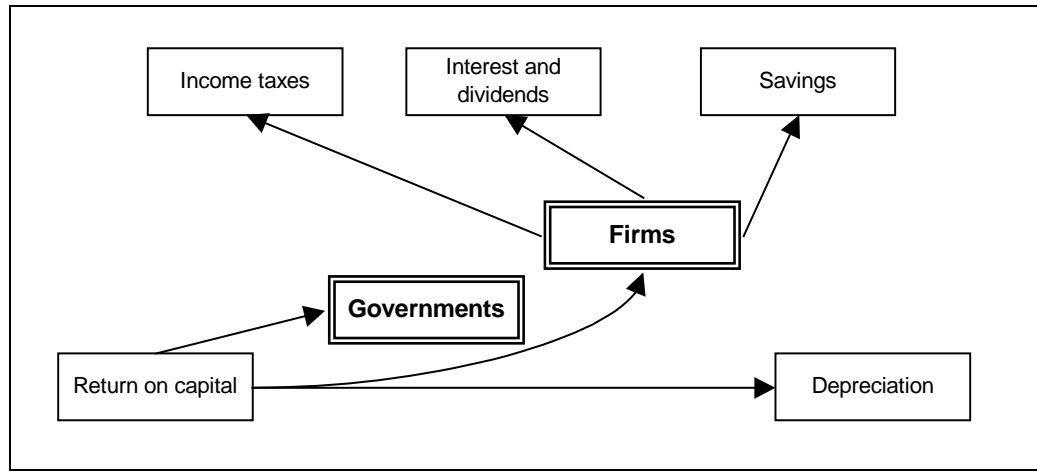
$$\sum_{men} C_{dp1,men,rg} = A_{dp1,rg}^{DP} \left[\sum_{png} \alpha_{png,dp1,rg}^{DP} CC_{png,dp1,rg}^{-\rho_{dp1,rg}^{DP}} \right]^{\frac{-1}{\rho_{dp1,rg}^{DP}}} [36]$$

$$CC_{png,dp1,rg} = \left[\left(\frac{PCC_{pngj,dp1,rg}}{PCC_{png,dp1,rg}} \right) \left(\frac{\alpha_{png,mdp1,rg}^{DP}}{\alpha_{pngj,mdp1,rg}^{DP}} \right) \right]^{\sigma_{dp1,rg}^{DP}} CC_{pngj,dp1,rg} [37]$$

3.3 Firms

Firms receive most of the return on capital paid by industries after depreciation expenditures are paid directly to savings (equation [13]). The portion of return on capital that corresponds to royalties on natural resources is paid to the state (equation [30]). Firms pay corporate income taxes to governments (equation [18]), and they pay dividends and interest to the corresponding supra-regional accounts (equation [15], equation [16]). The rest (retained earnings after taxes and dividends) goes to savings (equation [14]).

DIAGRAM 3b - Firms



$$YE_{ent} = \sum_{rg} \sum_k \lambda_{ent,k,rg}^K \sum_{inf\ c} r_{k,inf\ c,rg} KD_{k,inf\ c,rg} + eTRAW - \sum_{rg} \sum_i de_{ent,i,rg} \sum_{bs} PP_{i,bs,rg} XSP_{i,bs,rg} \quad [13]$$

$$SE_{ent} = YE_{ent} - \sum_{ag} TR_{ag,ent} - \sum_{gvt} TD_{gvt,ent} - TRWA_{ent} - \varphi_{ent}^D YE_{ent} - \varphi_{ent}^I YE_{ent} \quad [14]$$

$$DIV = \sum_{ent} \varphi_{ent}^D YE_{ent} + eDIV^W \quad [15]$$

$$INT = \sum_{ent} \varphi_{ent}^I YE_{ent} + eINT^W + \sum_{gvt} SDP_{gvt} + \sum_{men} ICS_{men} \quad [16]$$

$$TD_{gvt,ent} = ty_{gvt,ent} YE_{ent} \quad [18]$$

$$YG_{gvt} = \sum_{ang} TD_{gvt,ang} + \sum_{rg} \sum_{png} \left(\sum_{ttx} TI_{gvt,ttx,png,rg} + TIM_{gvt,png,rg} + TIE_{gvt,png,rg} \right) \quad [30]$$

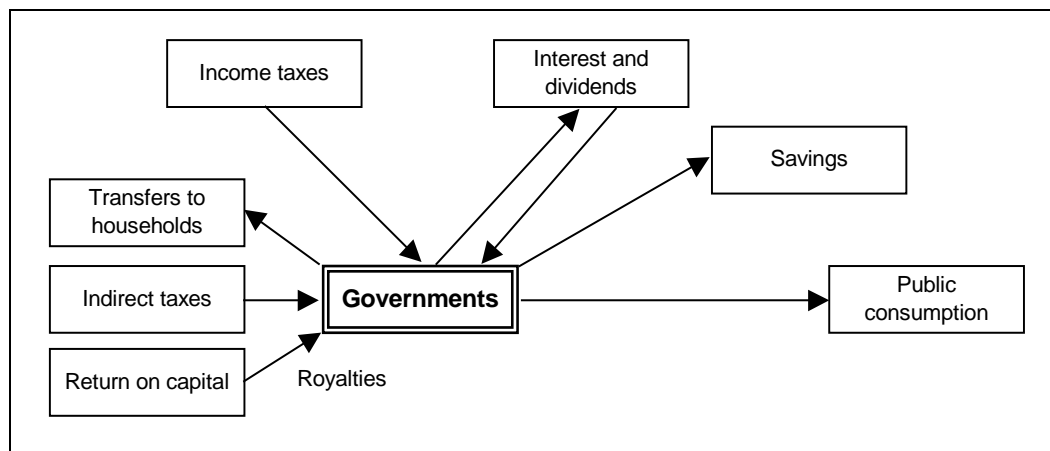
$$+ \sum_{rg} \sum_{inf\ c} \left(TEI_{gvt,inf\ c,rg} + \sum_{ttp} TNP_{gvt,ttp,inf\ c,rg} + \sum_{ttw} TWL_{gvt,ttw,inf\ c,rg} + \sum_{ttk} TRK_{gvt,ttk,inf\ c,rg} \right) + TY_{gvt}^{RDM} + \sum_{civ} PERI_{gvt,civ}$$

$$+ \sum_{rg} \sum_{dp} PERD_{gvt,dp,rg} + \sum_{rg} \sum_k \lambda_{gvt,k,rg}^K \sum_i r_{k,inf\ c,rg} KD_{k,inf\ c,rg} + \sum_{ag} TR_{gvt,ag} + eTRAW_{gvt} + \eta_{gvt}^D DIV + \eta_{gvt}^I INT$$

3.4 Governments

The model distinguishes three levels of government: the federal government, provincial governments and local governments (municipalities, RCM, metropolitan governments). The model does not recognize territorial subdivisions within the ROC, so that the governments of the nine provinces and the territories (Nunavut, Yukon and N.W.T.) of the ROC are treated as a single agent, like the local governments of the provinces and territories.

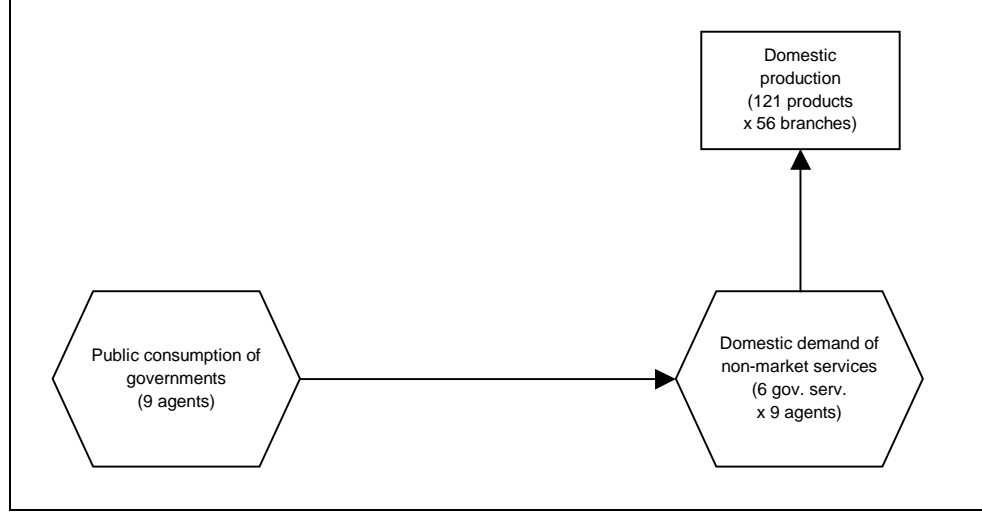
DIAGRAM 3c - Governments



Unlike firms and households, the model does not ascribe optimization behaviour to governments (however, the production costs of government services are minimized: see below and 3.1 above). They collect taxes and make expenditures. Government revenues consist of income taxes and indirect taxes (equation [30]). Their expenditures consist of current expenditures, fixed in real terms (more specifically exogenous), and transfer payments to households and junior-level governments, fixed in nominal terms. Governments' current expenditures consist of purchases from the activities producing government services (or non-market services - equation [76]). These activities are productive industries that, like any other, minimize their costs subject to their production function. Public investments are financed, like other investments, by the pool of savings and as such are no different from private investments. Every government funds the excess of its current expenditures over its revenue (deficit) by borrowing on domestic and/or foreign markets. Similarly, a government current budget surplus adds to the pool of savings (equation [31] and equation [79]). In the case of the federal government in Québec, the balance, before being added

to savings, is first added to that of the consolidated federal government (equation [32]).

DIAGRAM 1d - Public consumption of governments



$$\begin{aligned}
 YG_{gvt} = & \sum_{ang} TD_{gvt,ang} + \sum_{rg} \sum_{png} \left(\sum_{ttx} TI_{gvt,ttx,png,rg} + TIM_{gvt,png,rg} + TIE_{gvt,png,rg} \right) \\
 & + \sum_{rg} \sum_{infrc} \left(TEI_{gvt,infrc,rg} + \sum_{ttp} TNP_{gvt,ttp,infrc,rg} + \sum_{ttw} TWL_{gvt,ttw,infrc,rg} + \sum_{ttk} TRK_{gvt,ttk,infrc,rg} \right) \\
 & + TY_{gvt}^{RDM} + \sum_{civ} PERI_{gvt,civ} + \sum_{rg} \sum_{dp} PERD_{gvt,dp,rg} + \sum_{rg} \sum_k \lambda_{gvt,k,rg}^K \sum_i r_{k,infrc,rg}^{KD} KD_{k,infrc,rg} \\
 & + \sum_{ag} TR_{gvt,ag} + eTRAW_{gvt} + \eta_{gvt}^D DIV + \eta_{gvt}^I INT
 \end{aligned} \tag{30}$$

$$SG_{gnf} = YG_{gnf} - \sum_{ag} TR_{ag,gnf} - TRWA_{gnf} - \sum_{pr} TRP_{pr,gnf} - \sum_{rg} \sum_{psg} G_{psg,gnf,rg} - SDP_{gnf} \tag{31}$$

$$\begin{aligned}
 TR_{GFQ,GFQ} = & YG_{GFQ} - \sum_{ang} TR_{ang,GFQ} - \sum_{gnfc} TR_{gnfc,GFQ} \\
 & - \sum_{pr} TRP_{pr,GFQ} - \sum_{rg} \sum_{psg} G_{psg,GFQ,rg} - TRWA_{GFQ} - SDP_{GFQ}
 \end{aligned} \tag{32}$$

$$\sum_i XSP_{i,psg,rg} PP_{i,psg,rg} = \sum_{gvt} G_{psg,gvt,rg} \tag{76}$$

$$IT = \sum_{men} SM_{men} + \sum_{ent} SE_{ent} + \sum_{gnf} SG_{gnf} + eBC + \sum_k \sum_{rg} AMT_{k,rg} \tag{79}$$

Particular care has been given in the treatment of taxation. In the model, each tax applies to a flow that represents the corresponding tax base as closely as possible. In particular, this applies to indirect taxes (equations [19-29]), that apply one on top of another in successive layers, so to speak. In addition, the model allows for different indirect tax rates, depending on whether the taxes apply to household consumption, investment or intermediate consumption expenditure (equations [19-23] and equations [51-53]). The modelling of indirect taxes will come up again in relation to price formation.

$$\begin{aligned}
 TI_{gvt,tx1,png,rg} = & txc_{gvt,tx1,png,rg} \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \sum_{dp} CC_{png,dp,rg} \\
 & + txv_{gvt,tx1,png,rg} \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \sum_{civ} INV_{png,civ,rg} \\
 & + txp_{gvt,tx1,png,rg} \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) DIT_{png,rg}
 \end{aligned} \tag{19}$$

$$\begin{aligned}
 TI_{gvf,tx2,png,rg} = & txc_{gvf,tx2,png,rg} \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \sum_{dp} CC_{png,dp,rg} \left(1 + \sum_{gvt,tx1} txc_{gvt,tx1,png,rg} \right) \\
 & + txv_{gvf,tx2,png,rg} \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \sum_{civ} INV_{png,civ,rg} \left(1 + \sum_{gvt,tx1} txv_{gvt,tx1,png,rg} \right) \\
 & + txp_{gvf,tx2,png,rg} \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) DIT_{png,rg} \left(1 + \sum_{gvt,tx1} txp_{gvt,tx1,png,rg} \right)
 \end{aligned} \tag{20}$$

$$\begin{aligned}
 TI_{gvp,tx2,png,rg} = & txc_{gvp,tx2,png,rg} \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \sum_{dp} CC_{png,dp,rg} \left(1 + \sum_{gvt,tx1} txc_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvf,tx2} txc_{gvf,tx2,png,rg} \right) \\
 & + txv_{gvp,tx2,png,rg} \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \sum_{civ} INV_{png,civ,rg} \left(1 + \sum_{gvt,tx1} txv_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvf,tx2} txv_{gvf,tx2,png,rg} \right) \\
 & + txp_{gvp,tx2,png,rg} \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) DIT_{png,rg} \left(1 + \sum_{gvt,tx1} txp_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvf,tx2} txp_{gvf,tx2,png,rg} \right)
 \end{aligned} \tag{21}$$

$$\begin{aligned}
 TI_{gvt,tx3,png,rg} = & txc_{gvt,tx3,png,rg} \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \sum_{dp} CC_{png,dp,rg} \left(1 + \sum_{gvt,tx1} txc_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvf,tx2} txc_{gvf,tx2,png,rg} \right) \left(1 + \sum_{gvp,tx2} txc_{gvp,tx2,png,rg} \right) \\
 & + txv_{gvt,tx3,png,rg} \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \sum_{civ} INV_{png,civ,rg} \left(1 + \sum_{gvt,tx1} txv_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvf,tx2} txv_{gvf,tx2,png,rg} \right) \left(1 + \sum_{gvp,tx2} txv_{gvp,tx2,png,rg} \right) \\
 & + txp_{gvt,tx3,png,rg} \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) DIT_{png,rg} \left(1 + \sum_{gvt,tx1} txp_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvf,tx2} txp_{gvf,tx2,png,rg} \right) \left(1 + \sum_{gvp,tx2} txp_{gvp,tx2,png,rg} \right)
 \end{aligned} \tag{22}$$

$$\begin{aligned}
 TI_{gvt,tx4,png,rg} &= txc_{gvt,tx4,png,rg} \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \sum_{dp} CC_{png,dp,rg} \left(1 + \sum_{gvt\ ttx1} txc_{gvt,tx1,png,rg} \right) \\
 &\quad \left(1 + \sum_{gvt\ ttx2} txc_{gvt,tx2,png,rg} \right) \left(1 + \sum_{gvp\ ttx2} txc_{gvp,tx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txc_{gvt,tx3,png,rg} \right) \quad [23] \\
 &+ txv_{gvt,tx4,png,rg} \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \sum_{civ} INV_{png,civ,rg} \left(1 + \sum_{gvt\ ttx1} txv_{gvt,tx1,png,rg} \right) \\
 &\quad \left(1 + \sum_{gvt\ ttx2} txv_{gvt,tx2,png,rg} \right) \left(1 + \sum_{gvp\ ttx2} txv_{gvp,tx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txv_{gvt,tx3,png,rg} \right) \\
 &+ txp_{gvt,tx4,png,rg} \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) DIT_{png,rg} \left(1 + \sum_{gvt\ ttx1} txp_{gvt,tx1,png,rg} \right) \\
 &\quad \left(1 + \sum_{gvt\ ttx2} txp_{gvt,tx2,png,rg} \right) \left(1 + \sum_{gvp\ ttx2} txp_{gvp,tx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txp_{gvt,tx3,png,rg} \right)
 \end{aligned}$$

$$TIM_{gvt,png,rg} = tm_{gvt,png,rg} e^{PWM_{png,rg}} M_{png,rg} \quad [24]$$

$$TIE_{gvt,png,rg} = te_{gvt,png,rg} \left(PE_{png,rg} + \sum_{bm} mex_{bm,png,rg} PC_{bm,rg} \right) EX_{png,rg} \quad [25]$$

$$TNP_{gvt,tp,inf,rg} = tp_{gvt,tp,inf,rg} P_{inf,rg} XS_{inf,rg} \quad [26]$$

$$TWL_{gvt,ttw,inf,rg} = tw_{gvt,ttw,inf,rg} \sum_l w_{l,rg} LD_{l,inf,rg} \quad [27]$$

$$TRK_{gvt,ttk,inf,rg} = tk_{gvt,ttk,inf,rg} \sum_k r_{k,inf,rg} KD_{k,inf,rg} \quad [28]$$

$$TEI_{gvt,inf,rg} = tki_{gvt,inf,rg} r_{KIND,inf,rg}^{KD_{KIND,inf,rg}} \quad [29]$$

$$\begin{aligned}
 PCC_{png,rg} &= \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt\ ttx1} txc_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvt\ ttx2} txc_{gvt,tx2,png,rg} \right) \\
 &\quad \left(1 + \sum_{gvp\ ttx2} txc_{gvp,tx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txc_{gvt,tx3,png,rg} \right) \left(1 + \sum_{gvt\ ttx4} txc_{gvt,tx4,png,rg} \right) \quad [51]
 \end{aligned}$$

$$\begin{aligned}
 PCP_{png,rg} &= \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt\ ttx1} txp_{gvt,tx1,png,rg} \right) \left(1 + \sum_{gvt\ ttx2} txp_{gvt,tx2,png,rg} \right) \\
 &\quad \left(1 + \sum_{gvp\ ttx2} txp_{gvp,tx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txp_{gvt,tx3,png,rg} \right) \left(1 + \sum_{gvt\ ttx4} txp_{gvt,tx4,png,rg} \right) \quad [52]
 \end{aligned}$$

$$PCV_{png,rg} = \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt\ ttx1} txv_{gvt,ttx1,png,rg} \right) \left(1 + \sum_{gvt\ ttx2} txv_{gvt,ttx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txv_{gvt,ttx3,png,rg} \right) \left(1 + \sum_{gvt\ ttx4} txv_{gvt,ttx4,png,rg} \right) \quad [53]$$

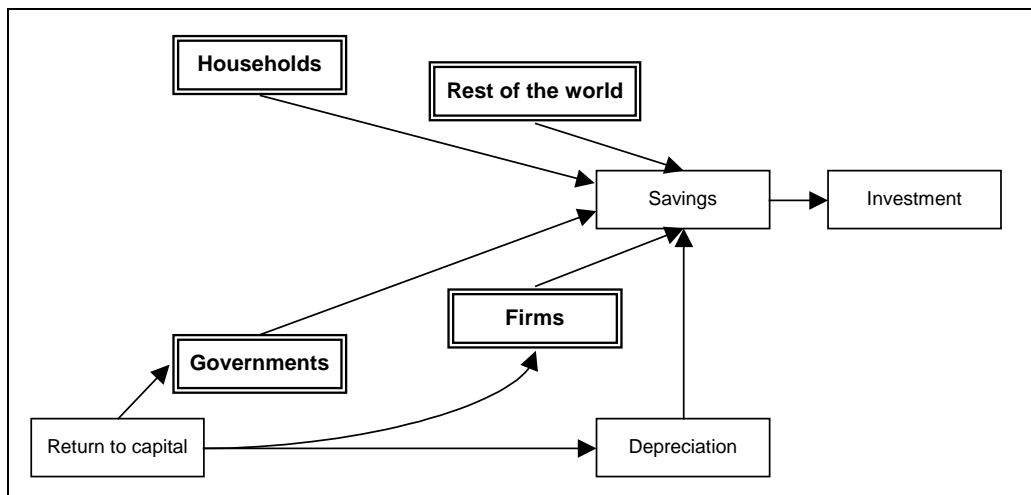
Only the federal government collects customs duties (equation [24]). Direct tax rates and indirect tax rates (chiefly the GST and the QST) are considered parameters. A change to any of these taxes has implications on the behaviour of households and firms that react to changes in relative prices in the economy. In addition, these changes necessarily have an impact on the government's budget.

Turning to household income tax, it should be noted that, strictly speaking, the model cannot be a microsimulation model in which various "typical cases" would be represented within each group of households or firms: households of each category are modeled as a representative household and firms of each branch are represented by a representative firm. The precision of the modelling of taxation is accordingly conditioned by the detail of the classification of households and productive sectors. These classifications were defined in agreement with the ministère des Finances.

3.5 Investment

The savings pool is fed by the savings of all agents (households, firms and governments) of the two regions, as well as by net foreign savings (Canada's international trade current account deficit), which reflects the free flow of capital in Canada (equation [79]). According to the Walras' law, the total value of investments must be equal to total available savings. The closure rule adopted in the basic model is that the total value of investments is endogenous, i.e. determined by total savings in Canada.

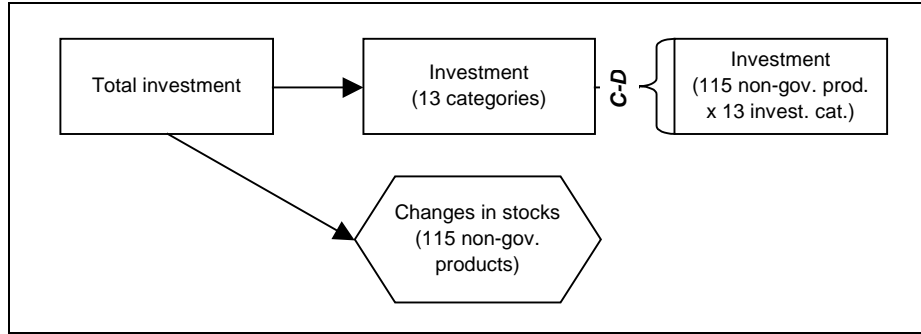
DIAGRAM 3d - Savings and investment



$$IT = \sum_{men} SM_{men} + \sum_{ent} SE_{ent} + \sum_{gnf} SG_{gnf} + eBC + \sum_k \sum_{rg} AMT_{k,rg} \quad [79]$$

Changes in stocks are exogenous in real terms. After their value has been deducted from savings, the rest is distributed among the 13 investment categories according to fixed value shares (equation [38]). After deducting, for each category, exogenous amounts of permits paid to governments (in particular building permits), the remainder is allocated according to fixed value shares among products and regions (equation [39]).

DIAGRAM 1e - Investment

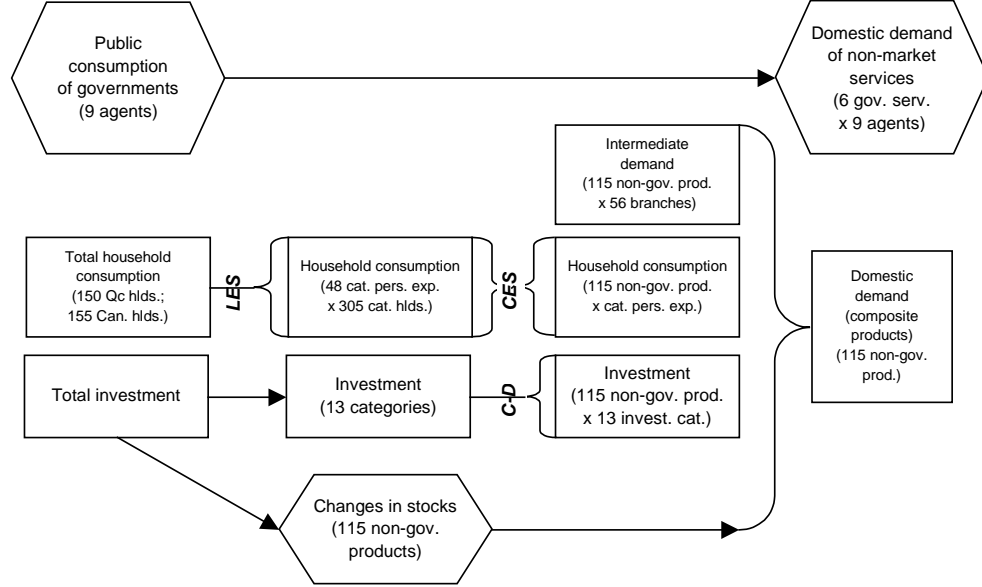


$$CINV_{civ} = \chi_{civ} \left[IT - \sum_{rg} \sum_{pnm} PC_{pnm,rg} STOCK_{pnm,rg} \right] \quad [38]$$

$$INV_{png,civ,rg} PCV_{png,rg} = \mu_{png,civ,rg} \left(CINV_{civ} - \sum_{gvt} PERI_{gvt,civ} \right) \quad [39]$$

3.6 Product demand by each region

The internal absorption of each good is the sum of the quantities of this good demanded by households, firms and governments for final consumption, investment and intermediate consumption purposes (equation [40], equation [69] and equation [70]). In most cases, a good or a service can be supplied by more than one local productive sector, or it can be imported from the ROC or elsewhere in the world. It is assumed that, from the purchasers' point of view, products of the same category of goods and services from different local productive sectors are perfect substitutes for each other.

DIAGRAM 1f - Domestic demand


$$DIT_{png,rg} = \sum_i DI_{png,i,rg} \quad [40]$$

$$Q_{pnm,rg} = DIT_{pnm,rg} + \sum_{dp} CC_{pnm,dp,rg} + \sum_{civ} INV_{pnm,civ,rg} + STOCK_{pnm,rg} + ENP_{pnm,rg} + ENP_{pnm,rg}^W \quad [69]$$

$$Q_{bm,rg} = DIT_{bm,rg} + \sum_{dp} CC_{bm,dp,rg} + \sum_{civ} INV_{bm,civ,rg} + \sum_{png} md_{bm,png,rg} D_{png,rg} \quad [70]$$

$$+ \sum_{png} md_{bm,png,rg} M_{png,rg} + \sum_{png} md_{bm,png,rg} MN_{png,rg} + \sum_{png} mex_{bm,png,rg} EX_{png,rg}$$

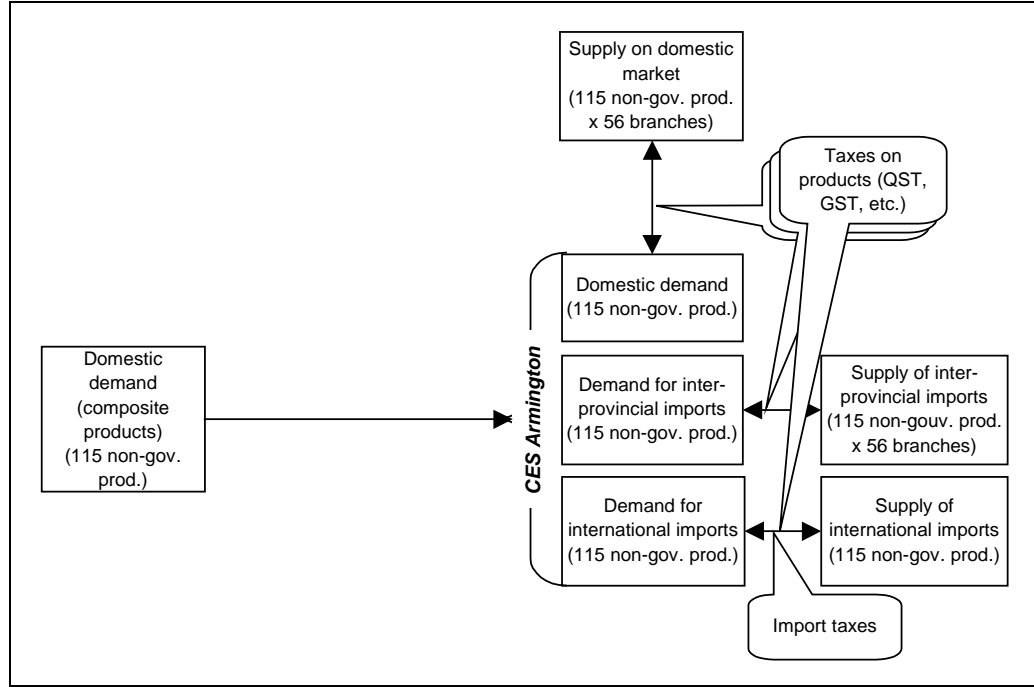
$$+ \sum_{png} mrex_{bm,png,rg} REX_{png,rg} + ENP_{bm,rg} + ENP_{bm,rg}^W + REX_{bm,rg}$$

3.7 External trade and Québec-ROC trade

While, from the standpoint of purchasers, products from different local productive sectors are perfect substitutes for each other, that is not the case for locally produced goods and services in relation to imports from another region or from the ROW. The quantity demanded of each good is accordingly a combination of local production and imports. The distribution of demand for such composite good among the three competing sources of supply is governed by a constant elasticity of substitution (CES) function (equation [65], equation [66] and equation [67]). The choice of a finite elasticity reflects the assumption that imports and local products are not perfect substitutes, in accordance with

the Armington (1969) approach currently used in this type of model. Accordingly, the shares of the three sources of supply in the aggregate are determined by minimizing the acquisition cost of the composite good. The homothetic property of the CES function allows us to deduce the price of the composite good. One advantage of this form of import modelling is that different tax systems can be applied to goods depending on their origin (as is the case with customs duties, which are collected only on international imports - equation [24]).

DIAGRAM 1g - Domestic demand and imports



$$TIM_{gvt,png,rg} = tm_{gvt,png,rg} e^{PWM_{png,rg}} M_{png,rg} \quad [24]$$

$$Q_{png,rg} = AM_{png,rg} \left(\alpha 1_{png,rg}^M M_{png,rg}^{-\rho_{png,rg}} + \alpha 2_{png,rg}^M MN_{png,rg}^{-\rho_{png,rg}} + \alpha 3_{png,rg}^M D_{png,rg}^{-\rho_{png,rg}} \right)^{\frac{-1}{\rho_{png,rg}}} \quad [65]$$

$$M_{png,rg} = \left[\left(\frac{PL_{png,rg}}{PM_{png,rg}} \right) \left(\frac{\alpha 1_{png,rg}^M}{\alpha 3_{png,rg}^M} \right) \right]^{\sigma_{png,rg}} D_{png,rg} \quad [66]$$

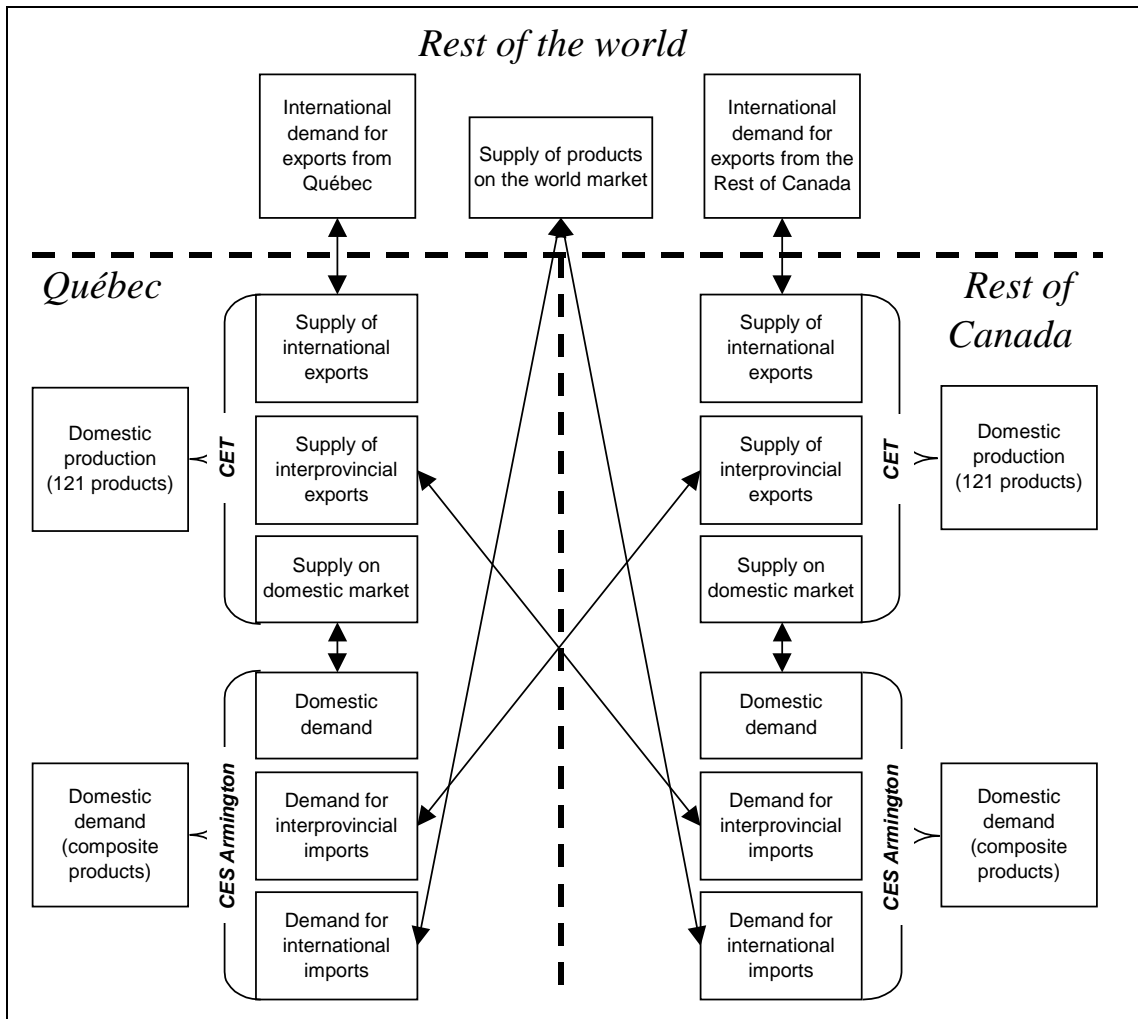
$$MN_{png,rg} = \left[\left(\frac{PL_{png,rg}}{PCA_{png,rg}} \right) \left(\frac{\alpha 2_{png,rg}^M}{\alpha 3_{png,rg}^M} \right) \right]^{\sigma_{png,rg}} D_{png,rg} \quad [67]$$

The supply of international imports is perfectly elastic at world prices, which corresponds to the assumption that, as importers, Québec and the ROC are “small countries”, as the expression is understood in international trade theory.

As for trade between the two regions, Québec and the ROC are both modelled explicitly, so that the supply of imports from region *A* on the market of region *B* is identical to the supply of exports to *B* from all producers of *A* (equation [75]). Since these mutual supplies of exports and demands for imports are sensitive to changes in relative prices of each region and between regions, the prices that apply to this trade are themselves necessarily endogenous.

$$MN_{png,rg} = EXN_{png,rgj} + ENP_{png,rgj};rg \neq rgj \quad [75]$$

DIAGRAM 2 - Interprovincial and international trade



The aggregate supply of exports (to the other region or to the ROW) of a product by a region is simply the sum of the supplies of its industries, which reflects the assumption that in the eyes of buyers of the other region or of the ROW, products of the same category of goods and services from different industries are perfect substitutes for each other (equation [71], equation [72]).

$$EX_{png,rg} = \sum_i EXS_{i,png,rg} \quad [71]$$

$$EXN_{png,rg} = \sum_i EXNS_{i,png,rg} \quad [72]$$

Turning to demand for international exports, Québec and the ROC could be considered small countries in relation to the ROW: that would imply that the demand for international exports, just like the supply of imports from the world, would be considered as perfectly elastic with respect to international prices (in practice, in most cases, with respect to prevailing prices in the United States). However, we know that in reality, any increase in exports requires a competitive effort. Accordingly, the model takes this phenomenon into account by specifying a finite price elasticity for international demand functions for exports from Québec and the ROC. International export and reexport prices are therefore endogenous (equation [63] and [64]).

$$EXD_{png,rg} = \left(\frac{PWE_{png,rg}}{PE_{png,rg}^{FOB}} \right)^{\epsilon_{png,rg}} EXDI_{png,rg} \quad [63]$$

$$REX_{pnm,rg} = \left(\frac{PWE_{pnm,rg}^R}{PE_{pnm,rg}^{FOBR}} \right)^{\epsilon_{pnm,rg}^R} REXI_{pnm,rg} \quad [64]$$

The consolidated current account trade deficit between Canada (including Québec) and the ROW is the amount of net foreign savings (if the current account balance is positive, there is a drain on Québec and the ROC domestic savings) (equation [68] and equation [79]). In the basic model, the current account balance is exogenous and balance of payments current account equilibrium is obtained through changes in the real exchange rate, the nominal exchange rate e being the numeraire.

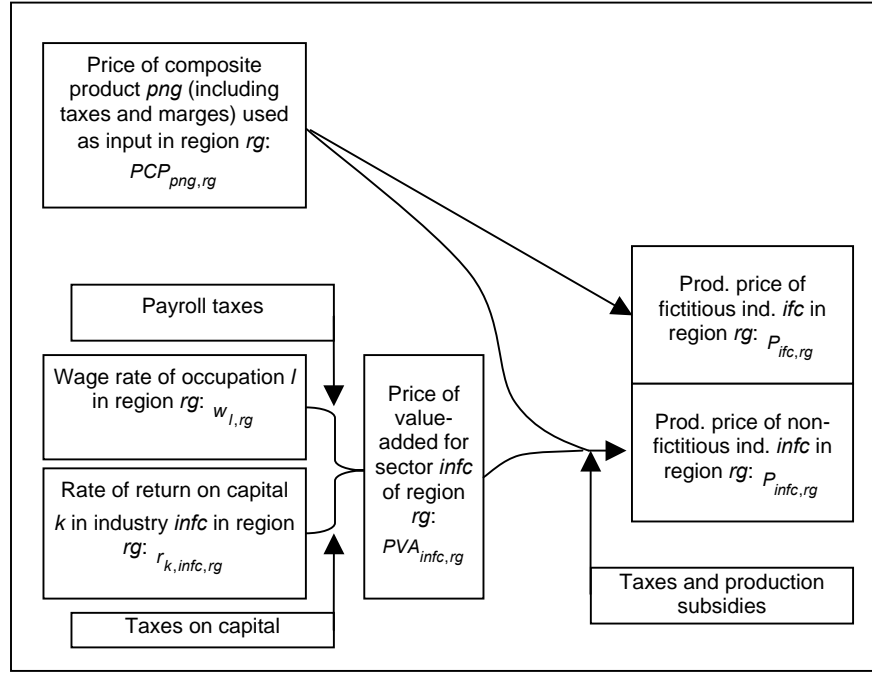
$$\begin{aligned}
 BC = & \sum_{rg} \sum_{png} PWM_{png,rg} M_{png,rg} + \sum_{rg} \sum_{pnm} PWM_{pnm,rg}^R REX_{pnm,rg} \\
 & - \sum_{rg} \sum_{png} PE_{png,rg}^{FOB} EX_{png,rg} - \sum_{rg} \sum_{pnm} PE_{pnm,rg}^{FOBR} REX_{pnm,rg} + \frac{1}{e} \sum_{ag} TRWA_{ag} \\
 & - \sum_{ag} TRAW_{ag} - \frac{1}{e} \sum_{gvt} TY_{gvt}^{RDM} + \frac{1}{e} \eta^{DW} DIV + \frac{1}{e} \eta^{IW} INT - DIV^W - INT^W \\
 & - \frac{1}{e} \sum_{rg} \sum_{png} \left(PC_{png,rg} + \sum_{bm} mex_{bm,png,rg} PC_{bm,rg} \right) ENP_{png,rg}^W \\
 & - \frac{1}{e} \sum_{rg} \sum_{png} PC_{bm,rg} REX_{bm,rg}
 \end{aligned} \tag{68}$$

$$IT = \sum_{men} SM_{men} + \sum_{ent} SE_{ent} + \sum_{gnf} SG_{gnf} + eBC + \sum_k \sum_{rg} AMT_{k,rg} \tag{79}$$

3.8 Price formation

Since this is a general equilibrium model, prices influence the behaviour of agents and are determined simultaneously with quantities. Accordingly, the price formation model is, as expected, the dual of the quantity flow model.

DIAGRAM 4a - Producer cost



$$r_{KSOC,ifc,rg} \left(1 + \sum_{gvt} \sum_{ttk} tk_{gvt,ttk,ifc,rg} \right) KD_{KSOC,ifc,rg} = \alpha_{KSOC,ifc,rg} PVA_{ifc,rg} VA_{ifc,rg} \quad [07]$$

$$r_{KIND,ifc,rg} \left(1 + \sum_{gvt} \left(\sum_{ttk} tk_{gvt,ttk,ifc,rg} \right) + tk_{i,gvt,ifc,rg} \right) KD_{KIND,ifc,rg} = \alpha_{KIND,ifc,rg} PVA_{ifc,rg} VA_{ifc,rg} \quad [08]$$

In competitive general equilibrium, producer prices are equal to production costs.

Accordingly, the producer prices of the 53 non-fictitious industries are determined by a Leontief combination of intermediate input prices and the price of the value-added (equation [42]). The producer prices of the three fictitious industries (that generate no value-added) are equal to the cost of their intermediate consumption (equation [41]). A Cobb-Douglas function ties the price of the value-added of each of the 53 non-fictitious industries to the prices

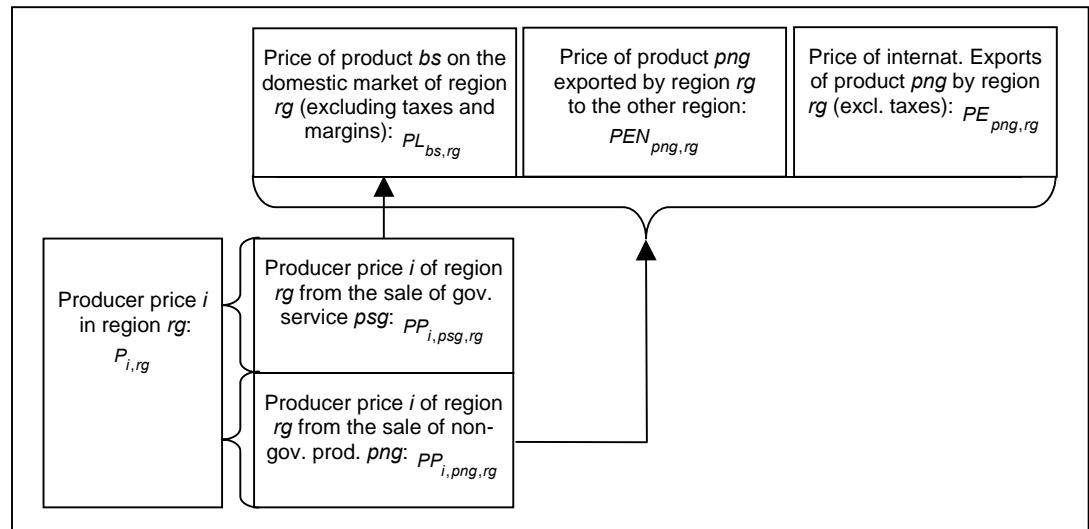
of its component factors: capital (2 types, specific to each branch) and labour (11 categories) (equation [07] and equation [08]). The model also defines a deflator of GDP at factor cost, which is a weighted average of the prices of the values-added of the industries (equation [55])⁶.

$$P_{ifc,rg} XS_{ifc,rg} = \sum_{png} PCP_{png,rg} DI_{png,ifc,rg} \quad [41]$$

$$PVA_{ifc,rg} VA_{ifc,rg} = \left(1 - \sum_{gvt,tp} tp_{gvt,tp,ifc,rg} \right) P_{ifc,rg} XS_{ifc,rg} - \sum_{png} PCP_{png,rg} DI_{png,ifc,rg} \quad [42]$$

$$PINDEX = \sum_{rg} \sum_{ifc} \pi_{ifc,rg} PVA_{ifc,rg} \quad [55]$$

DIAGRAM 4b - Producer prices



6 This is a Laspeyres-type index, in which the weights of the components are proportional to their value in the basic SAM.

Turning to the supply side, we have seen that each branch first allocates its production among the various products, then among goods produced for the domestic market and those intended for export to the ROC or the ROW, according to nested two-level constant elasticity of transformation (CET) functions. In view of the homothetic property of CET functions, the producer price of aggregate production of each branch is accordingly a weighted average of the prices of its products (equation [48]), while the price of each product of a given branch is a weighted average of the equilibrium prices over the three destination markets (internal market, exports to the other region and international exports; equation [49]). For non-market products (government services), there are no exports and the producer price is simply equal to the domestic price (equation [50]).

$$P_{i,rg} X S_{i,rg} = \left(1 + \sum_{ent} de_{ent,i,rg} \right) \sum_{bs} PP_{i,bs,rg} X SP_{i,bs,rg} \quad [48]$$

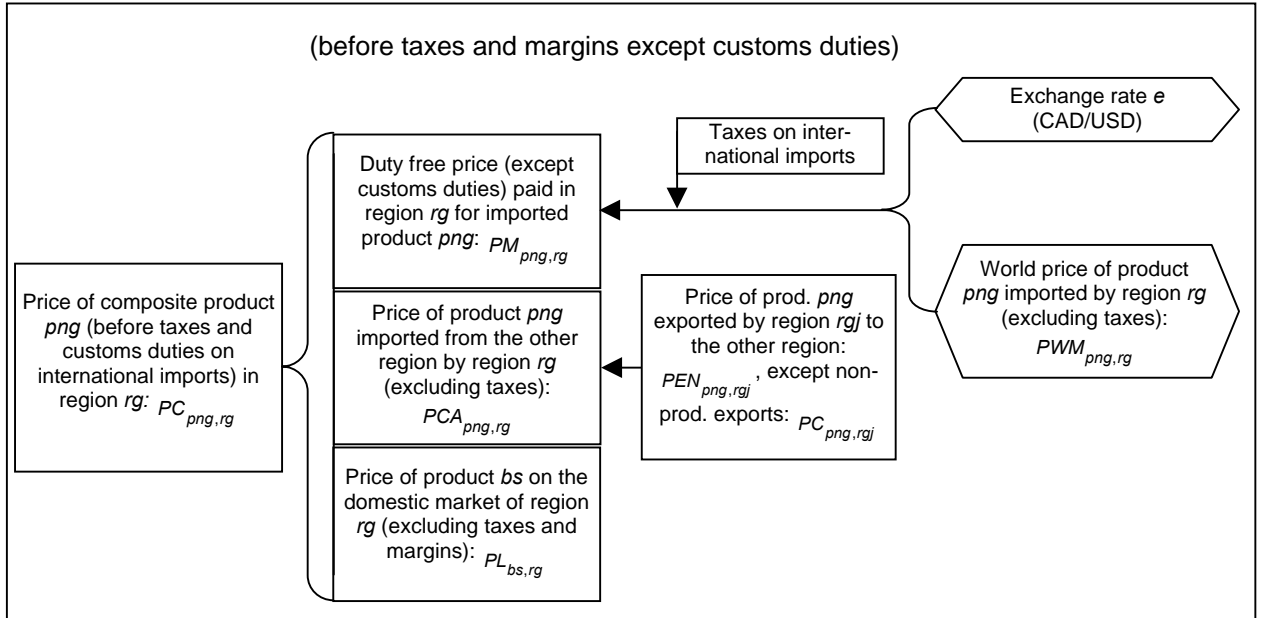
$$PP_{i,png,rg} X SP_{i,png,rg} = PL_{png,rg} DS_{i,png,rg} + PE_{png,rg} EXS_{i,png,rg} + PEN_{png,rg} EXNS_{i,png,rg} \quad [49]$$

$$PP_{i,psg,rg} = PL_{psg,rg} \quad [50]$$

On the domestic market, local production competes with imports from the other region and from the ROW. The composite good is a combination of products from these three sources and its price is accordingly a weighted average of the prices of locally produced and imported goods (equation [47]). Naturally, the prices paid for products imported from the other region are equal to the prices received by the other region (equation [44])⁷. And the prices of imports are equal to their price on the world market in foreign currency, translated into Canadian dollars at the exchange rate, to which are added taxes on international imports (customs duties) collected by the federal government (equation [43]).

7 Concerning the “non-produced exports” mentioned in the diagram, see Appendix 2.

DIAGRAM 4c - Price of the composite good



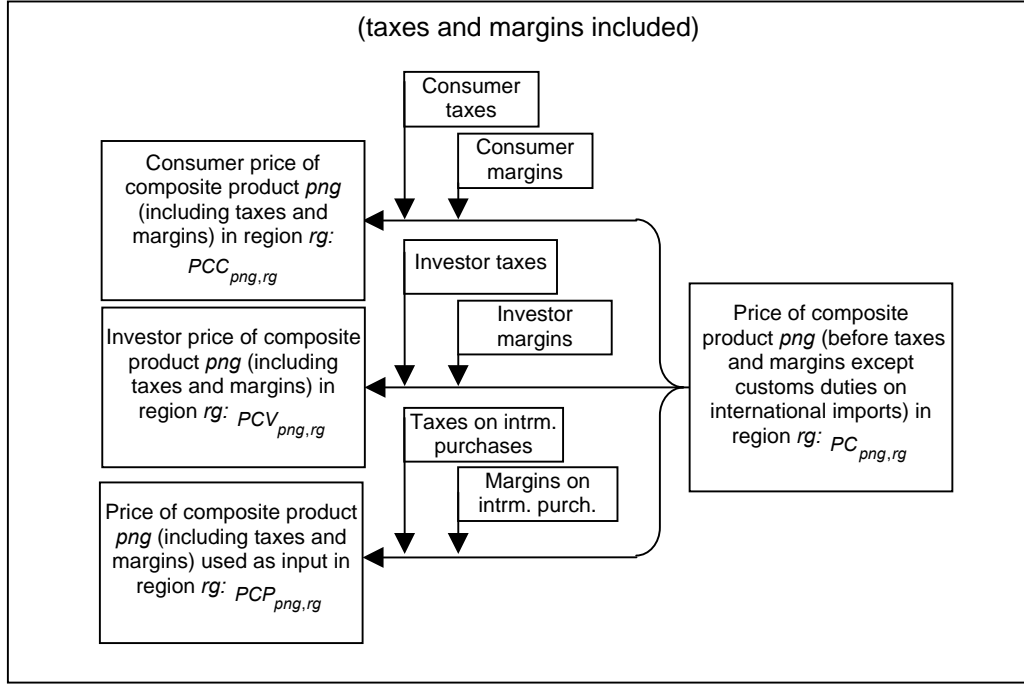
$$PM_{png,rg} = e PWM_{png,rg} \left(1 + \sum_{gvt} tm_{gvt,png,rg} \right) \quad [43]$$

$$PCA_{png,rg} MN_{png,rg} = PEN_{png,rgj} EXN_{png,rgj} + PC_{png,rgj} ENP_{png,rgj}; rg \neq rgj \quad [44]$$

$$PC_{png,rg} Q_{png,rg} = PL_{png,rg} D_{png,rg} + PM_{png,rg} M_{png,rg} + PCA_{png,rg} MN_{png,rg} \quad [47]$$

Purchaser prices include taxes as well as transport and trade margins. In the model, these can vary depending on the category of purchaser (consumer prices, investor prices or production input prices (equations [51-53])). Production input prices apply to intermediate consumption and determine, as mentioned above, jointly with the sector price of value-added, the cost of each branch. The price associated with each category of personal expenditure is a weighted average of consumer prices of its component products, to which are added permits (equation [54], not represented in the diagrams).

DIAGRAM 4d - Purchaser prices on the domestic market



$$PCC_{png,rg} = \left(PC_{png,rg} + \sum_{bm} mc_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt\ ttx1} txc_{gvt,ttx1,png,rg} \right) \left(1 + \sum_{gvf\ ttx2} txc_{gvf,ttx2,png,rg} \right) \left(1 + \sum_{gvp\ ttx2} txc_{gvp,ttx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txc_{gvt,ttx3,png,rg} \right) \left(1 + \sum_{gvt\ ttx4} txc_{gvt,ttx4,png,rg} \right) \quad [51]$$

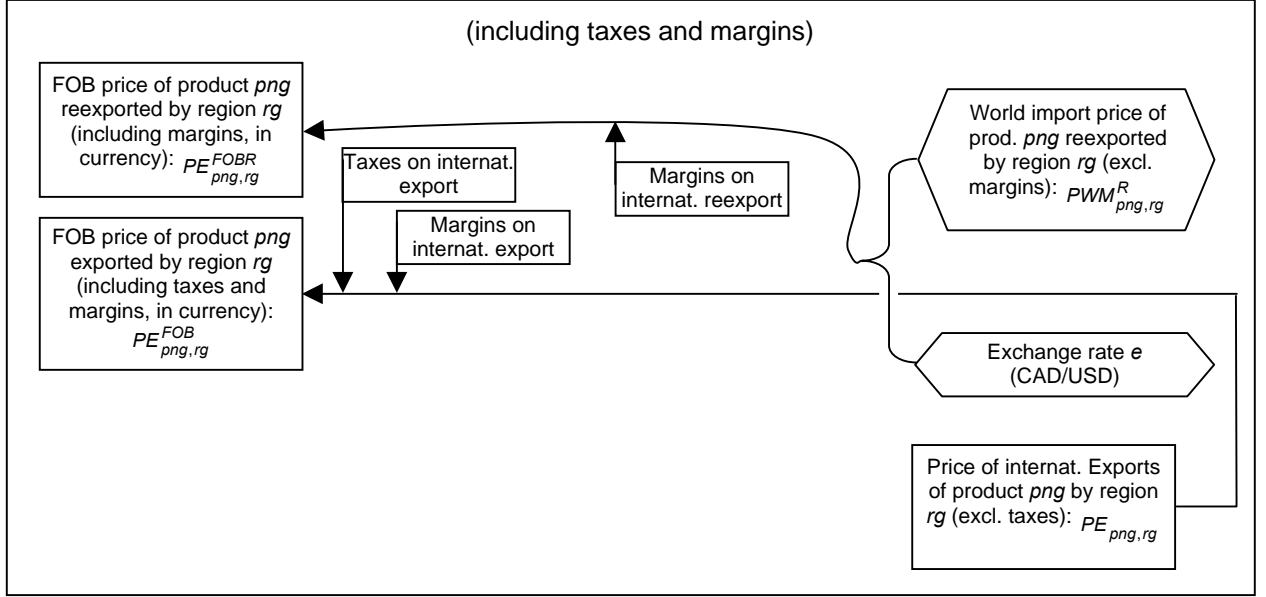
$$PCP_{png,rg} = \left(PC_{png,rg} + \sum_{bm} mp_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt\ ttx1} txp_{gvt,ttx1,png,rg} \right) \left(1 + \sum_{gvf\ ttx2} txp_{gvf,ttx2,png,rg} \right) \left(1 + \sum_{gvp\ ttx2} txp_{gvp,ttx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txp_{gvt,ttx3,png,rg} \right) \left(1 + \sum_{gvt\ ttx4} txp_{gvt,ttx4,png,rg} \right) \quad [52]$$

$$PCV_{png,rg} = \left(PC_{png,rg} + \sum_{bm} mv_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt\ ttx1} txv_{gvt,ttx1,png,rg} \right) \left(1 + \sum_{gvf\ ttx2} txv_{gvf,ttx2,png,rg} \right) \left(1 + \sum_{gvp\ ttx2} txv_{gvp,ttx2,png,rg} \right) \left(1 + \sum_{gvt\ ttx3} txv_{gvt,ttx3,png,rg} \right) \left(1 + \sum_{gvt\ ttx4} txv_{gvt,ttx4,png,rg} \right) \quad [53]$$

$$PCT_{dp,rg} \sum_{men} C_{dp,men,rg} = \sum_{png} PCC_{png,rg} CC_{png,dp,rg} + \sum_{gvt} PERD_{gvt,dp,rg} \quad [54]$$

Free on board (FOB) prices of exports also include taxes and margins (equation [45]). Reexports are not taxed, but are burdened by margins. These margins are added to the world price of goods imported for reexport purposes, translated into CAD at the exchange rate (equation [46]).

DIAGRAM 4e -FOB prices of exports and reexports

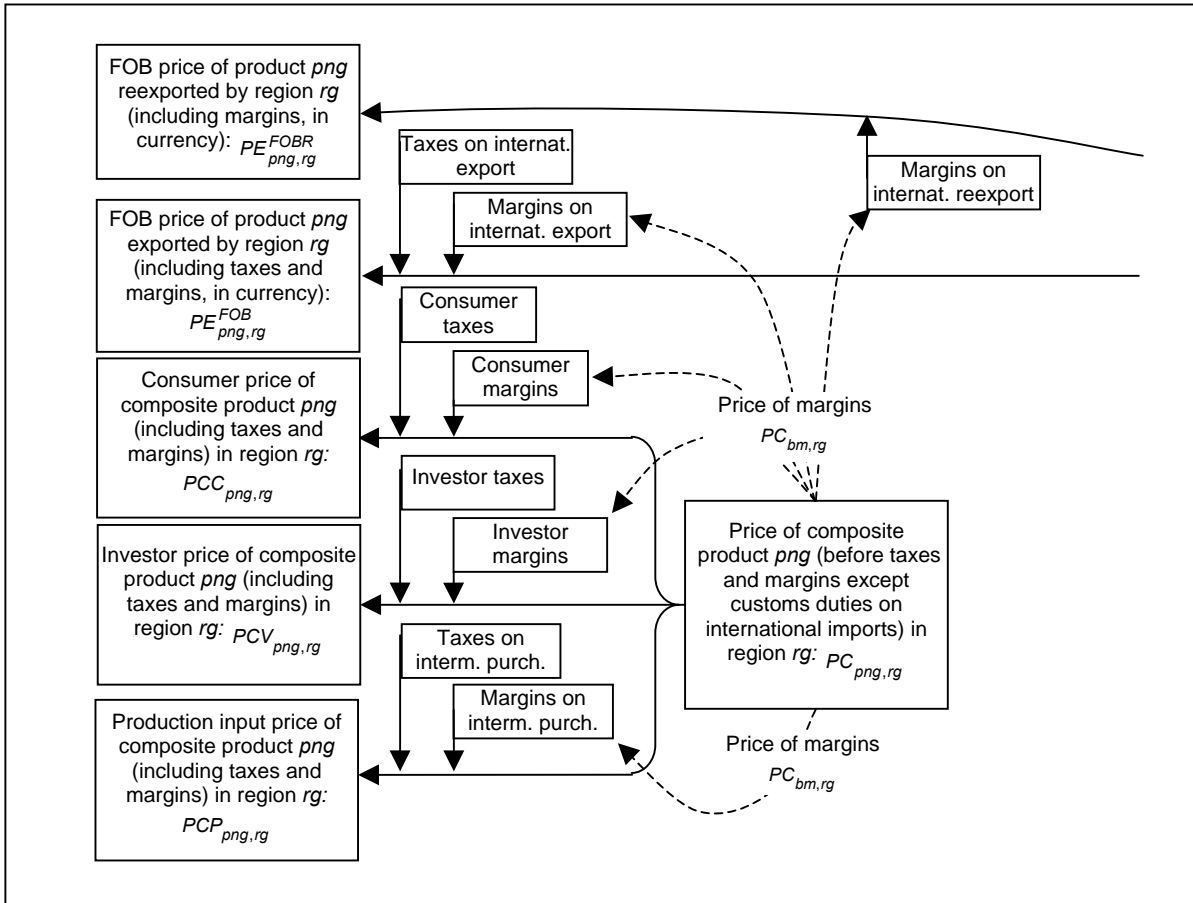


$$e PE_{png,rg}^{FOB} = \left(PE_{png,rg} + \sum_{bm} mex_{bm,png,rg} PC_{bm,rg} \right) \left(1 + \sum_{gvt} te_{gvt,png,rg} \right) \quad [45]$$

$$e PE_{png,rg}^{FOBR} = e PWM_{png,rg}^R + \sum_{bm} mrex_{bm,png,rg} PC_{bm,rg} \quad [46]$$

Trade and transport margins consist of services actually produced. The prices of the margins are therefore endogenous to the model. The *quantity* of the margins associated with a flow is proportional to the volume of the flow (quantity), while the *amount* of the margins is the product of their quantity by their price (equation [45], equation [46] and equations [51-53]).

DIAGRAM 4f - Prices of margins



3.9 General equilibrium

A general equilibrium of this model is a vector of prices and quantities that satisfy the following behaviour equations and conditions:

<p>- equilibrium on the domestic market of each product in each region (equation [65], equation [69], equation [70] and equation [73]);</p>	$Q_{png,rg} = AM_{png,rg} \left(\alpha^1 M_{png,rg}^{-\rho_{png,rg}} + \alpha^2 M_{png,rg}^{-\rho_{png,rg}} MN_{png,rg}^{-\rho_{png,rg}} + \alpha^3 M_{png,rg}^{-\rho_{png,rg}} D_{png,rg}^{-\rho_{png,rg}} \right)^{\frac{-1}{\rho_{png,rg}}} \quad [65]$ $Q_{pnm,rg} = \quad [69]$ $DIT_{pnm,rg} + \sum_{dp} CC_{pnm,dp,rg} + \sum_{civ} INV_{pnm,civ,rg} + STOCK_{pnm,rg} + ENP_{pnm,rg} + ENP_{pnm,rg}^W$ $Q_{bm,rg} = DIT_{bm,rg} + \sum_{dp} CC_{bm,dp,rg} + \sum_{civ} INV_{bm,civ,rg} + \sum_{png} md_{bm,png,rg} D_{png,rg} \quad [70]$ $+ \sum_{png} md_{bm,png,rg} M_{png,rg} + \sum_{png} md_{bm,png,rg} MN_{png,rg} + \sum_{png} mex_{bm,png,rg} EX_{png,rg}$ $+ \sum_{png} mrex_{bm,png,rg} REX_{png,rg} + ENP_{bm,rg} + ENP_{bm,rg}^W + REX_{bm,rg}$ $D_{png,rg} = \sum_i DS_{i,png,rg} \quad [73]$
<p>- equality of quantities demanded for import and supplied for export of each product in trade between Québec and the ROC and between each of the regions and the ROW (equation [74], equation [75]);</p>	$EX_{png,rg} = EXD_{png,rg} \quad [74]$ $MN_{png,rg} = EXN_{png,rgj} + ENP_{png,rgj}; rg \neq rgj \quad [75]$
<p>- equilibrium on the market of each category of labour in each region (equation [77]);</p>	$LS_{l,rg} = \sum_{infc} LD_{l,infc,rg} \quad [77]$
<p>- equilibrium on the market of each type of capital for each branch of each region (equation [78]);</p>	$KS_{k,infc,rg} = KD_{k,infc,rg} \quad [78]$
<p>- equality between total savings and the value of investment (equation [79]).</p>	$IT = \sum_{men} SM_{men} + \sum_{ent} SE_{ent} + \sum_{gnf} SG_{gnf} + eBC + \sum_k \sum_{rg} AMT_{k,rg} \quad [79]$

CONCLUSION

This research paper presents the main characteristics and the structure of the general equilibrium model of the ministère des Finances du Québec (GEMFQ). The model is a computable, static, multi-sector general equilibrium model. In addition, since Québec is a part of Canada, the GEMFQ is of a bi-regional nature, where not only Québec's economy but also that of the rest of Canada (ROC) are explicitly modelled, taking into account both their mutual relations and their relations with the rest of the world (ROW).

The GEM is a large-scale model that is sufficiently detailed to take into account the direct and indirect effects of federal and provincial policies on each of the two regions represented.

In terms of its structure, the model has four categories of economic agents: firms, households, governments and the rest of the world. For each of the two regions, there are 56 productive sectors, 48 categories of personal consumption expenditure, 121 categories of goods and services and 13 categories of investment goods. The types of households differ from one region to another: Québec has 150 while the ROC has 155. Labour demand distinguishes 11 types of manpower. There are also two types of capital goods corresponding to two types of business: corporations and unincorporated businesses.

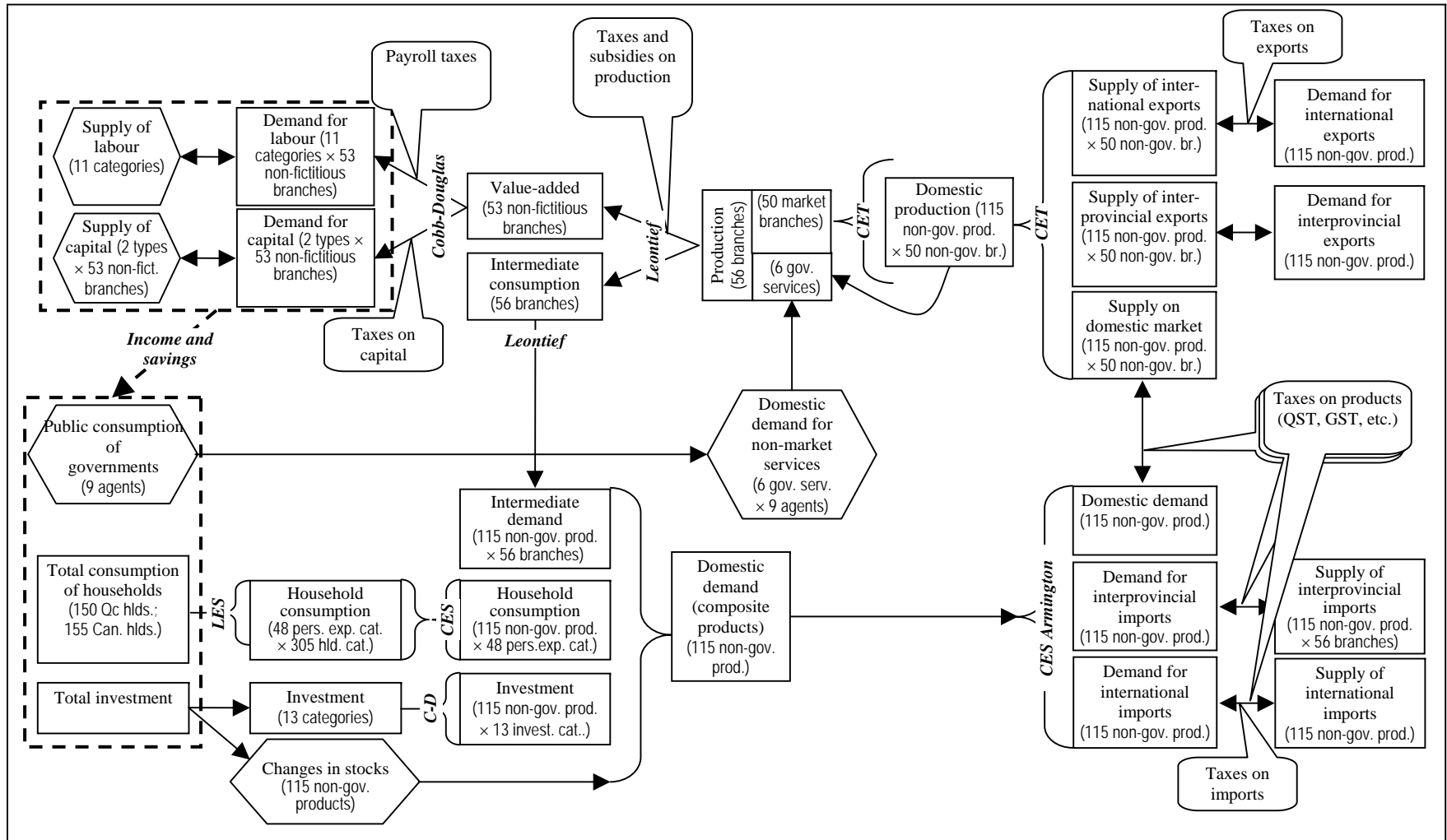
The computable general equilibrium model is an analytical instrument the ministère des Finances du Québec can apply to better understand the implications of fiscal and economic policy and hence make informed decisions.

LIST OF DIAGRAMS

DIAGRAM 1a - Production (inputs)	10
DIAGRAM 1b - Production (supply)	13
DIAGRAM 3a - Households.....	14
DIAGRAM 1c - Consumption.....	16
DIAGRAM 3b - Firms.....	17
DIAGRAM 3c - Governments	18
DIAGRAM 1d - Public consumption of governments.....	19
DIAGRAM 3d - Savings and investment	23
DIAGRAM 1e - Investment	24
DIAGRAM 1f - Domestic demand	25
DIAGRAM 1g - Domestic demand and imports	26
DIAGRAM 2 - Interprovincial and international trade.....	27
DIAGRAM 4a - Producer cost.....	30
DIAGRAM 4b - Producer prices	31
DIAGRAM 4c - Price of the composite good	33
DIAGRAM 4d - Purchaser price on the domestic market	34
DIAGRAM 4e -FOB prices of exports and reexports	35
DIAGRAM 4f - Prices of margins.....	36

APPENDIX A - DIAGRAMS

**Diagram 1 – Production, supply and demand for a region
(Québec or rest of Canada)**



MODELE D'EQUILIBRE GENERAL DU MINISTERE DES FINANCES DU QUEBEC (MEGFO):
CARACTERISTIQUES ET STRUCTURE DU MODELE

Diagram 2 – Interprovincial and international trade

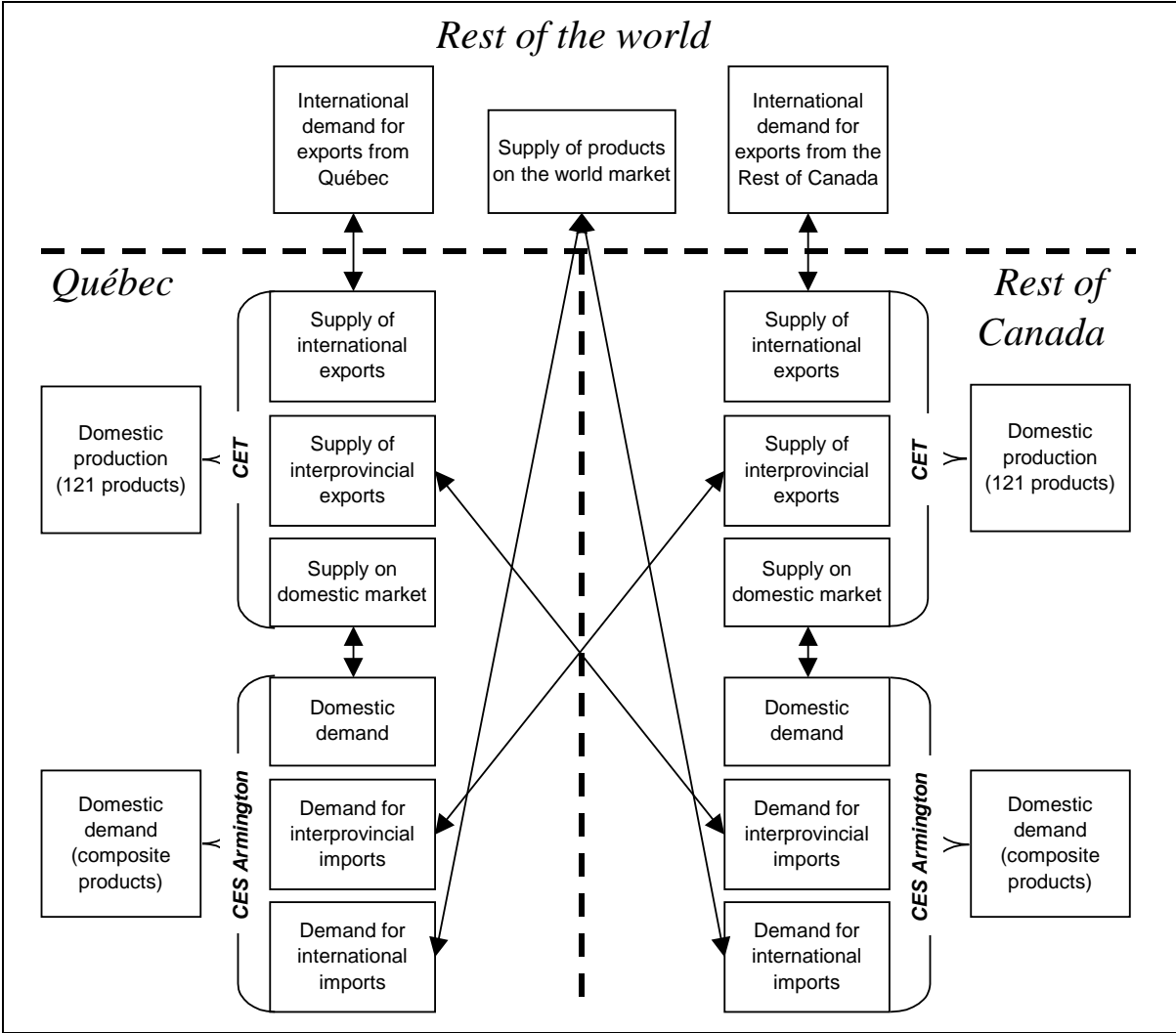


Diagram 3 – Income, savings and expenditure of agents

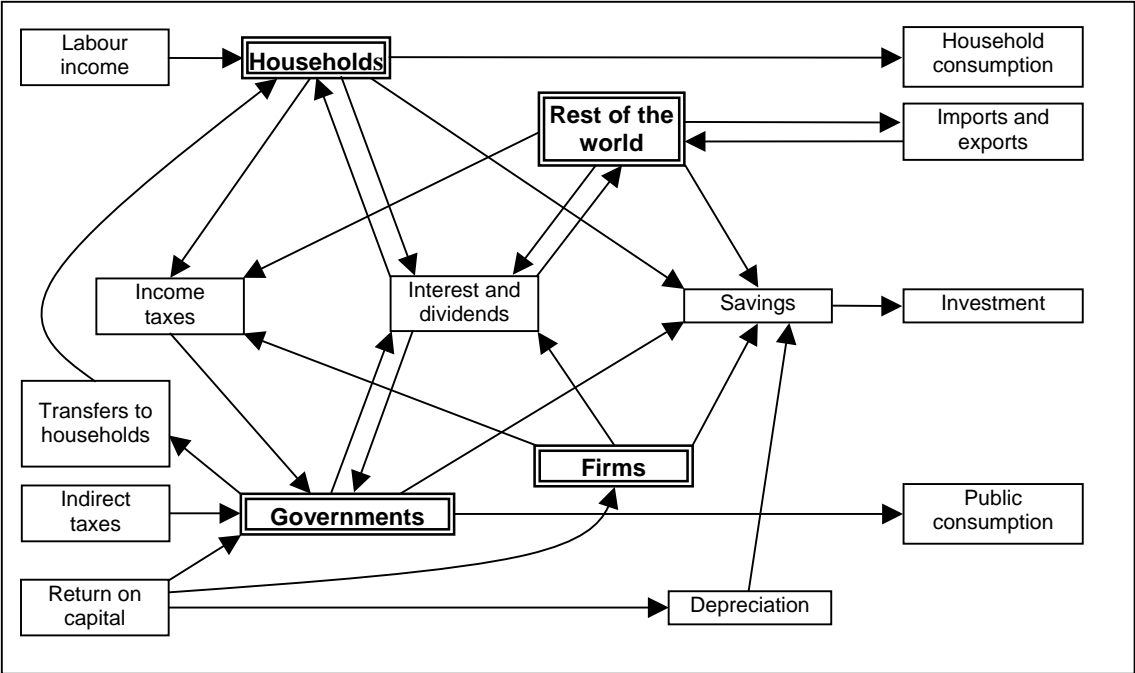
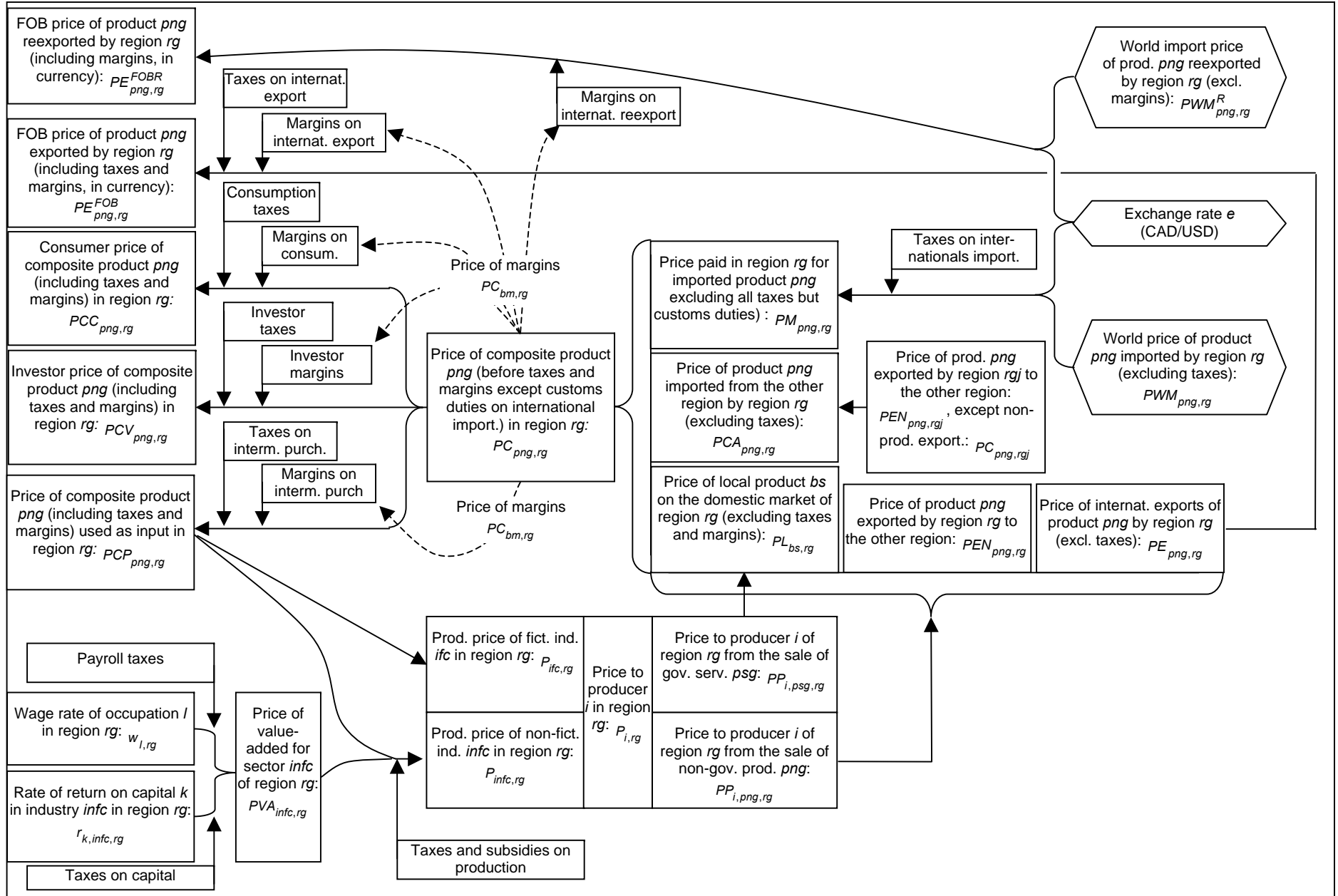


DIAGRAM 4 – PRICE FORMATION



APPENDIX B - DESCRIPTION OF THE
PARAMETERS AND VARIABLES OF
THE MODEL

Endogenous variables of the model

PRICE

e	Exchange rate
$P_{i,rg}$	Producer price in industrie i and in region rg
$PC_{png,rg}$	Price of composite product png (before taxes and margins except customs duties on international imports) in region rg
$PCA_{png,rg}$	Price of product png imported from the other region by region rg (excluding taxes)
$PCC_{png,rg}$	Consumer price of composite product png (including taxes and margins) in region rg
$PCP_{png,rg}$	Production input price of composite product png (including taxes and margins) in region rg
$PCT_{dp,rg}$	Index of prices for functional category dp in region rg
$PCV_{png,rg}$	Investor price of composite product png (including taxes and margins) in region rg
$PE_{png,rg}$	Price of product png exported by region rg (excluding taxes)
$PE_{png,rg}^{FOB}$	FOB price of product png exported by region rg (including taxes and margins, in currency)
$PE_{png,rg}^{FOBR}$	FOB price of product png reexported by region rg (including taxes and margins, in currency)
$PEN_{png,rg}$	Price of product png exported by region rg to the other region
$PINDEX$	GDP deflator
$PL_{bs,rg}$	Price of product bs on the domestic market of region rg (excluding taxes and margins)
$PM_{png,rg}$	Duty free (except customs duties) price paid in region rg for imported product png
$PP_{i,bs,rg}$	Price to producer i of region rg from the sale of bs
$PVA_{infc,rg}$	Price of the value-added for sector $infc$ of region rg
$r_{k,infc,rg}$	Rate of return on capital k in industry $infc$ in region rg
$w_{l,rg}$	Wage rate of occupation l in region rg

Production

$CI_{i,rg}$	Total intermediate consumption of sector i of region rg
$DI_{png,i,rg}$	Intermediate consumption of product png by sector i of region rg
$SO_{infc,rg}$	Operating surplus of sector $infc$ of region rg
$VA_{infc,rg}$	Value-added of sector $infc$ in region rg
$XS_{i,rg}$	Total production of sector i in region rg
$XSP_{i,bs,rg}$	Production of product bs by sector i of region rg

Factors of production

$AMT_{k,rg}$	Depreciation from the return on capital k in region rg
$LD_{l,infc,rg}$	Demand for labour l by sector $infc$ of region rg
$KD_{k,infc,rg}$	Demand for capital k by sector $infc$ of region rg

Savings income

DIV	Total value of dividends
INT	Total value of interest and other investment income
SE_{ent}	Savings of firm ent
SG_{gnf}	Savings of government gnf
SM_{men}	Savings of household men
$TD_{gvt,ang}$	Receipts of government gvt from direct taxes on income collected from non-government agent ang
$TEI_{gvt,infc,rg}$	Receipts of government gvt from taxes on capital on sole proprietorships of sector $infc$ in region rg
$TI_{gvt,ttx,png,rg}$	Receipts of government gvt from indirect taxes ttx on png in region rg
$TIE_{gvt,png,rg}$	Receipts of government gvt from taxes on international exports of png by region rg
$TIM_{gvt,png,rg}$	Receipts of government gvt from taxes on international imports of png by region rg
$TNP_{gvt,ttp,infc,rg}$	Receipts of government gvt from taxes ttp on the production of branch $infc$ of region rg
$TR_{GFC,GFQ}$	Transfer from the federal government to Québec in the consolidated account of the federal government

$TRK_{gvt,ttk,inf,rg}$	Receipts of government gvt from taxes ttk on the capital of sector inf in region rg
$TWL_{gvt,ttw,inf,rg}$	Receipts of government gvt from taxes ttw on the payroll of sector inf in region rg
YDM_{men}	Disposable income of household men
YE_{ent}	Income of firm ent
YG_{gvt}	Revenue of government gvt
YM_{men}	Income of household men

Demand

$C_{dp,men,rg}$	Consumption of household men in functional category dp of region rg
$CC_{png,dp1,rg}$	Consumption by demand category $dp1$ of product png of region rg
$CINV_{civ}$	Total investment of investment category civ
CTM_{men}	Total consumption of household men
$D_{png,rg}$	Production of png sold on the domestic market of region rg
$DIT_{png,rg}$	Intermediate demand of region rg for product png
$DS_{ing,png,rg}$	Production of png sold by sector ing on the domestic market of region rg
$INV_{png,civ,rg}$	Investment in product png by investment category civ in region rg
IT	Total investment
$Q_{png,rg}$	Composite product png on the market of region rg

International trade

$EX_{png,rg}$	Supply for international export by region rg of png
$EXD_{png,rg}$	Foreign demand for product png exported by region rg
$EXN_{png,rg}$	Interprovincial exports by region rg of png
$EXNS_{ing,png,rg}$	Interprovincial exports by sector ing of region rg of png
$EXS_{ing,png,rg}$	Supply for international export by sector ing of region rg of png
$M_{pgn,rg}$	International imports by region rg of product png
$MN_{png,rg}$	Interprovincial imports by region rg of product png
$REX_{pnm,rg}$	Reexport by region rg of pnm

Exogenous variables of the model

BC	Current account deficit
$CC_{png,DNETR,rg}$	Consumption by demand category $DNETR$ of product png of region rg
DIV^W	Dividends paid by the ROW
$DS_{isg,png,rg}$	Production of png sold by sector isg on the domestic market of region rg
$ENP_{png,rg}$	Non-produced exports of product png to the other provinces by region rg
$ENP^W_{png,rg}$	Non-produced exports of product png to the ROW by region rg
$EXDI_{png,rg}$	Initial foreign demand for product png exported by region rg
$EXNS_{isg,png,rg}$	Interprovincial exports by sector isg of region rg of png
$EXS_{isg,png,rg}$	Supply for international export by sector isg of region rg of png
$G_{psg,gvt,rg}$	Public consumption of government gvt of service psg in region rg
ICS_{men}	Interest on the consumer debt of household men
INT^W	Interest and other investment income paid by the ROW
$KS_{k,infrc,rg}$	Supply of capital k by sector $infrc$ of region rg
$LS_{l,rg}$	Supply of labour l in region rg
$PERD_{gvt,dp,rg}$	Permits paid to government gvt by personal expenditure category dp in region rg
$PERI_{gvt,civ}$	Permits paid to government gvt by investment category civ

$PWE_{png,rg}$	World price of product png exported by region rg (including taxes)
$PWE_{png,rg}^R$	World price of product png reexported by region rg (including taxes)
$PWM_{png,rg}$	World price of product png imported by region rg (excluding taxes)
$PWM_{png,rg}^R$	World import price of product png reexported by region rg (excluding taxes)
$REX_{bm,rg}$	Product bm reexported by region rg
$REXI_{png,rg}$	Initial foreign demand for product png reexported by region rg
SDP_{gvt}	Public debt service of government gvt
$STOCK_{png,rg}$	Changes in stocks for product png in region rg
$TR_{ag,agj}$	Transfers between agents (from agj to ag) with the exception of the transfer from the federal government to Québec towards the consolidated federal government
$TRAW_{ag}$	Transfers from the ROW to agent ag (in currency)
$TRP_{pr,gvt}$	Public transfers pr paid by government gvt to households
$TRWA_{ag}$	Transfers from agent ag to the ROW
TY_{gvt}^{RDM}	Income tax paid by the ROW to government gvt

Parameters of the model

Parameters of production functions

$A_{infc,rg}$	Coefficient of scale (Cobb-Douglas value-added)
$A_{ifc,rg}^{FC}$	Coefficient of scale (Leontief, fictitious sectors ifc)
$aij_{png,i,rg}$	Input-output coefficients
$io_{infc,rg}$	Coefficient (Leontief total intermediate consumption)
$v_{infc,rg}$	Coefficient (Leontief value-added)
$\alpha_{f,infc,rg}$	Share (in value) of factor f in value-added

Parameters of the CET according to destination

$B_{i,png,rg}$	Coefficient of scale
$\beta 1_{i,png,rg}$, $\beta 2_{i,png,rg}$, $\beta 3_{i,png,rg}$	Coefficients of distribution
$\kappa_{i,png,rg}$	Elasticity parameter

$\tau_{i,png,rg}$ Elasticity of transformation

Parameters of the CET according to production

$B_{i,rg}^P$ Coefficient of scale
 $\beta_{i,bs,rg}^P$ Coefficients or distribution
 $\kappa_{i,rg}^P$ Elasticity parameter
 $\tau_{i,rg}^P$ Elasticity of transformation

Parameters of the CES among component products of expenditure categories

$A_{dp1,rg}^{DP}$ Coefficient of scale
 $\alpha_{png,dp1,rg}^{DP}$ Coefficient of distribution
 $\rho_{dp1,rg}^{DP}$ Elasticity parameter
 $\sigma_{dp1,rg}^{DP}$ Elasticity of substitution

Parameters of the CES among various origins

$AM_{png,rg}$ Coefficient of scale
 $\alpha 1_{png,rg}^M, \alpha 2_{png,rg}^M, \alpha 3_{png,rg}^M$ Coefficient of distribution
 $\rho_{png,rg}$ Elasticity parameter
 $\sigma_{png,rg}$ Elasticity of substitution

Tax rate

$te_{gvt,png,rg}$ Tax rate on international exports of product *png*
 $tk_{gvt,ttk,inf,rg}$ Tax rate *ttk* on the capital of sector *inf*
 $tki_{gvt,inf,rg}$ Tax rate on the capital of sole proprietorships of sector *inf*
 $tm_{gvt,png,rg}$ Tax rate on international imports of product *png*
 $tp_{gvt,tip,inf,rg}$ Tax rate *ttp* for industry *inf*
 $tw_{gvt,ttw,inf,rg}$ Tax rate *ttw* on the payroll of sector *inf*
 $txc_{gvt,ttx,png,rg}$ Rates of indirect consumption taxes on product *png*
 $txp_{gvt,ttx,png,rg}$ Rates of indirect taxes on production inputs, on product *png*
 $txv_{gvt,ttx,png,rg}$ Rates of indirect taxes on investment on product *png*

$t_{y_{gvt,ang}}$ Income tax rate of agents

Margin rates

$mc_{bm,png,rg}$ Margin rate bm on sales to consumers

$mp_{bm,png,rg}$ Margin rate bm on sales to producers

$mv_{bm,png,rg}$ Margin rate bm on sales for investment purposes

$mex_{bm,png,rg}$ Margin rate bm on exports

$mrex_{bm,png,rg}$ Margin rate bm on reexports

Distribution parameters and other parameters

$de_{ent,i,rg}$	Rate of deviation, assumed by firm ent , between the “normal” operating surplus and the negative surplus of the base year of branch i in region rg
$\mathcal{E}_{png,rg}$	Elasticity of world demand for product png exported by region rg
$\mathcal{E}_{png,rg}^R$	Elasticity of world demand for product png reexported by region rg
η_{ag}^D	Share (in value) of dividends paid to agent ag
η^{DW}	Share (in value) of dividends paid to the ROW
η_{ag}^I	Share (in value) of interest and other investment income paid to agent ag
η^{IW}	Share (in value) of interest and other investment income paid to the ROW
$\gamma_{dp,men,rg}^1$	Marginal budgetary share of expenditure of type dp in the consumption of household men
$\gamma_{DNETR,dp,rg}^2$	Share (in value) of product $DNETR$ in expenditure category dp
$\lambda_{men,l,rg}^L$	Share of wages paid to household men
$\lambda_{ag,k,rg}^K$	Share of the return on capital k paid to agent ag
$\mu_{png,civ,rg}$	Share (in value) of product png in investment category civ
$\nu_{men,pr,gvt}$	Share (in value) of public transfer pr paid to household men by government gvt
φ_{ent}^D	Share (in value) of the income of firm ent transferred in the form of dividends
φ_{ent}^I	Share (in value) of the income of firm ent transferred in the form of interest and other investment income
$\pi_{infc,rg}$	Initial share of the value-added of sector $infc$ of region rg in total value-added
ψ_{men}	Average propensity to save of household men
χ_{civ}	Share (in value) of investment category civ in total investment

SETS OF THE MODEL

Sets relating to industries

$i \in I$ = All industries

$ifc \in IFC \subset I$: Sub - set of fictitious industries

$infc \in INFC \subset I$: Sub - set excluding fictitious industries

$isg \in ISG \subset I$: Sub - set of governmentservicesindustries

$ing \in ING \subset I$: Sub - set excluding governmentservicesindustries

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>IAGRI</i>	Agriculture	<i>I, INFC, ING</i>
<i>ICHAS</i>	Fishing, hunting and trapping	<i>I, INFC, ING</i>
<i>IFORE</i>	Forest operations and forest services	<i>I, INFC, ING</i>
<i>IMINE</i>	Mines	<i>I, INFC, ING</i>
<i>IPEGN</i>	Crude oil and natural gas	<i>I, INFC, ING</i>
<i>ICARR</i>	Quarries and sandpits	<i>I, INFC, ING</i>
<i>ISMIN</i>	Mining services industries	<i>I, INFC, ING</i>
<i>IALIM</i>	Food	<i>I, INFC, ING</i>
<i>IBOSS</i>	Beverages	<i>I, INFC, ING</i>
<i>ICAOU</i>	Rubber	<i>I, INFC, ING</i>
<i>IPLAS</i>	Plastics	<i>I, INFC, ING</i>
<i>ITEXT</i>	Prime textiles manufacturing	<i>I, INFC, ING</i>
<i>IPTEX</i>	Textile products	<i>I, INFC, ING</i>
<i>IVETE</i>	Clothing	<i>I, INFC, ING</i>
<i>IBOIS</i>	Wood	<i>I, INFC, ING</i>
<i>IMEUB</i>	Furniture and furnishings	<i>I, INFC, ING</i>
<i>IPAPI</i>	Paper and related products	<i>I, INFC, ING</i>
<i>IIMPR</i>	Printing, publishing and related ind.	<i>I, INFC, ING</i>
<i>IPMTT</i>	Prime metal manufacturing	<i>I, INFC, ING</i>
<i>IMETA</i>	Metal fabricating	<i>I, INFC, ING</i>
<i>IMACH</i>	Machinery	<i>I, INFC, ING</i>
<i>IMATR</i>	Transportation equipment	<i>I, INFC, ING</i>
<i>IPELE</i>	Electric and electronic products	<i>I, INFC, ING</i>
<i>IPMNM</i>	Non-metallic mineral products	<i>I, INFC, ING</i>
<i>IPRAF</i>	Refined oil and coal products	<i>I, INFC, ING</i>
<i>ICHIM</i>	Chemical industries	<i>I, INFC, ING</i>
<i>IMDIV</i>	Miscellaneous manufacturing	<i>I, INFC, ING</i>
<i>ICONS</i>	Construction	<i>I, INFC, ING</i>
<i>ITRAN</i>	Transportation	<i>I, INFC, ING</i>

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>IPIPE</i>	Pipeline transmission	<i>I, INFC, ING</i>
<i>IENTR</i>	Storage and warehousing	<i>I, INFC, ING</i>
<i>ICOMM</i>	Communications	<i>I, INFC, ING</i>
<i>ISUPU</i>	Public utilities	<i>I, INFC, ING</i>
<i>ICMGR</i>	Wholesale trade	<i>I, INFC, ING</i>
<i>ICMDE</i>	Retail trade	<i>I, INFC, ING</i>
<i>ISFIN</i>	Financial and real estate services	<i>I, INFC, ING</i>
<i>IASSU</i>	Insurance	<i>I, INFC, ING</i>
<i>IPROP</i>	Owner-occupied buildings	<i>I, INFC, ING</i>
<i>ISENT</i>	Business services	<i>I, INFC, ING</i>
<i>IENSE</i>	Education services	<i>I, INFC, ING</i>
<i>ISESS</i>	Health and social services	<i>I, INFC, ING</i>
<i>IHBER</i>	Lodging and food services	<i>I, INFC, ING</i>
<i>ILOIS</i>	Recreation and leisure	<i>I, INFC, ING</i>
<i>ISPER</i>	Personal and domestic services	<i>I, INFC, ING</i>
<i>ISER</i>	Other service industries	<i>I, INFC, ING</i>
<i>IFOUR</i>	Office cafeteria operating supplies	<i>I, IFC, ING</i>
<i>IVOYA</i>	Leisure travel, adv. promotion	<i>I, IFC, ING</i>
<i>IMTRA</i>	Transport margins	<i>I, IFC, ING</i>
<i>IOSBL</i>	Non-profit organizations excl. educ.	<i>I, INFC, ING</i>
<i>IIENS</i>	Education institutions	<i>I, INFC, ING</i>
<i>IGHOP</i>	Hospitals and care for int. clients	<i>I, INFC, ISG</i>
<i>IGEDU</i>	Education	<i>I, INFC, ISG</i>
<i>IGDEF</i>	Defence services	<i>I, INFC, ISG</i>
<i>IGADL</i>	Other local administrations	<i>I, INFC, ISG</i>
<i>IGADP</i>	Other prov. and ter. administrations	<i>I, INFC, ISG</i>
<i>IGADF</i>	Other federal administration	<i>I, INFC, ISG</i>

Product sets

$bs, bsj \in BS$: All goods and services

$psg \in PSG \subset BS$: Sub - set of government services

$png \in PNG \subset BS$: Sub - set excluding government services

$bm \in BM \subset PNG$: Sub - set including margins

$pnm \in PNM \subset PNG$: Sub - set excluding government services and margins

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>PCERE</i>	Grains	<i>BS, PNG, PNM</i>
<i>PAVIV</i>	Live animals	<i>BS, PNG, PNM</i>
<i>PAGRI</i>	Other farm products	<i>BS, PNG, PNM</i>
<i>PFORE</i>	Forest products and services	<i>BS, PNG, PNM</i>
<i>PPOIS</i>	Fish and seafood	<i>BS, PNG, PNM</i>
<i>PCHAS</i>	Hunting and trapping products	<i>BS, PNG, PNM</i>
<i>PMFER</i>	Iron ore and concentrates	<i>BS, PNG, PNM</i>
<i>PMMET</i>	Other metal ores and concentrates	<i>BS, PNG, PNM</i>
<i>PCHAR</i>	Coal	<i>BS, PNG, PNM</i>
<i>PHUIB</i>	Crude mineral oils	<i>BS, PNG, PNM</i>
<i>PGAZN</i>	Natural gas other than liquefied	<i>BS, PNG, PNM</i>
<i>PMNMT</i>	Non-metallic minerals	<i>BS, PNG, PNM</i>
<i>PSMIN</i>	Mine extraction services	<i>BS, PNG, PNM</i>
<i>PVIAN</i>	Meat products	<i>BS, PNG, PNM</i>
<i>PLAIT</i>	Dairy products	<i>BS, PNG, PNM</i>
<i>PPFDM</i>	Fish and seafood products	<i>BS, PNG, PNM</i>
<i>PFLEG</i>	Products of fruits and vegetables, etc.	<i>BS, PNG, PNM</i>
<i>PAPAN</i>	Animal food	<i>BS, PNG, PNM</i>
<i>PFBLE</i>	Flour and starch	<i>BS, PNG, PNM</i>
<i>PCTEB</i>	Grain, table, bakery prod.	<i>BS, PNG, PNM</i>
<i>PSUCR</i>	Sugar	<i>BS, PNG, PNM</i>
<i>PADIV</i>	Miscellaneous food products	<i>BS, PNG, PNM</i>
<i>PBOGA</i>	Carbonated drinks	<i>BS, PNG, PNM</i>
<i>PBOAL</i>	Alcoholic beverages	<i>BS, PNG, PNM</i>
<i>PTANU</i>	Unrefined tobacco	<i>BS, PNG, PNM</i>
<i>PCIGA</i>	Cigarettes and other tobacco products	<i>BS, PNG, PNM</i>
<i>PPNEU</i>	Tires and inner tubes	<i>BS, PNG, PNM</i>
<i>PCAOU</i>	Other rubber products	<i>BS, PNG, PNM</i>
<i>PPLAS</i>	Plastic products	<i>BS, PNG, PNM</i>
<i>PCUIR</i>	Leather and leather products	<i>BS, PNG, PNM</i>
<i>PFILS</i>	Wires and fibres	<i>BS, PNG, PNM</i>

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>PTISU</i>	Fabrics	<i>BS, PNG, PNM</i>
<i>PTEXT</i>	Other textile products	<i>BS, PNG, PNM</i>
<i>PTRIC</i>	Socks and knitted clothing	<i>BS, PNG, PNM</i>
<i>PVETE</i>	Other clothing and accessories	<i>BS, PNG, PNM</i>
<i>PBOIS</i>	Lumber and treated wood products	<i>BS, PNG, PNM</i>
<i>PPLAC</i>	Veneers and plywood	<i>BS, PNG, PNM</i>
<i>PPBOI</i>	Other wood products	<i>BS, PNG, PNM</i>
<i>PMEUB</i>	Furniture and furnishings	<i>BS, PNG, PNM</i>
<i>PPDEB</i>	Wood pulp	<i>BS, PNG, PNM</i>
<i>PJPCC</i>	Newsprint, other paper, building board	<i>BS, PNG, PNM</i>
<i>PPCPP</i>	Coated paper and paper products	<i>BS, PNG, PNM</i>
<i>PIMED</i>	Printed papers and publishing services	<i>BS, PNG, PNM</i>
<i>PPUBJ</i>	Advertising services, newspapers, magazines, etc.	<i>BS, PNG, PNM</i>
<i>PACPT</i>	Iron prod. and prime steel manufacturing	<i>BS, PNG, PNM</i>
<i>PALUM</i>	Aluminum products and aluminum alloys	<i>BS, PNG, PNM</i>
<i>PCUIV</i>	Copper products and copper alloys	<i>BS, PNG, PNM</i>
<i>PNICK</i>	Nickel products and nickel alloys	<i>BS, PNG, PNM</i>
<i>PMNFE</i>	Other non-ferrous metal products	<i>BS, PNG, PNM</i>
<i>PRESE</i>	Boilers and plate work	<i>BS, PNG, PNM</i>
<i>PSTRU</i>	Prefab. metal structural prod.	<i>BS, PNG, PNM</i>
<i>PAMET</i>	Other metallic products	<i>BS, PNG, PNM</i>
<i>PMAGR</i>	Farm machinery	<i>BS, PNG, PNM</i>
<i>PMACH</i>	Other industrial machinery	<i>BS, PNG, PNM</i>
<i>PAUTO</i>	Automobiles	<i>BS, PNG, PNM</i>
<i>PPIEC</i>	Automobile parts	<i>BS, PNG, PNM</i>
<i>PMTRR</i>	Other transportation equipment and repairs	<i>BS, PNG, PNM</i>
<i>PAPPD</i>	Household machines and appliances	<i>BS, PNG, PNM</i>
<i>PELEC</i>	Other electric and electronic products	<i>BS, PNG, PNM</i>
<i>PBETO</i>	Concrete and concrete products	<i>BS, PNG, PNM</i>
<i>PMNME</i>	Other non-metallic mineral products	<i>BS, PNG, PNM</i>
<i>PESSE</i>	Engine fuel	<i>BS, PNG, PNM</i>
<i>PCARB</i>	Aviation fuel	<i>BS, PNG, PNM</i>
<i>PDIES</i>	Diesel fuel	<i>BS, PNG, PNM</i>
<i>PMAZO</i>	Fuel oil	<i>BS, PNG, PNM</i>
<i>PGLIQ</i>	Liquefied petroleum gas inc. natural gas	<i>BS, PNG, PNM</i>
<i>PPETR</i>	Other petroleum and coal products	<i>BS, PNG, PNM</i>
<i>PCHIM</i>	Industrial chemical products	<i>BS, PNG, PNM</i>

APPENDICES

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>PENGR</i>	Fertilizer	<i>BS, PNG, PNM</i>
<i>PPHAR</i>	Pharmaceutical products	<i>BS, PNG, PNM</i>
<i>PENTR</i>	Maintenance products	<i>BS, PNG, PNM</i>
<i>PSPER</i>	Personal care products	<i>BS, PNG, PNM</i>
<i>PACHI</i>	Other chemical products	<i>BS, PNG, PNM</i>
<i>PAMED</i>	Ophthalmological apparatus	<i>BS, PNG, PNM</i>
<i>PLABO</i>	Mat. med. photo lab. med. ophth. appa.	<i>BS, PNG, PNM</i>
<i>PAMAN</i>	Other manufactured products	<i>BS, PNG, PNM</i>
<i>PCOBR</i>	Construction of residential buildings	<i>BS, PNG, PNM</i>
<i>PCONR</i>	Non-residential construction	<i>BS, PNG, PNM</i>
<i>PCORE</i>	Construction (repair)	<i>BS, PNG, PNM</i>
<i>PMAPI</i>	Pipeline transport margin	<i>BS, PNG, BM</i>
<i>PTAIR</i>	Air transportation	<i>BS, PNG, PNM</i>
<i>PTEAU</i>	Water transportation	<i>BS, PNG, PNM</i>
<i>PTFER</i>	Rail transportation	<i>BS, PNG, PNM</i>
<i>PTURB</i>	Urban mass transit	<i>BS, PNG, PNM</i>
<i>PTSCO</i>	School transportation, ambulance services	<i>BS, PNG, PNM</i>
<i>PTROU</i>	Road transportation	<i>BS, PNG, PNM</i>
<i>PTAUT</i>	Other transportation services	<i>BS, PNG, PNM</i>
<i>PEMMA</i>	Storage and warehousing	<i>BS, PNG, BM</i>
<i>PDIFF</i>	Radio and television broadcasting incl. cable	<i>BS, PNG, PNM</i>
<i>PCOMM</i>	Telephone and other telecom. services	<i>BS, PNG, PNM</i>
<i>PPOST</i>	Postal and courier services	<i>BS, PNG, PNM</i>
<i>PELTE</i>	Electricity	<i>BS, PNG, PNM</i>
<i>PMGAZ</i>	Natural gas distribution margin	<i>BS, PNG, BM</i>
<i>PASPU</i>	Other public services	<i>BS, PNG, PNM</i>
<i>PMCGR</i>	Wholesale trade margins	<i>BS, PNG, BM</i>
<i>PMCDT</i>	Retail trade margins	<i>BS, PNG, BM</i>
<i>PLBIM</i>	Gross rents charged	<i>BS, PNG, PNM</i>
<i>PSFIN</i>	Financial services	<i>BS, PNG, PNM</i>
<i>PSLOG</i>	Lodging services	<i>BS, PNG, PNM</i>
<i>PASSU</i>	Insurance	<i>BS, PNG, PNM</i>
<i>PSENT</i>	Business and computer services	<i>BS, PNG, PNM</i>
<i>PENSP</i>	Private education services	<i>BS, PNG, PNM</i>
<i>PSSSS</i>	Health care and social services	<i>BS, PNG, PNM</i>
<i>PLOTG</i>	Lotteries and races	<i>BS, PNG, PNM</i>
<i>PLOIS</i>	Other recreational services	<i>BS, PNG, PNM</i>

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>PHBR</i>	Lodging and meal services	<i>BS, PNG, PNM</i>
<i>PSER</i>	Other services	<i>BS, PNG, PNM</i>
<i>PMTRA</i>	Transport margins	<i>BS, PNG, BM</i>
<i>PFOUR</i>	Office, cafeteria, lab. operating supplies	<i>BS, PNG, PNM</i>
<i>PVOYA</i>	Travel and entertainment. pub. promotion	<i>BS, PNG, PNM</i>
<i>PSMEN</i>	Household services (NPO)	<i>BS, PNG, PNM</i>
<i>PEDUC</i>	Non-profit education services	<i>BS, PNG, PNM</i>
<i>PGHOP</i>	Hospitals and care for int. clients	<i>BS, PSG</i>
<i>PGEDU</i>	Education	<i>BS, PSG</i>
<i>PGDEF</i>	Defence services	<i>BS, PSG</i>
<i>PGMUN</i>	Other municipal administration services	<i>BS, PSG</i>
<i>PGPRO</i>	Other provincial administration services	<i>BS, PSG</i>
<i>PGFED</i>	Other federal administration service	<i>BS, PSG</i>
<i>PIMNC</i>	Non-competitive imports	<i>BS, PNG, PNM</i>
<i>PIENR</i>	Non-allocated imports and exports	<i>BS, PNG, PNM</i>
<i>PVASG</i>	Sales of other government services	<i>BS, PNG, PNM</i>

Sets relating to factors of production

$f \in F$: All factors of production

$l \in L \subset F$: Labour sub - set

$k \in K \subset F$: Capital sub - set

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>LDIR</i>	Management and administration	<i>F,L</i>
<i>LSCI</i>	Natural sciences, engineering, math., social sciences, religion	<i>F,L</i>
<i>LENS</i>	Teaching	<i>F,L</i>
<i>LADM</i>	Administrative work	<i>F,L</i>
<i>LCOM</i>	Trade	<i>F,L</i>
<i>LSER</i>	Services	<i>F,L</i>
<i>LAGR</i>	Agr., hort., breeding, fishing, trapping and forest development	<i>F,L</i>
<i>LPRE</i>	Mines and quarries, processing and machining of raw materials	<i>F,L</i>
<i>LFMR</i>	Manufacturing, assembly and repair of finished products	<i>F,L</i>
<i>LCON</i>	Construction	<i>F,L</i>
<i>LTRM</i>	Transportation, handling, operation of machines and miscellaneous apparatus	<i>F,L</i>
<i>KSOC</i>	Capital of corporations	<i>F,K</i>
<i>KIND</i>	Capital of sole proprietorships	<i>F,K</i>

Sets relating to agents

$ag, agj \in AG$: All agents

$men \in MEN \subset AG$: Households sub - set

$ent \in ENT \subset AG$: Firms sub - set

$gvt \in GVT \subset AG$: Governments sub - set

$gnf \in GNF \subset GVT$: Sub - sets of governments excluding the federal government in Québec

$gnfc \in GNFC \subset GVT$: Sub - sets of governments excluding the federal government in Canada

$gvf \in GVF \subset GVT$: Sub - sets of the federal governments (in Québec and in Canada)

$gvp \in GVP \subset GVT$: Sub - sets of provincial governments (in Québec and in Canada)

$ang \in ANG \subset AG = MEN \cup ENT$: Sub - set of non - government agents

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M111Q</i>	<35 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M112Q</i>	<35 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M113Q</i>	<35 years <\$15000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M114Q</i>	<35 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M115Q</i>	<35 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M116Q</i>	<35 years <\$15000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M117Q</i>	<35 years <\$15000 other	<i>AG, ANG, MEN</i>
<i>M121Q</i>	<35 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M122Q</i>	<35 years \$15000-\$24999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M123Q</i>	<35 years \$15000-\$24999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M124Q</i>	<35 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>
<i>M125Q</i>	<35 years \$15000-\$24999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M126Q</i>	<35 years \$15000-\$24999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M127Q</i>	<35 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M131Q</i>	<35 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M132Q</i>	<35 years \$25000-\$34999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M133Q</i>	<35 years \$25000-\$34999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M134Q</i>	<35 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M135Q</i>	<35 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M136Q</i>	<35 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M137Q</i>	<35 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M141Q</i>	<35 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M142Q</i>	<35 years \$35000-\$59999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M143Q</i>	<35 years \$35000-\$59999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M144Q</i>	<35 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>

APPENDICES

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
M145Q	<35 years \$35000-\$59999 couple, 1 child	AG, ANG, MEN
M146Q	<35 years \$35000-\$59999 couple 2 child. or +	AG, ANG, MEN
M147Q	<35 years \$35000-\$59999 other	AG, ANG, MEN
M151Q	<35 years \$60000-\$84999 pers. alone	AG, ANG, MEN
M152Q	<35 years \$60000-\$84999 s.p., 1 child	AG, ANG, MEN
M154Q	<35 years \$60000-\$84999 couple no child.	AG, ANG, MEN
M155Q	<35 years \$60000-\$84999 couple, 1 child	AG, ANG, MEN
M156Q	<35 years \$60000-\$84999 couple 2 child. or +	AG, ANG, MEN
M157Q	<35 years \$60000-\$84999 other	AG, ANG, MEN
M151Q	<35 years >\$85000 pers. alone	AG, ANG, MEN
M154Q	<35 years >\$85000 couple no child.	AG, ANG, MEN
M155Q	<35 years >\$85000 couple, 1 child	AG, ANG, MEN
M156Q	<35 years >\$85000 couple 2 child. or +	AG, ANG, MEN
M157Q	<35 years >\$85000 other	AG, ANG, MEN
M211Q	35-44 years <\$15000 pers. alone	AG, ANG, MEN
M212Q	35-44 years <\$15000 s.p., 1 child	AG, ANG, MEN
M213Q	35-44 years <\$15000 s.p., 2 child. or +	AG, ANG, MEN
M214Q	35-44 years <\$15000 couple no child.	AG, ANG, MEN
M215Q	35-44 years <\$15000 couple, 1 child	AG, ANG, MEN
M216Q	35-44 years <\$15000 couple 2 child. or +	AG, ANG, MEN
M217Q	35-44 years <\$15000 other	AG, ANG, MEN
M221Q	35-44 years \$15000-\$24999 pers. alone	AG, ANG, MEN
M222Q	35-44 years \$15000-\$24999 s.p., 1 child	AG, ANG, MEN
M223Q	35-44 years \$15000-\$24999 s.p., 2 child. or +	AG, ANG, MEN
M224Q	35-44 years \$15000-\$24999 couple no child.	AG, ANG, MEN
M225Q	35-44 years \$15000-\$24999 couple, 1 child	AG, ANG, MEN
M226Q	35-44 years \$15000-\$24999 couple 2 child. or +	AG, ANG, MEN
M227Q	35-44 years \$15000-\$24999 other	AG, ANG, MEN
M231Q	35-44 years \$25000-\$34999 pers. alone	AG, ANG, MEN
M232Q	35-44 years \$25000-\$34999 s.p., 1 child	AG, ANG, MEN
M233Q	35-44 years \$25000-\$34999 s.p., 2 child. or +	AG, ANG, MEN
M234Q	35-44 years \$25000-\$34999 couple no child.	AG, ANG, MEN
M235Q	35-44 years \$25000-\$34999 couple, 1 child	AG, ANG, MEN
M236Q	35-44 years \$25000-\$34999 couple 2 child.	AG, ANG, MEN

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
	or +	
<i>M237Q</i>	35-44 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M241Q</i>	35-44 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M242Q</i>	35-44 years \$35000-\$59999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M243Q</i>	35-44 years \$35000-\$59999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M244Q</i>	35-44 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M245Q</i>	35-44 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M246Q</i>	35-44 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M247Q</i>	35-44 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>
<i>M251Q</i>	35-44 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>
<i>M252Q</i>	35-44 years \$60000-\$84999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M254Q</i>	35-44 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M255Q</i>	35-44 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M256Q</i>	35-44 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M257Q</i>	35-44 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M261Q</i>	35-44 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M262Q</i>	35-44 years >\$85000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M263Q</i>	35-44 years >\$85000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M264Q</i>	35-44 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M265Q</i>	35-44 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M266Q</i>	35-44 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M267Q</i>	35-44 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>M311Q</i>	45-64 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M312Q</i>	45-64 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M313Q</i>	45-64 years <\$15000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M314Q</i>	45-64 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M315Q</i>	45-64 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M316Q</i>	45-64 years <\$15000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M317Q</i>	45-64 years <\$15000 other	<i>AG, ANG, MEN</i>
<i>M321Q</i>	45-64 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M322Q</i>	45-64 years \$15000-\$24999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M323Q</i>	45-64 years \$15000-\$24999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M324Q</i>	45-64 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>
<i>M325Q</i>	45-64 years \$15000-\$24999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M326Q</i>	45-64 years \$15000-\$24999 couple 2 child.	<i>AG, ANG, MEN</i>

APPENDICES

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
	or +	
<i>M327Q</i>	45-64 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M331Q</i>	45-64 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M332Q</i>	45-64 years \$25000-\$34999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M333Q</i>	45-64 years \$25000-\$34999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M334Q</i>	45-64 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M335Q</i>	45-64 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M336Q</i>	45-64 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M337Q</i>	45-64 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M341Q</i>	45-64 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M342Q</i>	45-64 years \$35000-\$59999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M343Q</i>	45-64 years \$35000-\$59999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M344Q</i>	45-64 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M345Q</i>	45-64 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M346Q</i>	45-64 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M347Q</i>	45-64 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>
<i>M351Q</i>	45-64 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>
<i>M352Q</i>	45-64 years \$60000-\$84999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M353Q</i>	45-64 years \$60000-\$84999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M354Q</i>	45-64 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M355Q</i>	45-64 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M356Q</i>	45-64 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M357Q</i>	45-64 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M351Q</i>	45-64 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M352Q</i>	45-64 years >\$85000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M354Q</i>	45-64 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M355Q</i>	45-64 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M356Q</i>	45-64 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M357Q</i>	45-64 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>M411Q</i>	>65 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M412Q</i>	>65 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M414Q</i>	>65 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M415Q</i>	>65 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M417Q</i>	>65 years <\$15000 other	<i>AG, ANG, MEN</i>

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M421Q</i>	>65 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M424Q</i>	>65 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>
<i>M426Q</i>	>65 years \$15000-\$24999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M427Q</i>	>65 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M431Q</i>	>65 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M434Q</i>	>65 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M435Q</i>	>65 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M436Q</i>	>65 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M437Q</i>	>65 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M441Q</i>	>65 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M444Q</i>	>65 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M445Q</i>	>65 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M446Q</i>	>65 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M447Q</i>	>65 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>
<i>M451Q</i>	>65 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>
<i>M454Q</i>	>65 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M455Q</i>	>65 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M456Q</i>	>65 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M457Q</i>	>65 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M461Q</i>	>65 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M464Q</i>	>65 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M465Q</i>	>65 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M466Q</i>	>65 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M467Q</i>	>65 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>M111C</i>	<35 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M112C</i>	<35 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M113C</i>	<35 years <\$15000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M114C</i>	<35 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M115C</i>	<35 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M116C</i>	<35 years <\$15000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M117C</i>	<35 years <\$15000 other	<i>AG, ANG, MEN</i>
<i>M121C</i>	<35 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M122C</i>	<35 years \$15000-\$24999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M123C</i>	<35 years \$15000-\$24999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M124C</i>	<35 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>

APPENDICES

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M125C</i>	<35 years \$15000-\$24999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M126C</i>	<35 years \$15000-\$24999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M127C</i>	<35 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M131C</i>	<35 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M132C</i>	<35 years \$25000-\$34999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M133C</i>	<35 years \$25000-\$34999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M134C</i>	<35 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M135C</i>	<35 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M136C</i>	<35 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M137C</i>	<35 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M141C</i>	<35 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M142C</i>	<35 years \$35000-\$59999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M143C</i>	<35 years \$35000-\$59999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M144C</i>	<35 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M145C</i>	<35 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M146C</i>	<35 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M147C</i>	<35 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>
<i>M151C</i>	<35 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>
<i>M152C</i>	<35 years \$60000-\$84999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M153C</i>	<35 years \$60000-\$84999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M154C</i>	<35 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M155C</i>	<35 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M156C</i>	<35 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M157C</i>	<35 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M151C</i>	<35 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M154C</i>	<35 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M155C</i>	<35 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M156C</i>	<35 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M157C</i>	<35 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>M211C</i>	35-44 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M212C</i>	35-44 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M213C</i>	35-44 years <\$15000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M214C</i>	35-44 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M215C</i>	35-44 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M216C</i>	35-44 years <\$15000 couple 2 child. or +	<i>AG, ANG, MEN</i>

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M217C</i>	35-44 years <\$15000 other	<i>AG, ANG, MEN</i>
<i>M221C</i>	35-44 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M222C</i>	35-44 years \$15000-\$24999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M223C</i>	35-44 years \$15000-\$24999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M224C</i>	35-44 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>
<i>M225C</i>	35-44 years \$15000-\$24999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M226C</i>	35-44 years \$15000-\$24999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M227C</i>	35-44 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M231C</i>	35-44 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M232C</i>	35-44 years \$25000-\$34999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M233C</i>	35-44 years \$25000-\$34999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M234C</i>	35-44 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M235C</i>	35-44 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M236C</i>	35-44 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M237C</i>	35-44 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M241C</i>	35-44 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M242C</i>	35-44 years \$35000-\$59999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M243C</i>	35-44 years \$35000-\$59999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M244C</i>	35-44 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M245C</i>	35-44 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M246C</i>	35-44 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M247C</i>	35-44 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>
<i>M251C</i>	35-44 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>
<i>M252C</i>	35-44 years \$60000-\$84999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M253C</i>	35-44 years \$60000-\$84999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M254C</i>	35-44 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M255C</i>	35-44 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M256C</i>	35-44 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M257C</i>	35-44 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M261C</i>	35-44 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M262C</i>	35-44 years >\$85000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M263C</i>	35-44 years >\$85000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>

APPENDICES

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M264C</i>	35-44 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M265C</i>	35-44 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M266C</i>	35-44 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M267C</i>	35-44 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>M311C</i>	45-64 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M312C</i>	45-64 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M313C</i>	45-64 years <\$15000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M314C</i>	45-64 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M315C</i>	45-64 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M316C</i>	45-64 years <\$15000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M317C</i>	45-64 years <\$15000 other	<i>AG, ANG, MEN</i>
<i>M321C</i>	45-64 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M322C</i>	45-64 years \$15000-\$24999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M323C</i>	45-64 years \$15000-\$24999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M324C</i>	45-64 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>
<i>M325C</i>	45-64 years \$15000-\$24999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M326C</i>	45-64 years \$15000-\$24999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M327C</i>	45-64 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M331C</i>	45-64 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M332C</i>	45-64 years \$25000-\$34999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M333C</i>	45-64 years \$25000-\$34999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M334C</i>	45-64 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M335C</i>	45-64 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M336C</i>	45-64 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M337C</i>	45-64 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M341C</i>	45-64 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M342C</i>	45-64 years \$35000-\$59999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M343C</i>	45-64 years \$35000-\$59999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M344C</i>	45-64 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M345C</i>	45-64 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M346C</i>	45-64 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M347C</i>	45-64 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>
<i>M351C</i>	45-64 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M352C</i>	45-64 years \$60000-\$84999 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M353C</i>	45-64 years \$60000-\$84999 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M354C</i>	45-64 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M355C</i>	45-64 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M356C</i>	45-64 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M357C</i>	45-64 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M351C</i>	45-64 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M352C</i>	45-64 years >\$85000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M353C</i>	45-64 years >\$85000 s.p., 2 child. or +	<i>AG, ANG, MEN</i>
<i>M354C</i>	45-64 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M355C</i>	45-64 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M356C</i>	45-64 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M357C</i>	45-64 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>M411C</i>	>65 years <\$15000 pers. alone	<i>AG, ANG, MEN</i>
<i>M412C</i>	>65 years <\$15000 s.p., 1 child	<i>AG, ANG, MEN</i>
<i>M414C</i>	>65 years <\$15000 couple no child.	<i>AG, ANG, MEN</i>
<i>M415C</i>	>65 years <\$15000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M416C</i>	>65 years <\$15000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M417C</i>	>65 years <\$15000 other	<i>AG, ANG, MEN</i>
<i>M421C</i>	>65 years \$15000-\$24999 pers. alone	<i>AG, ANG, MEN</i>
<i>M424C</i>	>65 years \$15000-\$24999 couple no child.	<i>AG, ANG, MEN</i>
<i>M425C</i>	>65 years \$15000-\$24999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M426C</i>	>65 years \$15000-\$24999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M427C</i>	>65 years \$15000-\$24999 other	<i>AG, ANG, MEN</i>
<i>M431C</i>	>65 years \$25000-\$34999 pers. alone	<i>AG, ANG, MEN</i>
<i>M434C</i>	>65 years \$25000-\$34999 couple no child.	<i>AG, ANG, MEN</i>
<i>M435C</i>	>65 years \$25000-\$34999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M436C</i>	>65 years \$25000-\$34999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M437C</i>	>65 years \$25000-\$34999 other	<i>AG, ANG, MEN</i>
<i>M441C</i>	>65 years \$35000-\$59999 pers. alone	<i>AG, ANG, MEN</i>
<i>M444C</i>	>65 years \$35000-\$59999 couple no child.	<i>AG, ANG, MEN</i>
<i>M445C</i>	>65 years \$35000-\$59999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M446C</i>	>65 years \$35000-\$59999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M447C</i>	>65 years \$35000-\$59999 other	<i>AG, ANG, MEN</i>

APPENDICES

<i>Name</i>	<i>Description</i>	<i>Component of sets</i>
<i>M451C</i>	>65 years \$60000-\$84999 pers. alone	<i>AG, ANG, MEN</i>
<i>M454C</i>	>65 years \$60000-\$84999 couple no child.	<i>AG, ANG, MEN</i>
<i>M455C</i>	>65 years \$60000-\$84999 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M456C</i>	>65 years \$60000-\$84999 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M457C</i>	>65 years \$60000-\$84999 other	<i>AG, ANG, MEN</i>
<i>M461C</i>	>65 years >\$85000 pers. alone	<i>AG, ANG, MEN</i>
<i>M464C</i>	>65 years >\$85000 couple no child.	<i>AG, ANG, MEN</i>
<i>M465C</i>	>65 years >\$85000 couple, 1 child	<i>AG, ANG, MEN</i>
<i>M466C</i>	>65 years >\$85000 couple 2 child. or +	<i>AG, ANG, MEN</i>
<i>M467C</i>	>65 years >\$85000 other	<i>AG, ANG, MEN</i>
<i>ESOCQ</i>	Québec corporations	<i>AG, ANG, ENT</i>
<i>EINDQ</i>	Québec sole proprietorships	<i>AG, ANG, ENT</i>
<i>ESOCC</i>	Canadian corporations	<i>AG, ANG, ENT</i>
<i>EINDC</i>	Canadian sole proprietorships	<i>AG, ANG, ENT</i>
<i>GFQ</i>	Federal government in Québec	<i>AG, GVT, GNFC, GVF</i>
<i>GPO</i>	Québec provincial government	<i>AG, GVT, GNF, GNFC, GVP</i>
<i>GLQ</i>	Québec local and regional governments	<i>AG, GVT, GNF, GNFC</i>
<i>RRQ</i>	Régie des rentes du Québec	<i>AG, GVT, GNF, GNFC, GVP</i>
<i>RPCQ</i>	CPP in Québec	<i>AG, GVT, GNF, GNFC, GVF</i>
<i>GFC</i>	Federal government outside Québec	<i>AG, GVT, GNF, GVF</i>
<i>GPC</i>	Provincial governments other than Québec	<i>AG, GVT, GNF, GNFC, GVP</i>
<i>GLC</i>	Local and regional governments outside Québec	<i>AG, GVT, GNF, GNFC</i>
<i>RPCC</i>	CPP outside Québec	<i>AG, GVT, GNF, GNFC, GVF</i>

INDEX OF EQUATIONS

equation [01]	10	equation [42]	30
equation [02]	10	equation [43]	32
equation [03]	10	equation [44]	32
equation [04]	10	equation [45]	35, 36
equation [05]	10	equation [46]	35, 36
equation [06]	11	equation [47]	32
equation [07]	11, 31	equation [48]	32
equation [08]	11, 31	equation [49]	32
equation [09]	11	equation [50]	32
equation [10]	14	equation [54]	33
equation [11]	15	equation [55]	31
equation [12]	15	equation [56]	12
equation [13]	11, 17	equation [57]	12
equation [14]	17	equation [58]	14
equation [15]	17	equation [60]	12
equation [16]	17	equation [61]	12
equation [17]	15	equation [62]	12
equation [18]	17	equation [63]	28
equation [24]	22, 26	equation [64]	28
equation [30]	11, 17, 18	equation [65]	25, 37
equation [31]	19	equation [66]	25
equation [32]	19	equation [67]	25
equation [34]	16	equation [68]	29
equation [35]	16	equation [69]	24, 37
equation [36]	16	equation [70]	24, 37
equation [37]	16	equation [71]	28
equation [38]	24	equation [72]	28
equation [39]	24	equation [73]	37
equation [40]	24	equation [74]	37
equation [41]	30	equation [75]	27, 37

equation [76]	14, 18
equation [77]	11, 37
equation [78]	11, 37
equation [79]	19, 23, 29, 37

REFERENCES

- ANNABI, Nabil, *Formes fonctionnelles et paramétrisation dans les modèles d'équilibre général calculables*, ministère des Finances du Québec, Unpublished Research Paper.
- ARMINGTON, P. (1969) "A theory of demand for products distinguished by place of production", IMF Staff Papers 16, 1969; 159-178.
- BAHAN, David, Danielle BILODEAU, André LEMELIN and Véronique ROBICHAUD (2003), *Une matrice de comptabilité sociale birégionale pour le modèle d'équilibre général du ministère des Finances du Québec*, ministère des Finances du Québec, Research Paper 2003-003.
- DECALUWÉ, Bernard, André MARTENS and Luc SAVARD (2001), *La politique économique du développement et les modèles d'équilibre général calculable*, Les Presses de l'Université de Montréal, Montréal.
- ROUND, Jeffery I. (1988) "Incorporating the international, regional, and spatial dimension into a SAM: some methods and applications", p. 24-45 in HARRIGAN, F. and MCGREGOR, P. G. (1988) *Recent advances in regional economic modelling*, Coll. London Papers in Regional Science; vol. 19, Pion Ltd., London.



The general equilibrium model of the ministère des Finances du Québec (GEMFQ) is a calculable static multi-sector general equilibrium model adapted to reflect the characteristics and special features of Québec, in a Canadian and global context. As a part of Canada, Québec is subject to the fiscal and monetary policies of the federal government and the rules of free movement with Canada's borders.

Since Québec is a component of Canada, the model is accordingly a bi-regional model where not only Québec's economy, but also that of the Rest of Canada (RC) are explicitly modelled, while taking into account their mutual relations and relations with the Rest of the World (RW). This makes it possible to incorporate feedback effects between the two economies. In addition, as well as representing the direct effects of federal and provincial policies, the model takes into account, because of its bi-regional nature, their indirect effects, i.e. those that affect Québec through the effects of these policies on RC and vice versa.

This paper describes the structure of the model in detail, in particular:

- Production and the link between supply and demand of each region
- Interprovincial trade flows
- Revenue and expenditure of economic agents
- Price determination