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SOCIAL POLICY AND PRODUCTIVITY GROWTH: WHAT ARE THE LINKAGES?

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1. INTRODUCTION

The equity versus efficiency argument has been the bread and butter of economic policy and social policy discussions since the emergence of the modern welfare state in the post World War II period. In virtually all aspects of policy, the twin goals of promoting economic progress and social justice stands as a hallmark of the modern industrial democracy. By the late 1960s, the general view was that a conflict existed between the efficiency objective and the equity objective, nicely summarized in Okun's famous 1975 book: *Equality and Efficiency: The Big Tradeoff*.[1] In the 1990s, a new debate has emerged covering similar, although conceptually different, ground. Productivity growth is widely regarded as the major long-run determinant of per capita income growth in industrial countries. Over the last two decades, economists have been pre-occupied with understanding the sources of productivity growth, and slow productivity growth in Canada has been a major policy concern for several years. Prior to the mid-1980s, traditional economic analysis focused on the static effects of economic policy — the so-called size-of-the-pie effects. For example, when looking at the impact of taxes on labour supply, the analysis was concerned with the one-time effect an increase in wage taxes could have on the labour supply, rather than its effect on long-run economic growth. However, it is evident that, in the longer term, how fast the pie grows is more important. The reason is simple: a small change in long-term growth rates — on the order of 1.0 percent, or even less — has dramatically larger consequences than a similar percentage change in GDP. This explains the emphasis put, in both research and policy, on understanding the factors leading to higher, or lower, productivity growth, as opposed to other factors that do not have permanent consequences on growth. Social policy might well be one factor that could have an impact on growth. The expansion of the welfare state was heavily dependent on strong economic growth in the 1950s and 1960s. The fiscal repercussions of slow productivity growth, which had set in by the mid-1970s and were evident in a debt and deficit build-up by the mid-1980s, raised concerns about the sustainability of high social spending. For both of these reasons, the dynamics of social policy became inevitably linked with the issue of economic growth.

That growth depends on productivity is not a fact in serious dispute; but the long-run sources, or ultimate determinants of productivity growth, are not completely understood. At the most general level, this is Adam Smith's question: What are the sources of the wealth of nations? At a more restricted level, there is agreement on the proximate sources of productivity growth — new investment, human capital formation, new technology and product innovation. What drives these factors in an economy has been accounted for largely by economic determinants, that is those impinging directly on investment, innovation, education and trade, which appear to have a direct and medium-term impact on productivity growth. However, recent research has put forward the hypothesis that social factors may also be a major determinant of productivity growth. Social factors would include the distribution of income and wealth in an economy, the range of social policy interventions including health, education, labour market regulation, and a variety of income support programs. These social policies may be defined to include the tax–transfer system, which finances the social budget. The implications of this change of perspective are potentially quite powerful in making a case for social policy. If it could be established that social determinants are a quantitatively major factor in productivity growth, then the traditional efficiency–equity tradeoff may not exist. Social policies to promote equity could also be defended on grounds that they simultaneously increase economic growth. The tradeoff is replaced by a virtuous circle in which equity-enhancing policies also promote economic growth. This paper provides a critical evaluation of these arguments.

In the paper, we present a survey of the evidence and debate on the social determinants of productivity in the context of the Canadian productivity debate. The paper examines both the basic theoretical arguments and the evidence advanced by economists, and their relationship to what might be called modern social policy. Not all social policy is directly motivated by equity considerations. In particular, modern social policies in the area of education and health focused on promoting the growth of human capital represent one category where both the evidence and debate on the growth effects are qualitatively different than in other areas of social policy.

It is instructive to consider the context in which this often heated, and at times politically loaded, debate surrounding the impact of social policy on economic growth has taken place. Three trends have been driving the wider debate in industrial countries — all of which are noticeable in Canada. First, the slow growth in Europe, particularly of employment, had led many to put the blame on the welfare state.[2] Eurosclerosis became the term employed to describe the slow growth and poor employment record of a number of European countries through the 1980s and early 1990s. A parallel debate in the Scandinavian countries has led many to the conclusion that the Scandinavian welfare state had similar consequences. Assar Lindbeck's critique is one of the most well known.[3] Part of the European record was the perception that generous social programs were a major factor responsible for the poor growth record. This debate was fuelled in part by the famous *OECD Jobs Study* (1994), and an attack by all OECD governments on the growth of debt and deficits in the mid-1990s. It may well be that the factors behind the slow employment growth in Europe ultimately have little to do with long-term productivity growth; but in the popular debate, the impacts of the European welfare state on productivity, employment and fiscal policy tend to get lumped together. Canada is typically viewed as somewhere between the United States and Europe on the welfare state spectrum, so that these arguments have likewise played out here.

A second major element, of more recent origin, is the debate on the *new economy* in the United States in contrast with the slow growth in Europe. The long and extraordinary economic expansion in the United States throughout the 1990s was accompanied by high employment and strong productivity growth. While the sources of this growth remain a matter of discussion, the *new economy* hypothesis claims that it is driven by the impact of innovations in the information, communications and telecommunications fields, giving rise to an entirely new phase of economic development — the so-called Third Industrial Revolution. Prior to the recent surge in growth, beginning in the mid- to late-1970s but continuing into the 1980s, there was a significant rise in market income inequality in the United States and the United Kingdom. These trends have subsequently shown up in most OECD countries, including Canada, but in Europe particularly it appeared that inequality was not increasing to the same degree. The acceleration of growth in the United States during the 1990s led some to infer that inequality seemed to contribute to growth. The divergent U.S. and European growth patterns in the 1990s has brought the charge that the re-distributive and labour market policies responsible for eurosclerosis have also prevented Europe from experiencing the growth benefits of the *new economy*. Economic growth and the preservation of equality as seen through this debate appear to be conflicting goals, reinforcing the old view that equity and growth are in opposition with one another.

Thirdly, an intellectual challenge to the existence of an equity-efficiency tradeoff emerged at about the same time the eurosclerosis debate began. From the mid-1980s, economists began to seriously re-think the sources of economic growth, which led to both to the New Growth Theory[4] and to a large empirical literature on the determinants of growth and productivity. The development of new data sets for a large number of developing and developed countries allowed researchers to pose new and interesting questions about the sources of growth. Much, if not all, of the intellectual impetus to discover links between social factors and growth are found in this literature on cross-country growth comparisons. In the early 1990s, a number of researchers identified a robust negative empirical correlation between measures

of inequality and economic growth — lower inequality would be associated with higher growth. Other researchers began to look for other policy determinants of growth, many of which bear directly or indirectly on the issue of social policy, such as education and fiscal policy. Lastly, a voluminous literature emerged on the rising wage inequality in advanced industrial countries over the last two decades. While not directly about productivity and social policy, the wage inequality issue figures prominently in the productivity–social policy debate for a simple reason. Much of this literature adopts the opposite perspective — what is driving inequality is economic growth, which in turn is driven by technological change. From this perspective, understanding the consequences of any policy intervention on inequality and growth requires an understanding of the complex interaction between technological change, productivity growth, and its implications for wages and employment.

My purpose in this paper is to try to make sense of these often seemingly contradictory pieces of theory and evidence linking social policy to economic growth. Essentially the paper looks at four areas of research: i) the growth and inequality debate; ii) the small but growing literature on the policy determinants of economic growth; iii) an examination of two specific social policies — education and health; and iv) the literature on major technological change, wage inequality and the *new economy*. To provide the context for this discussion, the paper also includes some background material on economic growth, productivity, and social policy in OECD countries.

By way of a caveat, the paper is focused specifically on issues that are pertinent to Canada, or at least to countries like Canada — a democratic, high-income, small, open OECD economy. Nothing in what follows is meant to prescribe what development strategies are, or are not, appropriate for the developing world. The paper does not discuss the other main objectives of social policy that are not directly related to growth. Lastly, the paper does not discuss two areas of social policy that do have growth effects but are not directly related to the productivity issue. These are: a) the consequence of social security reform on savings — a very active debate driven by the aging population issue; and b) the effects of labour market regulation on employment, which have been extensively discussed since the release of the *OECD Jobs Study*.[5]

My main conclusion is in the form of a non-conclusion. This is one case where strong policy conclusions are well ahead of both theory and evidence. Neither provides conclusive support for the proposition that either a) policies directed at reducing inequality will increase productivity growth or b) increased social spending will raise productivity growth. Both advocates and opponents of such policies will find little comfort in these conclusions. Advocates, for the obvious reason that they are left in the position of dealing with the charge that equity and efficiency are often conflicting goals. Opponents, because the evidence is often sufficiently indecisive to leave ample room for *a priori* reasoned arguments to the contrary. Lastly, it is important to stress that most of the research is relatively recent. It is entirely possible that the balance of evidence may shift one way or the other as new studies are published.

2. SOME BACKGROUND: PRODUCTIVITY GROWTH AND SOCIAL POLICY

Productivity Growth: Concepts and Framework[6]

Economic growth is measured as an increase in real economic output per person at the national level and is generally regarded as reflecting four factors :

- capital accumulation,
- employment growth relative to population growth,
- external market factors, and
- productivity growth.

Of these four factors, productivity growth has generally been found the most important for industrial countries. However, all the other factors can play an important role at various times. For example, a sudden increase in the fraction of the population that is employed would have substantive effects on growth for a few years. Moreover, a strict additive decomposition of these four factors could easily lead to incorrect inferences as to what is driving growth. For example, an increase in productivity growth caused by the availability of new technologies can lead to higher investment, which has an additional knock-on effect on the growth rate. Causality can also run the other way — investment can carry spillover effects through improved knowledge flows, leading to higher productivity.

The *productivity* of an economic activity is defined by economists as the ratio of an index of outputs to an index of inputs. It can be defined at the level of an individual performing a certain task, a plant producing a particular good, a firm carrying out a diverse set of economic activities, an industry, or an entire country. Productivity goes up when you can get more output with the same inputs. The definition of productivity hinges critically upon how one measures the inputs and the outputs. In the economic literature, the starting point is a production function depicting a microeconomic relationship at a point in time and mapping input to outputs. So we write, for example:

$$Y = AF(K, L),$$

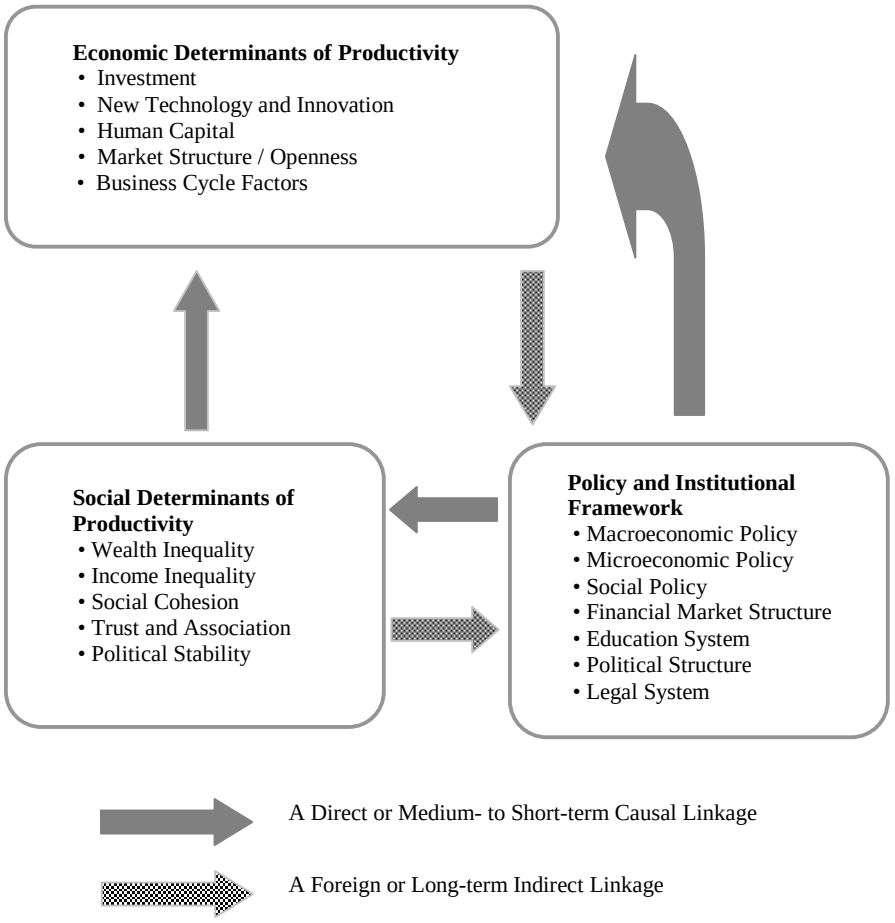
where Y is output, K and L are measures of capital and labour, $F(\blacklozenge)$ is a time-invariant functional relationship between capital and labour, and A is a time-varying parameter, referred to as an efficiency parameter or total factor productivity (TFP) parameter. The productivity level is defined as the output per unit of labour input — the average labour productivity — either per worker or per hour worked, defined as Y/L. In this framework, productivity growth is the sum of two effects: the increase in the TFP parameter A, and the increase in capital per worker K/L. This approach is extremely well known and is used at both the individual micro-unit level and at the level of the entire economy.[7] In the latter case, output is measured as real GDP, and L is either the working population or the total number of hours worked. At the macro level, A is also referred to as the *stock of knowledge*, in line with the recent emphasis on knowledge as the truly ultimate determinant of technological feasibility. In practice, growth in A is invariably done by attributing to it what other factors cannot explain. In macroeconomics, this is often referred to as the Solow residual. For most industrial countries, growth in labour productivity is accounted for by changes in A, while relatively little growth is accounted for by changes in capital per unit of labour. However, the range of estimates vary considerably.[8]

While this framework is conceptually simple and widely used because productivity growth can be identified by the residual method (i.e. the change in *A* calculated by subtracting from the growth in *Y* a weighted average of the growth in *K* and *L*), it has long been recognized that this approach presents some serious shortcomings. In particular, there is no institutional context describing how economic incentives are determined, where new technology comes from, or what factors determine investment. The major accounts of the industrial revolution or of economic development offered by economic historians place great emphasis on these last factors.[9]

A more general diagram depicting the determinants of productivity growth is given in Figure 1, which distinguishes between three interrelated categories — the economic determinants of productivity, the social determinants of productivity, and the policy and institutional framework in which these factors interact. The arrows indicate the possible directions of causality running between the three sets of interrelated factors. It is conventional to distinguish between the direct effect and the indirect or feedback effect each of these variables has on each other. It is generally agreed that investment, particularly in machinery and equipment, has the most direct measured impact on business sector productivity. This shows up in both country micro-studies and cross-country studies. Many social determinants could

Figure 1

A Conceptual Framework for the Analysis of Productivity



have an impact on productivity growth through their effect on investment. For example, greater political stability contributes to investment growth by reducing uncertainty; this higher investment in turn raises productivity growth, which leads to high economic growth. More generally, government policies — economic and social — probably have some medium-term effect on productivity growth via their impact on the economic determinants of productivity growth, such as investment. However, both economic and social policy also impact on the social determinants of productivity growth. For example, education policy affects both the average level of human capital in the economy and the longer run wage distribution between skilled and unskilled workers, which in turn affects future investments in human capital. There are also linkages running between the economic and social determinants to the list of institutional and policy factors. Greater income inequality can influence political decisions on social policy for example, which would have second round effects on growth and inequality, and so on. For the purposes of this paper, these highly indirect factors will only be occasionally mentioned, largely because there is not a lot of evidence to appeal to. However, they certainly figure prominently in the larger debate about the sources of differences in national economic performance.[10]

One of the major problems affecting research on the deeper causal pathways running from policy to growth is the time frame involved. Tax policy changes are likely to affect investment next year; education policy reforms may not change the stock of human capital in the economy for years. This time-horizon problem has forced researchers to use empirical data and methods that are capable of identifying medium-term measurable linkages between particular inputs and economic growth. Much of the cross-country research, for example, tries to identify the long-term effect of policy on growth by using averages of long-term growth rates over long periods, often two or more decades, and samples of countries with vastly different levels of economic development. The difficulty with this approach is that one is forced to assume that the effect of a given variable on growth is the same for all countries, thus ignoring potentially significant differences between countries in the way a given policy or social factor might impinge on growth.

As discussed in a companion paper to this (Harris, 1999), the bulk of the micro evidence on productivity is primarily about the so-called economic determinants. This reflects both data availability and the fact that economic theories linking these factors to productivity growth have received a lot more attention from economists than potential social determinants. We now turn to a description of where this evidence stands, and a review of recent trends in social policy.

Economic Determinants of Productivity

The bulk of the productivity literature is concerned with either a) measuring productivity, or b)attempting to assess the quantitative importance of a set of limited economic determinants, largely at the microeconomic level but also at the macroeconomic level. The determinants that have received the most attention include investment, human capital, innovation and diffusion of technology, effects of international and domestic competition, various forms of knowledge spillovers, and most recently geographic agglomeration of economic activity. The success of these explanations has varied. Beyond the first four explanations, the measured effects are highly variable and in many cases difficult to detect statistically.

The social policy–inequality–growth debate has been partially motivated and conducted almost entirely within a macroeconomic framework focused on national comparisons. This is not surprising since differences in social determinants are generally regarded as having systemic economy-wide effects that would tend to impact on all sectors of the economy. The search for empirical regularities has therefore

largely focused on differences between economies, averaged over a number of years. Attributing differences in productivity growth across time within a national economy to a single policy is fraught with difficulty. In particular, the fact that so many economic variables tend to trend together make it impossible to prove the importance of one particular factor relative to any number of others. The most prevalent form of evidence that has been offered in the modern debate, therefore, is either reduced-form or structural growth equations in which the variable to explain is the average growth of GDP per worker, or per hour, across a number of countries. Researchers in this area are well aware of the possible complex causal relations linking these variables at the aggregate level. Success may thus be judged by the standard scientific criteria of demonstrating that a few variables explain the data fairly well, or that particular variables show up repeatedly as quantitatively significant, despite variations in the data or statistical methods used. So far, it has been difficult to show that the economic determinants do a fairly good job in explaining the growth experience of countries at all levels of economic development.

Using a full sample of countries at all stages of development and only a limited set of economic variables leaves a lot to be explained. In discussing this issue, Hall and Jones (1999) point out that vast differences in income levels cannot be explained by savings behaviour or even measured human capital levels:

> Output per worker in the five countries with the highest levels of output per worker in 1988 was 31.7 times higher than output per worker in the five lowest countries (based on a geometric average). Relatively little of this difference was due to physical and human capital: differences in capital intensity and human capital per worker contributed factors of 1.8 and 2.2, respectively, to the difference in output per worker. Productivity, however, contributed a factor of 8.3 to this difference: with no difference in productivity, output per worker in the five richest countries would have been only about four times larger than in the five poorest countries. In this sense, differences in physical capital and educational attainment explain only a modest amount of the difference in output per worker across countries.
> (Hall and Jones, 1999)

International productivity differences (in levels) are enormous and any coherent explanation will have to rely on institutional and social infrastructure factors. The relevance of this to the OECD countries — many have very similar levels of economic development and quite similar institutional structures — is questionable. For these countries, similarities in institutions and developmental stages imply that the sources of growth are more likely to be found in a common set of factors. Most economic theories simply assume the problem away. Contemporary growth theory largely assumes a well-functioning market system with efficient financial markets, and markets that clear (most of the time) for labour and capital. Are these theories — now textbook material for most graduate students — capable of describing the modern economic growth experience of advanced countries? The answer is not a decisive yes or no, but as we will see below, the support for these models in the case of industrial countries is fairly good. In general, however, the task they face is considerably less daunting than it is for models attempting to explain what Hall and Jones describe, given that the maximum difference in income levels can be expressed as factors of 2 to 3.

Growth theory and empirical work have made some progress in the last decade toward reducing the uncertainty surrounding the determinants of industrial country growth. Temple (1999), for example, is cautious but optimistic in his assessment of the literature. I would summarize the evidence on modern empirical growth models as involving three stages — the reduced-form literature, and then the structural models of growth — without and with explicit transitional dynamics.

First, in the cross-sectional reduced-form literature, there is a consensus that relatively few variables are statistically robust in a growth equation.[11] In a growth equation, average labour productivity growth is the dependent variable with a set of potential explanatory variables on the right-hand side. The *successful* variables include:

- the initial income level at the beginning of the period,
- investment-to-GDP ratios,
- schooling levels,
- population growth, and
- indicators of openness in trade and/or foreign direct investment (FDI).

Temple (2000) survey this literature and notes that given the lack of an explicit theoretical structure, a large number of variables have been tried and the whole literature suffers heavily from data mining. That said, the growth regression literature has been very influential, although more so with respect to developing country issues than advanced country issues. The early work also revealed a number of variables that, to some, were not good explainers of growth. These included fiscal policy, R&D measures, and various political and legal variables.

Second, an important structural model of growth is the Mankiw-Romer-Weil (1992) augmented Solow model. This is the basic neoclassical growth model of Robert Solow with exogenous savings in physical capital, to which is added a third factor input — human capital. This is all done within a constant returns to scale aggregate production framework. The model is empirically implemented by imposing a steady-state restriction which implies that countries are on a steady-state long-run growth path for the period examined. Under this assumption, growth rates (the dependent variable) can be expressed without reference to the stocks of physical or human capital, but as functions of the savings rate, a schooling variable, and an initial productivity level assumed to be randomly distributed across countries. Attempts to make this model fit OECD cross-sectional data have not met with much success. This can be regarded as either a failure of the theory or a reflection of the fact that the steady-state restriction is too constraining.[12]

Third, the 1990s have brought a variety of structural growth models that incorporate human capital and drop the assumption that observed growth is of the steady-state kind. By incorporating dynamic transition effects to allow theoretical growth rates to vary over time, the models have met with somewhat more success. Barro (1991) was an early pioneer in this area, but numerous methodological, measurement and econometric improvements have been made over the last decade. A good technical survey of this literature is provided by Durlauf and Quah (1999), and it is covered in part in the Barro and Sala-i-Martin (1995) textbook. More significantly, the most recent versions of these models use panel data that exploit both cross-sectional and time series variation and are estimated using a variety of what are referred to as *dynamic panel methods*. Initially, there was some debate about the way in which the human capital variables should enter the model and some of the early results on human capital were quite odd. However, this human capital paradox has recently been largely resolved. Many of these estimates support the view of close to non-diminishing returns to a broad measure of human and non-human capital. Non-diminishing returns imply that increases in broad capital per worker yield incremental output increases that do not diminish as more capital is added. This comes very close to supporting what is known as *endogenous* long-run growth. Endogenous growth, as developed by Romer (1990) and Lucas (1988), occurs when a policy variable, such as the savings rate, can have a permanent effect on the *growth rate* as opposed to the long-term level of income. Non-diminishing returns to capital are a sufficient condition for a growth model to generate endogenous growth. A model exhibits exogenous growth when policy variables have only transitional effects on growth rates, although they can impact on steady-state levels of income. The Mankiw-Romer-Weil model is an example of an exogenous growth model.

Measurement and data issues have turned out to be quite important in this literature. Changes in data on capital stocks, human capital and specific economic policy variables have tended to have a substantial effect on estimated parameter values.[13]

Policy enters these models either as an additional explanatory variable or as a structural characteristic of the model. While in principle one can distinguish between endogenous and exogenous growth models, empirically identifying the effect of a policy variable on the steady-state income level *versus* the medium-term growth rate has proven to be very difficult with data sets covering 20 to 30 years. This is simply because convergence in these models is relatively slow and when the share of profit and returns to human capital becomes high (on the order of 2/3 or greater for most high-income countries), endogenous and exogenous growth models begin to behave qualitatively in a very similar fashion. A lot of the most recent literature works largely within an augmented Solow framework, in which policy impacts on the transitional growth rate, although the effects can last for a couple of decades. Policy is often discussed in terms of its impact on the *rate of convergence*. This refers to the fact that holding policy constant, these theories predict income levels that tend to converge to the steady-state income level. The rate of convergence is defined by reference to how long the process takes. Typical estimates are in the range of 15 to 30 years. When an economy is out of steady-state growth, which is usually assumed to be the case of interest, changes in policy impact on the rate of convergence as well as on the long-run level of income. Other things being equal, a policy that raises long-run income and has a shorter period of convergence is to be preferred over one that has a longer period of convergence.[14]

A recent paper by Bassanini, Scarpetta and Hemmings (2001) provides a good example of the use of this type of econometric model for a cross-country analysis of growth in OECD countries over the 1971-98 period with a specific emphasis on economic determinants. The basic growth model is a dynamic version of the augmented Solow model discussed in Chapter 5 of Barro and Sala-i-Martin (1995) with human capital and R&D. Policy variables interact with accumulation variables and also have a potential impact on long-run steady-state levels of productivity. The model does not impose similar dynamics on all countries — rates of convergence are allowed to vary among countries, but it does assume that in the long run all countries are governed by similar parameter values up to a constant level of difference between countries. The model does quite well at tracking the data and the authors provide an illustrative decomposition of the factors that determine aggregate productivity growth. The set of variables that explain growth includes a group of baseline variables (those derived from the basic theory) and a group of economic policy variables that shift the growth path:

Baseline variables:

- the initial productivity level,
- the share of investment in GDP,
- population growth, and
- human capital.

Policy variables:

- trade intensity,
- R&D expenditures,
- inflation variability,
- government investment, and
- government consumption.

In the estimation of the model, government investment turned out to be insignificant, while the R&D variable had to be dropped due to limited country coverage, although both were significant on a more limited data set. Table 1 reports the decomposition of the growth rate for each country expressed as a deviation from the OECD average. Looking at the row for Canada, we see that the country's annual growth rate of labour productivity was 0.23 percentage points above the OECD average for the period. The last column reports the country-specific residual effect, which is that part of the growth differential unexplained by the model. For Canada, it turns out that 0.32 percentage points of growth are unexplained. Factors that impact on Canada's growth relative to the OECD average include:

- A high initial income, which tended to reduce Canada's growth relative to other OECD countries which started the period at much lower productivity levels;
- A share of investment in GDP that was lower than in other countries;
- Human capital levels that account for a large positive effect on the Canadian growth differential (0.62 percentage points per year);
- Openness to trade, which accounts for a positive 0.14 percentage points growth differential; and
- Population growth, government consumption levels, and inflation variability, which account for very little of the growth differential.

Table 1

Economic Determinants of Economic Growth in the OECD, 1971-98

Country	Annual Average Growth Rate	Growth Differential	Initial Condition GDP/Pop.	Investment Share	Human Capital	Population Growth	Variability of Inflation	Gov. Consump.	Trade Exposure	Residual Country-specific Effect
Australia	1.68	0.13	-0.37	0.20	0.52	-0.25	0.03	0.01	-0.41	0.40
Austria	1.57	0.02	-0.41	0.07	0.26	0.01	0.05	0.00	0.03	0.01
Belgium	1.66	0.11	-0.53	0.02	-0.15	0.20	0.03	-0.05	0.53	0.06
Canada	1.32	0.23	-0.90	-0.21	0.62	-0.18	0.04	-0.07	0.14	0.32
Denmark	1.69	0.14	-0.57	0.28	0.21	0.12	0.02	-0.14	-0.05	0.27
Finland	1.82	0.27	0.51	0.05	0.02	0.15	0.00	-0.06	-0.26	-0.14
France	1.35	0.20	-0.59	-0.09	-0.10	0.07	0.07	-0.08	0.05	0.48
Greece	1.15	-0.40	2.00	0.19	-0.56	-0.07	-0.16	0.17	-0.51	-1.48
Ireland	3.02	1.47	1.54	-0.18	-0.32	-0.18	0.01	0.09	0.17	0.34
Italy	1.73	0.18	0.22	-0.13	-0.69	0.13	0.02	0.01	0.14	0.48
Netherlands	1.26	-0.29	-0.47	-0.03	0.25	0.01	0.06	-0.13	0.52	-0.50
New Zealand	0.53	-1.02	0.34	-0.17	0.31	-0.29	-0.07	0.10	-0.36	-0.87
Norway	1.72	0.17	-0.12	-0.05	0.35	0.07	0.03	-0.06	-0.04	-0.01
Portugal	2.15	0.60	2.56	0.58	-1.20	0.07	-0.10	0.10	0.11	-1.52
Spain	1.28	-0.27	0.73	0.04	-1.12	0.00	0.03	0.07	-0.14	0.11
Sweden	1.20	-0.35	-0.60	-0.10	0.21	0.11	-0.10	-0.17	0.01	0.30
Switzerland	0.81	-0.74	-1.75	0.08	0.59	-0.04	0.00	0.15	0.02	0.21
United Kingdom	1.63	0.08	0.05	-0.21	0.17	0.15	-0.03	-0.02	0.31	-0.34
United States	1.93	0.38	-1.62	-0.34	0.63	-0.09	0.07	0.09	-0.25	1.89

Source: Bassanini, Scarpetta and Hemmings, 2001, Table 9.

The model performs well except for two countries — Greece and the United States. The authors note that Greece is an unusual case that also raises some data issues. However, the U.S. results are quite interesting. The large positive unexplained residual for the United States reflects the inability of the model to explain the acceleration of labour productivity growth in the 1990s — an issue to which we shall return later. To that extent, it is clear that the explanation of growth being offered by this model is less than complete. Nevertheless, the model provides an impressive example of how far modern theory and econometric methods can go in terms of explaining the growth performance of industrial countries. Providing explanations for the country-specific effects remain an important issue. There could be either social determinants or other unaccounted for economic determinants at work. It is important to emphasize that it would appear that a large portion of economic growth can be accounted for by a relatively small set of determinants.

Social Policy

The basic policy question to be addressed is the extent to which social policy might have consequences for productivity. As most of the empirical work in the area hinges on differences among countries in social policies, this section provides a brief review of some indicators of social policy. In Canada, social government expenditure cover a range of public sector activities. A typical classification scheme based on public finance theory would be as follows:

> *Public goods and services — Pure* public goods such as national defence and general public services such as administration, legislation and regulation.
>
> *Merit goods and services* — Quasi-public goods provided on grounds of market failure, externalities or economic justice principles. For example, government provision of education is common because citizens may ignore the social returns of human capital investment, or have limited access to capital markets. Health care is another example.
>
> *Economic services* — Private goods or services prone to natural monopoly or strong externalities. Examples include public utilities and financial support for specific activities such as research and development.
>
> *Social transfers* — Transfers providing support for income and living standards that have declined sharply, or to individuals who face exceptional expenses due to old age, disability, sickness, unemployment, family circumstances, etc.

Using this classification, social policy would tend to be defined in terms of spending under the *merit goods and services* and *social transfers* categories. An alternative perspective would be focus not on the classification of spending, but more directly on the goals of social policy. Social policy pursues a number of goals, including:

- increasing self-reliance,
- readjusting intergenerational burdens,
- improving flexibility and economic growth,
- reducing the incidence of low income and child poverty,
- improving the efficiency and quality of service delivery,
- improving public finances,
- improving social cohesion, and
- ensuring that basic social needs are met.

Clearly, economic growth is one goal, but only one of many, and almost certainly not the most important. The recent social policy debate in many OCED countries has tended to emphasize the cost side of the ledger. The *incentive cost* argument emphasizes that social protection can generate long-term welfare dependency and the capacity for flexible adjustment to shocks. The funding of social security contributions in the form of payroll taxes or general tax revenues increases the *distortionary welfare cost* of taxation. High social security and health care contribution liabilities for employers and other non-wage labour costs can lead to lower employment, especially for low-wage unskilled workers. All of these might contribute to lower productivity growth.

However, in principle, social programs can facilitate economic adjustment and thus economic growth. For example, unemployment benefits can provide replacement income while people search for a job. Social protection provides collective insurance to cover risks that may occur during a person's life (such as unemployment, sickness, disability, maternity), usually at a much lower cost than if such risks were insured privately, leading to increased investments in human capital and greater mobility. Active measures to encourage and facilitate labour force participation contribute to economic growth by enhancing the flexibility of the labour force. Policies to improve the health and safety of the workforce can increase labour productivity.[15]

Assessing the productivity effects of social policy is inherently difficult. Aside from the direct human capital effects, a lot of the impact is likely to be indirect, working through changes in incentives to invest, save or work or through the induced fiscal effects on similar variables. The search for empirical regularities linking growth to social policy is almost non-existent. OECD comparisons are inevitably going to be the data most discussed in this respect. To make matters worse, this comparative data is almost all related to expenditures — that is, it measures inputs to social programs but not their outputs, which would be preferable in a productivity study. The growth literature has investigated quite extensively two categories of public spending — public investment and government consumption. Generally, the results are mildly favourable toward the productivity or growth effects of public sector investment, and distinctly negative with respect to public sector consumption, as is illustrated by the results reported in the last section. However, neither of these captures what would be called various forms of social expenditure. Differences between countries in social spending is the only form of evidence available thus far to estimate the growth effects of social policy.

Using the public finance classification of spending, Canada tends to spend relatively little on what might be called public goods or economic services. Of total public spending, a great deal is accounted for by social spending. In 1995, public goods accounted for 2.6 percent of GDP, merit goods (health, education and other social services) 12.3 percent, income transfers 11.5 percent, economic services 2.4 percent, and interest on the public debt 9.6 percent. However, comparative numbers are more interesting. Table 2 compares Canada to two other countries perceived to be at opposite ends of the social policy spectrum — Sweden and the United States — with respect to spending on education, health and transfers. While there were substantial differences between the three countries in 1980, some convergence has occurred between Canada and the United States, but Sweden continues to standout in its spending on social transfers.

Here are some other characteristics of OCED social spending patterns worth noting:

- A well-established empirical regularity in public finance is what is known as Wagner's Law. The demand for certain types of social protection rises more than proportionately with the level of per capita income. While this relationship is not observed in a cross-section of countries, it holds very strongly in almost every national time series on public expenditure. This fact,

Table 2

Selected Social Expenditures as a Percentage of GDP, Canada, Sweden and the United States

	1980	1990	1995
		Health	
Canada	5.0	5.4	5.8
Sweden	8.4	7.6	5.7
United States	4.0	5.2	6.5
		Education	
Canada	5.4	6.7	6.5
Sweden	7.6	6.8	6.6
United States	5.3	5.3	5.0
		Transfers	
Canada	8.1	10.8	11.5
Sweden	16.5	19.2	21.2
United States	9.3	8.5	9.4

Source: OECD, *Social Expenditure Database, 1980-1997*, 2000.

usually explained by using simple arguments about voter preferences, implies that economic growth is likely to have a positive impact on social spending, confounding the detection of causal channels running in the other direction — from social spending to economic growth.

- Much of what government does is redistributive (Boadway, 1998), but the interesting fact is that the bulk of the redistribution is not from the rich to the poor. During the 1980s and 1990s, the reforms to the personal tax system in nearly all OECD countries and the pressure on public budgets meant that the generosity of benefit schemes was reduced. While benefit systems redistribute income, they do not primarily redistribute from the rich to the poor. Rather, they redistribute from young to old, from those who work to those who do not, and from childless families to families with children. Social policy, therefore, is not primarily directed at equity *per se* and its growth effects are dependent on the details of specific programs.
- There has been a general and persistent upward trend in total government spending within the OECD. From 1970 to 2000, the OECD average went from 29.2 percent to 36.5 percent of GDP. Canada went from 33.8 percent in 1970 to 46 percent in 1990, and then down to 37.8 percent in 2000 with the successive Martin budgets. The major factor to which most analysts attribute this growth is the creation and expansion of programs and the provision of services in the social policy area. The income support element of these entitlements is reflected in a persistent rise in income transfer payments until the mid-1990s.

The common social policy experience of so many countries points to the difficulty inherent in attempting to use these variables to explain differences in the growth experiences within the OECD. However, there are some notable differences as noted above, and these will prove important in the identification of the effects of social expenditures on productivity.

3. THE HUMAN CAPITAL DIMENSION OF GROWTH

Most Canadians would probably accept the proposition that the public health and education systems are part of the Canadian social program framework. These type of public expenditures, often classified as merit goods by public finance economists, provide the basic infrastructure for the maintenance and provision of human capital in Canada. While private sector provision of both health and education does occur in Canada, these are generally regarded as a critical public sector responsibility. While there is a great debate about how these services should be delivered, the resources that should be devoted to them, and their method of financing, there is relatively little public controversy and a strong presumption that both health and education expenditures contribute to the productivity of the labour force over the long term. That said, however, there remains the question of the order of magnitude of the impact of health and education expenditures on productivity in an advanced country like Canada. It is not uncommon to hear accusations that we have too many university graduates with the wrong kind of training or, in the health care field, that too much is spent on health. A balanced assessment of social policy effects on productivity must necessarily address these two critical issues. In the case of human capital, the level of uncertainty has been reduced considerably by more than three decades of economic research on education, human capital and productivity. Health presents exactly the opposite case — the uncertainty is large and probably unresolvable in the near term.

Education

Public and private expenditures on educational institutions account for about 6 percent of the collective GDP of OECD member countries. Canada has witnessed fairly significant increases in educational attainment levels but it spends close to the OECD average on education. How do these expenditures affect economic growth? In this section, we summarize the literature on education and productivity based on recent evidence. There are a number of useful surveys in the literature including Topel (1999) and Temple (2000). Economists working in this area have used vastly different methodological approaches. There are three broad approaches: i) the labour economics approach, which is based on individual micro-data sets for particular countries that look at wages and education; ii) the approach followed by macroeconomic growth economists who estimate growth models that rely on aggregate human capital as an input to production; and iii) productivity accounting studies that attempt to attribute growth in output to various factors, including productivity changes driven by increases in labour quality. This is, to put it mildly, a vast literature. The intent here is to hit the major points and provide some perspective on the Canadian figures.

Earnings Equations and Microeconomic Studies

The traditional labour economics approach to education is to estimate what is known as a Mincer wage equation or schooling function. Basically, market wages or earnings of individuals are regressed on a measure of schooling, an experience or age variable, and a number of controls for region, industry, and so forth. This literature has consistently shown that the private return to an additional year of education is in the 5 to 13 percent range, with a median estimate of 8 percent. (See Card, 1999, for example.) Note that this is the private return to schooling and not necessarily the social return. Therefore, increased schooling at the individual level can be associated with higher productivity if we assume that wages are paid according to productivity.

Macroeconomic Studies of Human Capital

Macroeconomists concerned with explaining national growth performance have generally worked within an aggregate production framework amended to include human capital. Thus, GDP is generated by an aggregate production function of the following form:

$$Y = AF(K, H, L),$$

where A is the TFP parameter defined earlier and H is a measure of human capital. By far, most of these studies, both for OECD countries and for developing countries, have used measures of either schooling enrolment or educational attainment, defined for the population or the labour force, as proxies for the human capital variables. Following Lucas (1988), many macro studies also attribute to human capital an indirect effect on TFP growth — it is assumed that either the level or the growth in TFP depends on the level of H.

The early macro studies[16] found the puzzling result that changes in output (Y) appeared unrelated or only weakly related to changes in human capital. This was completely at odds with the evidence on private returns to schooling and the considerable increase in average educational levels in the earlier part of the century, generally considered by historians to have been an important factor in early 20th century growth.[17] Many accounts of East Asian growth for example put a large weight on increases in educational attainment. Fortunately, this enigma has been resolved when researchers discovered a measurement error in international data on education. Recent improvements in data and econometric methods have yielded results very closely in line with the micro evidence on wages. De La Fuente and Domenech (2000) developed a much improved data set for human capital in the OECD, which is now used by a number of analysts. The crucial long-run elasticity of output with respect to human capital is estimated to be in the 0.6 range (see Bils and Klenow, 1998; Krueger and Lindahl, 1999; Topel, 1999; and Temple, 2000). This output elasticity implies that an additional year of schooling in the average working population raises output per capita by slightly less than 6 percent. This range of effects is entirely consistent with a standard production function framework.[18]

Many of the earlier results showed very large effects of human capital on growth but did so by using the level of human capital as a conditioning variable in a cross-section growth convergence relationship. This specification is subject to two interpretations — either a Lucas-type externality interpretation, in which one is picking up a human capital externality rather than a private return, or a conditioning variable interpretation in a Solow-type transitional growth equation. Unfortunately, it is difficult to distinguish between these two interpretations using cross-sectional evidence alone. Some of the estimates achieved within this framework are unreasonably high. For example, Barro and Sala-i-Martin (1995) estimated that a one year increase in average educational attainment raised steady-state per capita output by 30 percent. This macro evidence unfortunately does little to discriminate between countries; almost all these studies assume estimated parameters to be similar across countries.

Growth Accounting

An alternative methodological approach attempts to attribute changes in output to changes in input quantities, input quality and TFP changes. The growth accounting approach, which is heavily centered on detailed measurement, uses as its working assumption that wages reflect productivity. It assumes that returns to labour force quality, as measured by changes in educational levels, are reflected in wages. After reviewing the U.S. evidence for the 1950s and 1960s, Griliches (1997) concludes that this approach suggests that improvements in labour quality account for about 30 percent of the U.S. productivity

residual — the growth in output that cannot be accounted for by the growth in the quantities of capital and labour employed. In the 1950s and 1960s, this would correspond to an impact on the aggregate output annual growth rate of around 0.5 percentage points. During the 1970s productivity slowdown, the effect of educational improvement would have been smaller, perhaps raising the growth rate by 0.2 to 0.3 percentage points.

The Canadian Evidence

The Canadian evidence on the issue of human capital effects on growth is mixed. The estimated rate of return is very similar to that of the United States, although as we shall see later the most recent trends may signal some divergences. The macro growth regression approach hinges heavily on the exact measure of human capital that is used. In the OCED results referred to earlier, the typical concept of human capital intensity is the average educational attainment. In Canada, the data on average years of schooling show a small but important increase — in 1970, the average was 11.37 years, and by 1998 it had moved to 12.94 years. As noted in our discussion of economic determinants, while apparently small, this increase goes some way toward explaining Canada's productivity performance relative to the OCED average. However, measurement methods matter a lot in this debate. More detailed attempts to measure human capital often produce quite different results. Laroche and Mérette (2000) have recently done some in-depth work on human capital stock estimates for Canada adopting what is called an income-based approach — using wages to impute directly a value to the stock of human capital. The authors compare two common measures of the total human capital stock. Canada's working age population increased by about 33 percent over 1976-96. Adjusting by years of schooling, this would yield an estimated increase in human capital stock of 73 percent. Using an income-based approach, however, the estimated increase in human capital stock is 89 percent. Their study also points out that the measures are sensitive to whether they are applied to the labour force or simply to the population as a whole. The authors also estimated that the total *active* stock of human capital has increased more rapidly than the conventional population-based measure, mainly as a consequence of the large number of increasingly educated women entering the labour force during the period. This parallels similar results obtained for the United States by Jorgenson and Fraumeni (1989). While these results have yet to be used to estimate productivity growth, they will almost certainly have a significant impact on that portion of productivity growth attributed to increases in human capital.

Recent Industry Canada growth accounting exercises for Canada and the United States provide another useful perspective on the human capital issue. Within this framework, increases in labour quality correspond to shifts in the labour input mix according to a classification based on sex, employment category, age and education. Looking at the residual (output growth not accounted for by increases in inputs), Gu and Ho (2000) find that from 1988 to 1995, labour quality increases in Canada accounted for 58 percent of the productivity residual. As is evident in Table 3, the contribution of labour quality toward explaining the productivity residual is similar in Canada and the United States. An interesting point is that for the 1988-95 period, labour quality accounts for a higher percentage of the residual in both countries.

Social versus Private Returns to Education

It is commonly asserted that the social returns to education exceed private returns, and this provides a major justification for public support of education. There has been an on-going debate on the extent of the gap between social and private returns, and the way in which social returns can be measured. Some recent efforts to infer human capital externalities using wage data at the regional level have met with limited success. A study by Rauch (1993) suggested significant spillover effects on individual wages from the average level of human capital in a U.S. state.[19] Basically, these exercises attempt to detect whether

Table 3

Labour Quality as an Explanation of the Productivity Residual in the Private Business Sector, Canada and the United States
(average percentage growth per year)

	1961-95	1961-73	1973-88	1988-95
		Canada		
Value-added Growth	3.71	5.56	3.27	1.48
Contribution of Labour Quality	0.33	0.47	0.19	0.38
Solow Residual	1.68	3.22	0.92	0.66
Labour Quality as a Share of Residual	0.20	0.15	0.21	0.58
		United States		
Value-added Growth	3.14	4.41	2.57	2.18
Contribution of Labour Quality	0.36	0.50	0.24	0.39
Solow Residual	1.44	2.65	0.86	0.64
Labour Quality as a Share of Residual	0.25	0.19	0.28	0.61

Source: Author's calculations based on Gu and Ho, 2000.

individuals who would otherwise be equal tend to get higher wages in regions with higher average wages. Aggregate growth models have also been used to measure the size of dynamic human capital externalities — externalities that directly affect the growth rate and operate through time. For example, more human capital facilitates innovation and the diffusion of new ideas, the benefits of which are not captured by the returns to individuals in the form of higher wages but impact on economic growth generally. While these dynamic spillovers are widely believed to be important, there is little direct evidence that bears on this issue. Given that the dynamic productivity effects of R&D are fairly well established and the fact that R&D is very human-capital intensive, and in light of other measures of innovation, it is probable that such effects exist but are compounded with other productivity determinants. Of course, all of this literature presumes that social returns to education have to be measured in terms of economic output.[20] This is simply not the case. After all, as Weiss notes (1995, p. 151):

> Education does not have to be justified solely on the basis of its effect on labour productivity. This was certainly not the argument given by Plato or de Tocqueville and need not be ours. Students are not taught civics, or art, or music solely in order to improve their labour productivity, but rather to enrich their lives and make them better citizens.

Even if one accepts the inability of these recent studies to pick up a significant human capital externality based on regional U.S. wage data, it would be seriously premature to take this as evidence that public support of education is not warranted on economic criteria alone. Removal of public support would almost certainly have the effect that many who now choose to become educated would not make that decision, for reasons linked to capital market imperfections. These studies are entirely consistent with the view that, at current average education levels, additional subsidies to higher education may not be warranted on externality grounds. But at very low levels of educational attainment, the social-private discrepancy may still be substantial for the usual reasons, and thus the arguments for public support of education are entirely valid. Finally, it would be absurd to ignore the growth miracles of the last 25 years. In almost every case —

East Asia, Ireland, Finland — detailed accounts attribute a large share of economic success to either human capital upgrading, or the prior presence of a skilled labour force.[21]

Health

The links between health expenditures, health and productivity remains both under-researched by economists and highly controversial. There are relatively few studies similar to those in the education sector that one can appeal to. What evidence exists usually points to correlations between income and health without resolution of the dominant direction of causality. Nevertheless, entirely reasonable interpretations of this data and the growth experience since the industrial revolution attribute more or less importance to health factors. In developing countries, there is better evidence on the link between health and worker productivity; but for the industrial countries, given the high levels of health already attained as measured by life expectancy, it is more difficult to identify the relevant marginal productivity effects.

There are a variety of ways in which health can affect productivity. A large proportion of the working population depends on general good health and well-being, including mental health, in order to function at work. One approach to identifying the productivity effect is a *cost of illness* calculation that measures lost worktime — an obvious loss of productivity. At a more general level, capital formation requires that a high proportion of the skilled labour force remains active for a number of years. The concomitant experience is important for technical innovations that take years of investments in research and development. By increasing the probability that workers remain on the job for long and uninterrupted periods, health re-inforces the willingness of firms to invest in new equipment and on-the-job training. Unfortunately, identifying these effects by conventional econometric methods has so far not been possible.

Historical accounts of economic growth sometimes attribute a large role to health in a general sense. Robert Fogel (1997), a prominent economic historian, has emphasized in his research the role that improved health played in the industrial revolution. He posits a *technophysio* evolutionary process, which is similar to genetic evolution in that it involves biological changes over time, but distinct in that it is faster, less stable, more directly anthropogenic, in interaction with technological change, and very recent.[22] The primary outcome of this process (beginning with the second agricultural revolution) has been rapid population growth and longer life expectancy, driven primarily by improvements in nutrition. Fogel argues that, over this period, Western Europe has seen rapid increases in both labour force participation rates and the average number of calories available for work, increasing productivity by about 0.3 percentage points per year. This trend, according to Fogel (2000) accounts for about half of Britain's economic growth over the past two centuries!

Preston (1976) analyzed cross-country data on life expectancy and national income for the approximate periods ending in 1900, 1930 and 1960, and observed that for a given income level, life expectancy was increasing over time. Moreover, per capita GDP above 600 dollars (in 1963 prices) had little impact in raising the highest life expectancy (approximately 73 years) in the 1960s. While recognizing that shifts in the income–life expectancy relationship had multiple causes, Preston attributed approximately 15 percent of the gains in life expectancy to income growth but was less optimistic about the role played by nutrition and literacy.

The debate continues on the causal links between health and socio-economic status in developed countries. The traditional public health approach focuses on policies aimed at improving health, based on disease oriented risk-factor epidemiology. This approach seeks to identify the social, behavioural and

biomedical causes of disease. It has been heavily criticized by a number of physicians and social scientists. Prominent contributions to this debate by Canadians include Frank and Mustard (1994), Evans (1994) and Herzman (1996). The thrust of these arguments is that the health of a population can be explained by socio-economic success rather than the health care response to disease. It should be emphasized that these studies do not address the productivity issue directly. Rather, they focus more on a critique of the received wisdom on the determinants of health. However, one possible interpretation is that better health is more likely to be a function of good economic growth performance than additional expenditures on the health care system.

One would have to conclude that the productivity case for social expenditures on health in high-income countries, as conventionally carried out in modern health care systems, remains controversial. The lack of either detailed micro or macro studies linking health to productivity growth, and the unresolved debate amongst health specialists about the determinants of health, suggest that this uncertainty will not be resolved soon.

4. INEQUALITY, SOCIAL POLICY AND PRODUCTIVITY

In this chapter, we review the theoretical and empirical literature that points to a causal linkage running from inequality and social policy to productivity growth. It is instructive first to assess what has been a key driving force behind the policy dimension of this debate — the recent changes in income inequality. Looking at the total income of the working population, the changes have not been as dramatic as one might imagine from the popular debate on this topic. In Table 4, the levels and changes of two standard inequality indexes, the Gini coefficient and the ratio of income of the 90th decile to the 10th decile are recorded.[23] It is well known that total income inequality rose in the United States and the United Kingdom from the mid-1970s through the mid-1980s. These trends were never as evident in other countries. However, from 1985 to 1995 the trends slowed somewhat. The effects on the distribution of income for the working age population are shown in Table 4 for four countries: Canada, the United Kingdom, the United States and Sweden. While the level of inequality of income of the working age population in Canada would be considered to be higher than in Sweden, there has been virtually no change from the mid-1970s to the mid-1990s. However, with respect to market income, the underlying trend has been similar in most countries. A recent OECD summary of the trends with respect to Canada is provided in Box 1.

Table 4

Inequality Levels and Changes, Working Age Population, Mid-1970s to Mid-1990s

	Levels		**Absolute Changes Between Periods**			
	Gini Coefficient	**P_{90}/P_{10} Decile Ratio**	**Gini Coefficient**	**P_{90}/P_{10} Decile Ratio**	**Gini Coefficient**	**P_{90}/P_{10} Decile Ratio**
	mid-90s	**mid-90s**	**mid-70s / mid-80s**	**mid-80s / mid-90s**	**mid-70s / mid-80s**	**mid-80s / mid-90s**
Canada	28.7	3.9	0.1	0.1	-0.1	0.0
Sweden	24.7	3.1	-0.6	2.3	0.0	0.2
United Kingdom	30.4	4.1	3.7	2.7	0.7	0.4
United States	33.3	5.3	2.9	0.6	1.0	-0.1

Source: Förster and Pellizzari, 2000.

What has happened in Canada is typical of a number of OECD countries — from the 1980s to the mid-1990s there was a fairly significant change in the distribution of market income toward the upper end of the distribution despite the relatively mild changes in total inequality, which measures income after taxes and transfers.[24] Specifically for Canada, from 1983 to 1995, changes recorded in the market income share of different deciles are presented in Table 5.

There is little doubt that this data has been a major factor behind the renewed interest in growth and inequality. Specifically, it is being argued that there is a causal chain running in the following sequence:

Social policy →Income inequality→Economic growth,

Box 1

Inequality Trends In Canada

An OECD Summary

In Canada, the distribution of disposable incomes remained broadly stable over the last two decades, and some summary measures point to a slight decrease in inequality. This holds for both the working-age and the elderly population. During the first period, mid-1970s to mid-1980s, there was some "hollowing out" of the middle incomes, as both the bottom and the top incomes gained income shares at the expense of the middle incomes. This trend did not continue into the second period, from the mid-1980s to the mid-1990s. Real incomes, on average, did not improve in Canada over the last 10 years; they fell for the upper incomes while the real value was maintained for those at the bottom. There was redistribution across age groups in the last ten years: relative incomes of the elderly, in particular older senior citizens, increased more than in all other OECD countries (Austria excepted), namely by 3 percent for those aged 55 to 64, by 8 percent for those aged 65 to 74 and by 10 percent for those aged 75 and over. All other age groups lost ground.

As in most other countries, the share of market income, in particular capital and self-employment income, going to the bottom deciles among those of working-age decreased, and related to that, tax shares fell, too. At the same time, Canada is one of the few countries in which the transfer share of bottom incomes did not increase during the past ten years. Nevertheless, a decomposition of levels and trends in inequality among the working-age population shows that both taxes and transfers contributed to equalize the distribution of disposable incomes over time. As in a majority of countries, a process of "employment polarisation" took place in Canada in the last ten years. However, both fully employed and workless households increased their relative incomes while those of multi-adult households with only one worker fell. The contributions of these three groups to the slight decrease in overall inequality were different: while inequality within and between those groups contributed largely to the decrease, structural changes drove overall inequality up but did not outweigh the other decreasing effects.

Source: Förster and Pellizzari, 2000, pp. 36-37.

Table 5

Market Income Share Levels and Changes, Canada

	Share in 1995 (percent)	Change over 1988-95 (percentage points)
Three Bottom Deciles	9.6	-0.9
Four Middle Deciles	35.5	-0.5
Top Three Deciles	54.9	1.4

with the presumption that increased income inequality lowers growth. The debate was given a great deal of impetus by two related developments in the field of economic growth. First, an empirical finding that claimed to show a positive link between lower inequality and higher growth, based on cross-sectional growth regressions. Second, some theoretical work in the *new growth theory* tradition which provided a rationale for this link. In this chapter, we look at both. Finally, it should be pointed out that it has long been recognized that causal links could also run the other way — from growth to inequality, although the sign of the effect is largely viewed as ambiguous. In the broad sweep of evidence on the industrial

revolution and economic development, the received wisdom was summarized by a concept known as the Kuznets (1955) curve, which showed that as income levels rise inequality first increases and then subsequently decreases. However, the existence of an inverted U-shaped Kuznets curve says nothing directly about growth and inequality, other than to argue that as income levels get sufficiently large, inequality will fall.

Growth-inequality Regressions

Evidence on the positive link running from inequality to growth was first provided by Persson and Tabellini (1994), who looked at cross-sectional and time-series data for both developing countries and OECD countries. They found a significant *order of magnitude* effect of inequality on growth. The equations were a reduced-form growth regression with per capita GDP growth as the dependent variable and controls for the initial GDP level (per capita) and schooling. They estimated that a 0.07 increase in the income share held by the top 20 percent of the population lowered the growth rate of per capita income by just under 0.5 percent — a very large effect. They argued that this result also holds for OECD historical data. Using a 70-country postwar data set, Alesina and Rodrik (1994) found that a one standard-deviation increase in the Gini coefficient of land distribution affects growth rates by 0.8 percentage points per year. A number of studies came to similar conclusions, although it is important to note that the majority of these studies were done with samples dominated by developing countries.[25]

Very few empirical variables that have been asserted to *explain* growth have not gone unchallenged. The same can be said for inequality both within OECD and developing country samples. Here are some of the issues that have been raised in the growth–inequality context:

- Empirical growth regressions are very sensitive to the set of explanatory variables used. The significance and magnitude of coefficients often change when the set of explanatory variables changes. For example, most theory suggests that both investment levels and human capital should be important conditioning variables. Barro (1999) noted this sensitivity and specifically found that when fertility rates are included in the full sample (developed and developing countries), the inequality variable becomes insignificant.
- One of the major problems in this debate relates to the inclusion of both developing and high-income countries in the data sets. These countries differ not only in income per capita but also for a wide range of political and institutional factors. The convergence literature on developing countries has come to the conclusion that there appears to be evidence of non-convergence, suggesting that these differences are very persistent. How this should be dealt with statistically is a major issue. Purely cross-sectional methods have the disadvantage of imposing common parameters on a number of effects that might be expected to differ between countries at different levels of development. One way around this issue is to use dynamic panel methods of estimation that attempt to use both time-series and cross-sectional variation as a way of identifying the determinants of growth while controlling for country-specific effects.[26] One of the first to use this methodology with respect to the inequality issue was Forbes (2000), who found that once country-specific fixed effects were included, changes in inequality either had the opposite effect on growth rates, or were insignificant.
- Arjona, Ladaique and Pearson (2001) adopt a panel approach to look specifically at this issue and at the level of development issue in a sample of OECD countries. They use the transitional version of the Mankiw-Romer-Weil model discussed earlier, in which growth

depends on population growth, investment, initial income and human capital. They find virtually no evidence that inequality affects growth.

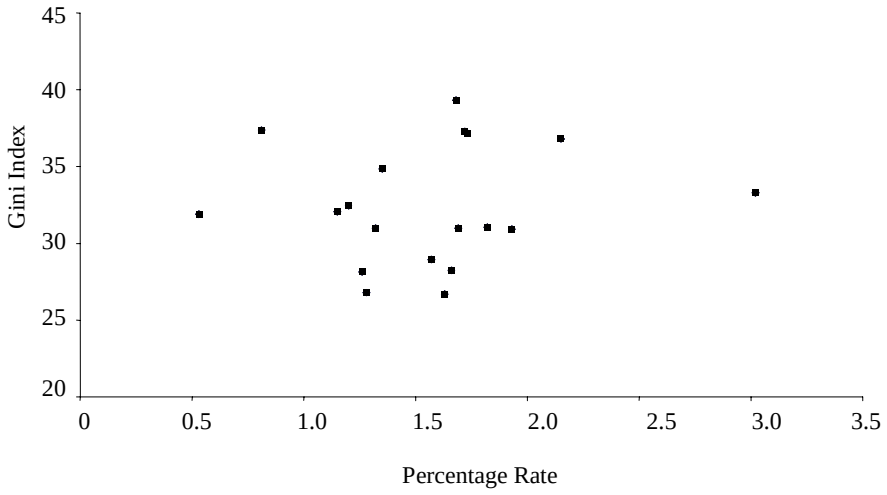
- Another major issue is causality. A standard criticism of much of the cross-sectional growth literature is that one can never be certain that correlation is causation. Usually, there is an attempt to control for this by using data covering long periods of growth as well as conditioning variables measured at the beginning of the period. More sophisticated studies will often try to estimate a structural model in which the causal linkages are more precise. There are a number of different theories linking inequality to growth and the transmission channel is quite different in each case. It is unfortunate that there have been few attempts to identify the underlying structural link. For example, if increased inequality is assumed to lower human capital investment it would be useful to check if this structural relationship exists. Perhaps future work will take this into account, but at the moment it is a major weakness of the underlying methodology.[27]

Should any of this be very surprising? Hardly. For two reasons. First, it has long been known that relatively few variables are robust in growth regressions.[28] Secondly, there is the basic data one has to work with. With a few exceptions, there is not much variation in inequality across OECD countries relative to developing countries. The United States and the United Kingdom tend to have higher levels of inequality, but their long-term growth performance has not been very different than that of most other industrial countries until very recently. The recent surge in U.S. growth has, if anything, added to the perception that the causality runs in the other direction. Figure 2 presents a simple plot of growth versus average income inequality.

The figure is plotted for the subset of older OECD countries (it excludes the recent joiners — Mexico, Korea, Greece, Spain, Portugal and Turkey). Not surprisingly, there is not much to be detected here using ocular statistical methods. The search for a more complicated correlation in this data is largely what the empirical debate has been about.

Figure 2

Growth and Inequality Scatter,
Average Annual Productivity Growth, OECD, 1971-98



On balance, the empirical case for a link running from growth to inequality for the high-income countries is at best statistically fragile, and at worst insignificant. Note that none of this points to the opposite conclusion — that increases in inequality cause higher economic growth.

The Theoretical Linkages

Often in economics, in the absence of decisive evidence for or against a hypothesis, economic theory plays an important role in determining the priors of both economists as social scientists and as policy advisors. Part of the renewed interest in this debate is the new theoretical literature that shows that increases in inequality can hurt growth. Most of this theory is rooted in endogenous growth theory[29] in which productivity growth is an endogenous characteristic of the economic system. Recent surveys that focus on inequality include Aghion, Caroli and Garcia-Penalosa (1999) and Lloyd-Ellis (2000). As it turns out, however, these theoretical developments while insightful do not establish a strong case. They provide interesting examples of models where changes in inequality can lead to lower growth under highly specialized assumptions. To get these results, the models themselves must be dramatically simplified. Now this is not a criticism, but merely serves to point out that often in economics theory does not suggest a one-sided causal pathway between two variables. In this particular case, there is also an older literature that suggests the opposite effect — higher inequality can raise growth. There is also a political economy literature that emphasizes the endogenous nature of policy and growth consequences.

A brief summary of the theoretical arguments is provided below.

Traditional Theory

- Kaldor (1957): With savings-driven accumulation and assuming the rich have a higher propensity to save than the poor, more inequality leads to higher savings which can lead to higher transitional growth rates.
- Large investment indivisibilities: Assuming that capital markets are very imperfect, significant individual wealth accumulation may be necessary to make an investment. More inequality could help growth in these circumstances by facilitating the concentration of large pools of investment funds.
- Incentive- or Mirrlees-type (1971) theories: With imperfect monitoring of contracts due to transaction costs, moral hazard is to be expected. Borrowers using traditional debt contracts are quite likely to behave opportunistically and not always in the lenders' interest. In such cases, optimal contracts should reward output, and with heterogeneity among borrowers the successful would be rewarded, not the unsuccessful. This implies a need for *ex post* inequality in rewards to maintain incentives. Similar arguments carry through to the taxation of savings in endogenous growth models driven by capital accumulation. By taxing savings growth is lowered (Rebelo, 1991). Both classes of arguments suggest that increased income inequality, as opposed to more equality supported by a highly progressive tax system, leads to higher growth.

Political Economy Models (Persson and Tabellini, 1994)

- Inequality affects taxation through the political process: In unequal societies, more voters prefer redistribution assuming the median voter determines policy outcomes. They consequently vote for redistribution, which reduces the incentives to invest, and hence lowers

the growth rate. Note that this argument assumes that more inequality→more redistribution→less growth.[30]

- Social protection reduces growth through rent-seeking: This argument was made by Lindbeck (1975, 1995), who looked at the link between growth and social protection. He suggested that the universality of Scandinavian welfare states *politicised* the returns to economic activity and thus encouraged people to seek material gain through the political process by passing redistributive legislation rather than through entrepreneurial and innovative activity.
- A variant on the first set of theories, but with reverse implications assuming that interest groups determine policies and that a strong social safety net exists: In the presence of a free-rider problem, interest groups work hard at preventing policies that hurt them but that otherwise may have positive, widely-diffused growth effects (e.g. trade liberalization, labour market reforms, etc.). With social protection, these losses are partially insured against, thus reducing the opposition of interest groups to growth-promoting policies and increasing the likelihood that they will vote in favour of such measures.

New Growth Theory

- Imperfect market and diminishing returns to investment: Aghion et al. (1999) refer to this as the opportunity-enhancing effect of redistribution with imperfect capital markets. Given diminishing returns to individual investments and restrictions on the ability of individuals to pool funds, people with high endowments have low marginal returns to investment, and conversely for the poor. Redistribution from the rich to the poor raises the average return and thus enhances growth.
- Reversing of the traditional incentive argument: This argument stresses the Mirrlees' case, but with the added assumptions that the effort of borrowers is related to initial income and that limited liability effects are important. Let's assume that the probability of success of an investment project depends on the effort of the borrower, but that moral hazard exists for the usual reasons. With limited liability, individual borrowers do not bear the risk of failure (the lenders lose) and this affects their effort. If the effort is increasing the borrowers own wealth, then redistribution towards poor borrowers will have a positive effect on their effort, thus promoting growth. Aghion et al. (1999) argue that redistribution will increase the effort because it reduces borrowing by the poor who now get a larger share of residual output; with a larger share, they have an incentive to work harder.

As is evident, there is a variety of theories suggesting alternative linkages between inequality and growth. Note that most economic theories hinge heavily on one market failure argument or another, and particularly on imperfect capital markets. In a developed-country case, this would only seem to make sense in the context of human capital given well-developed capital markets for other forms of investment in physical capital. If redistribution is to occur, it would have to be financed by distortionary taxes on wages and savings. This would have the traditional negative incentive effects on growth, offset or perhaps overcome by the opportunity-enhancement effect. However, the presumption that the appropriate policy to stimulate growth is to passively redistribute income is far from evident. With inequality of access to investment across individuals, a more suitable policy response would be to either a) reform financial institutions and markets such that able individuals could invest in education, or b) provide more direct support for public education.

The political economy theories point out that one must distinguish carefully between three related factors: inequality, which can be measured before the tax and transfer system apply; redistribution, which is income-based; and social insurance, which is situation-specific. Depending upon the assumptions made, more market income inequality before taxes and transfers may lead to greater or less redistribution *ex post*. Lindbeck views social protection as inducing greater political rent-seeking, whose opportunity cost is growth; the other view of social policy is that it provides insurance in a world with insufficient private markets for insuring risk against sickness, unemployment, and so forth. Thus, social safety nets a) promote individual investments in human capital and b) reduce political opposition to growth-promoting adjustments and policies. Which of these effects are more important?

In this instance, economic theory points to interesting hypotheses and provides the empirical economist, or policy maker, with some insight on what roadmarks to look for in determining the set of interactions amongst variables. Beyond that, however, the theories themselves are too diverse and too malleable to changes in assumptions or parameter choice to form a basis for reliable policy formulation without empirical validation.

Social Policy and Growth Evidence

It is entirely possible, and theoretically reasonable, that social policy might affect growth without a strong effect on the income distribution. For example, many of the theoretical arguments about the consequence of active labour market policies suggest that these could, in principle, be growth-enhancing. These same policies might also reduce the degree of market income inequality, but this is not certain without carefully specifying the dynamic feedback effects from growth to the income distribution. It is however reasonable to ask whether one can empirically identify the linkage between social policy and growth without reference to an intervening effect on inequality. Unfortunately, very few studies have been published on this issue, and it is one on which further research is required. There is a fairly well-developed body of evidence on the effects of government spending on growth, but it generally does not distinguish government spending directed at a social policy objective from spending toward other objectives.[31] A large number of studies on the growth consequences of fiscal policy have documented a significant and negative effect of government consumption on growth.[32]

One innovative study that attempts to look specifically at social policy for OECD countries is Arjona, Ladaique, and Pearson (2001). The authors use a framework similar to that discussed in the chapter entitled *Some Background: Productivity Growth and Social Policy* to infer the impact of social expenditures on growth in the OECD. The growth equation is a Mankiw-Romer-Weil transitional growth equation that controls for investment and human capital intensity across countries. It is estimated using an annual sample of 21 OECD countries over the period 1970 to 1998. They find virtually no evidence that post tax–transfer inequality affects growth rates in OECD countries. There is some evidence that total government spending on social programs reduces growth. The magnitude of the effects is consequential. In the basic model with aggregate social expenditure as a fraction of GDP, the coefficient is -0.134. This compares with a coefficient on the investment share of 0.345. Both are significant at the 95-percent level.[33] Quantitatively, the implication is that if one were to decrease social spending by 1.0 percent of GDP and increase investment by 1.0 percent of GDP, the impact on aggregate labour productivity growth would be on the order of 0.5 percent per year. Not a large impact, but over a number of years, this would begin to have a significant effect on income levels. Recall that until recently annual labour productivity growth has been in the 1.5 percent range.

The authors do find, however, that when social spending is disaggregated by function the results are cleaner in terms of both significance and magnitude. Passive social spending is prejudicial to growth while active social spending promotes growth. Interestingly, they also find that when the definition of active social spending is expanded to include health expenditures, the coefficient estimates on social spending become insignificant. When they include both passive and active social spending as explanatory variables the coefficient on passive social spending is significant and negative, while the coefficient on active social spending is significant and positive. The orders of magnitude are interesting. The coefficient estimates imply that a shift of 1.0 percent of GDP from passive to active spending produces a positive effect on growth of about 0.5 percent. Overall, the results suggest that social expenditures that promote adjustment and labour market participation tend to increase labour productivity growth, while other forms of social expenditures do not contribute to growth and in fact may reduce it.

Obviously, one should interpret these results with caution given the limited time-series variation in the data and other potentially omitted variables in the growth equation such as R&D and openness. Nevertheless, this is a good start on an important research and policy issue.

An alternative and in many ways unrelated body of evidence links social capital to economic growth. Social capital as defined by Putnam (1993) and Woolcock (1998) refers to the nature of trust in societies engendered by various forms of community association. One of the best known and most representative definitions can be found in the highly influential work of Putnam (1993):

> Social capital ... refers to features of social organisation, such as trust, norms, and networks, that can improve the efficiency of society by facilitating co-ordinated actions. (Putnam, 1993, p. 167)

To an economist, as Arrow pointed out long ago, trust is an important substitute for markets and contracts. *A priori*, one would imagine that more trust would imply higher growth. The issue is pertinent to the debate on social policy because there is a strong presumption that social cohesion and social capital are closely related, as argued by Ritzen et al. (2000). A major objective of social policy is to build social cohesion. These authors argue that social cohesion creates an environment in which good policy can be carried out by giving policy makers room to manoeuvre. The latter is created by reducing societal conflict over distributional objectives in part through common institutions such as social policy.

However, the empirical evidence on social trust and growth is simply absent, so there seems to be little point in pursuing in this vein. What evidence exists from cross-country comparisons based on the World Values Survey seems to show that these indices of *trust* actually lead to lower growth (see, for example, Knack and Keefer, 1997). When these authors exclude socialist countries and focus on a more recent period (1980-92), they get stronger results. Controlling for initial income per head, human capital and the relative price of investment goods, an increase of 10 percentage points in the level of their *trust* index (slightly less than one standard deviation) is associated with an annual growth rate higher by 0.8 percentage points. Typically, the results are weaker when attention is restricted to a sample of OECD countries. Also using World Values Survey data, Helliwell (1996) found that trust has a negative effect on growth in a sample of 17 OECD countries. Knack (2000) reports that in a sample of 25 OECD countries, the impact of trust is imprecisely measured, and the hypothesis that it has no effect cannot be rejected at conventional significance levels. This literature may prove to be influential at a future date, but thus far there is little in it that could be used as a major justification for policy.

5. EXPLAINING RISING INEQUALITY AND FAST GROWTH: THE *NEW ECONOMY* HYPOTHESIS

If inequality cannot explain growth, what about the reverse — does growth causes inequality? We will suggest in this chapter that the answer to that question is much more interesting from a policy perspective. But providing an exact answer is complicated. In general terms, the answer is sometimes yes and sometimes no. Economic growth in advanced countries is driven by a complex set of interacting factors. However, there is a growing and convincing body of evidence indicating that the recent growth experience of Canada and the United States could be explained by the *new economy* hypothesis — the impact of a major economy-wide technological change attributable to innovations in information technology, computers and telecommunications. The evidence for this is now showing up in the form of accelerated productivity growth in a number of countries, beginning in the United States but also now in Canada. The recognition of this change is now prompting economists to revise their views on recent economic history. The *new economy*, which was in its incipient phase in the early 1980s, has had a number of other important consequences, including increased wage inequality.

New Economy: The General Purpose technology Explanation

The hypothesis stating that the last two decades was a period where technological change of a particular form has both accelerated and constituted a major shift from the past has come from a variety of theoretical and empirical perspectives. One analytical perspective is that provided by the literature on *general purpose technologies* (GPT) described in Helpman (1998). These are generic and pervasive technologies that transform large sections of the economy, and give rise to widespread complementary investments in physical and human capital, including learning-by-doing. Historical examples include the steam engine, electricity, and the modern manufacturing assembly line method of production.
Other accounts, such as that of Greenwood, Hercowitz and Krussell (1997), stress that most of the recent technological change has been embodied in new capital equipment, particularly IT investment-specific technical change (IST). One major piece of evidence in this regard is the dramatic decline in equipment prices over the last two decades. Another perspective is the large literature from labour economics that has attempted to explain wage inequality trends over the past two decades as *skill-biased technological change* (SBT). Each of these perspectives has it own strengths and weaknesses in terms of consistency with the data. Simple SBT theories cannot account for the slowdown and acceleration in growth, while the GPT and IST theories can. The differences between them, however, are less important than their common features. At a popular level, they could all be subsumed under the heading of *new economy* — which is what will be used here.

We now realize that the arrival of the *new economy* was preceded by the demise, in part, of the old economy. This has lead to the obsolescence of skills and industries, which in the short term translates into falling incomes, rising unemployment and a painful structural adjustment that figures prominently in modern Schumpeterian theories of endogenous growth.[34] Economic policy and social policy have been responding to these pressures in predictable ways. The slow growth experienced in the 1970s and 1980s triggered an increase in spending on social support systems and rising debt and deficits. The 1990s led to the realization that the trends in debt accumulation were not sustainable and major fiscal adjustments were adopted in all OECD countries — dramatically so in Canada. These trends may or may not reverse depending upon how the technological transition works through the world economic system.
As emphasized by economic historians, there is great uncertainty about the exact consequences of such technological evolutions when you are right in the middle of them.[35] For example, few people realized

when it first appeared, or even well after, that a major consequence of the internal combustion engine would be the concentration of population in large cities. Undoubtedly, the same is true for the *new economy*.

The *new economy* hypothesis stresses the causation running from technological change to both growth and inequality. Putting this together with the fact that social expenditure is income-elastic (the Wagner hypothesis) leads to the following interpretation of what has been happening in OECD countries over the last two decades.

1. As the old GPT matures, growth slows down because productivity gains on the old technology become harder to obtain.
2. The GPT *arrives* in the form of a new set of generic technologies, and at first growth slows even more. Measured productivity growth slows down and inequality rises for technological reasons (skilled-biased technological change) and due to the obsolescence effect on older industries and technologies. Social policy responds largely to the increased demand placed upon it by the structural adjustments of the new technology.
3. Growth begins to pick up as productivity gains start to appear with the increased adoption of the new GPT. Wage inequality continues to rise, but pressure for spending on social programs abates as employment and incomes rise.
4. As diffusion of the GPT through the economy begins to peak out, growth slows down slightly but inequality falls due to: a) trickle down effects; b) the factor supply response (more people choose to be educated); and c) less technological displacement. Social spending continues to rise driven by the income effect.

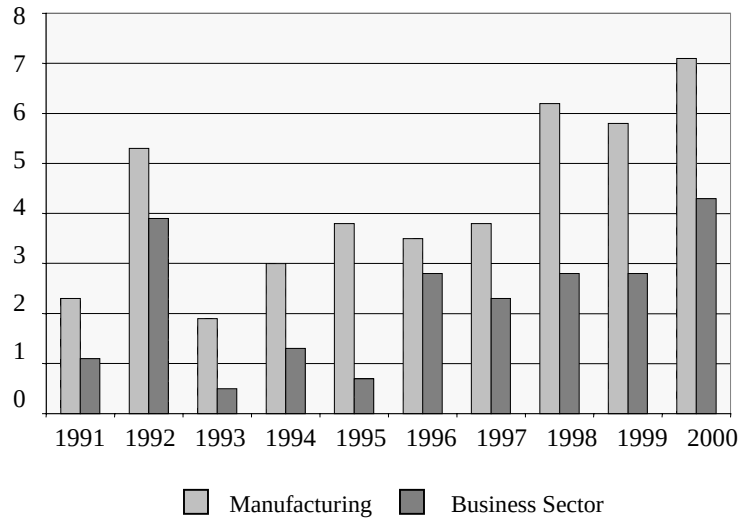
The hope is that we are somewhere in stage 3. Stage 4 is probably some way off.

The *New Economy*: Productivity Evidence

The major piece of macroeconomic evidence in favour of the *new economy* is the long U.S. economic expansion fuelled by strong and accelerating productivity growth that began in durable manufacturing and is now spreading to the entire business sector. The early productivity gains were almost entirely concentrated in the computer and electronic equipment industries, and the lack of evidence of accelerated productivity growth outside these industries has led to some scepticism as to how widespread these gains might be. As revealed by Figure 3, these gains are considerable, with economy-wide labour productivity growth reaching the 4 percent range by the end of the decade. While the most recent pace of growth is probably not sustainable, the data have suggest that productivity growth in the United States has entered an era of unusually high values. The international dimensions of the *new economy* are yet to be determined. However, the substantial globalization that has taken place over the past decade will probably contribute to a relatively rapid international diffusion by historical standards.

Figure 3

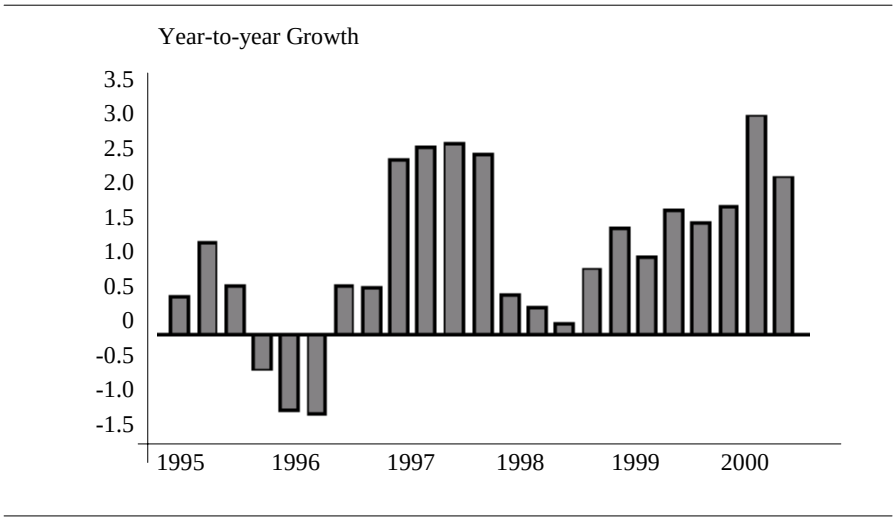
U.S. Productivity Growth in the 1990s (percentage)



Canada's productivity growth remained quite subdued in the early part of the decade, and even into the mid-1990s there seemed to be little evidence of a *new economy* effect. However, more recent data support the view that the *new economy* is reaching Canada, as shown in Figure 4. Labour productivity in the Canadian business sector grew at an annual pace of 2.1 percent from the third quarter of 1999 to the third quarter of 2000. While this evidence is only suggestive, it does point to trends similar to what happened in the United States.

The acceleration of productivity growth in the late 1990s has generated some controversy as to the quantitative significance of information technologies in fuelling these advances. A recent, and sceptical, summary of the debate linking the *new economy* and the acceleration of productivity is provided by Bosworth and Triplett (2000). The major debate revolves around the fact that IT, principally measured through its capital-deepening effects in a conventional Jorgensonian framework, can only seem to explain about one third of the acceleration in productivity growth. The rest is attributable to growth in TFP — exogenous technical change. The problem with this conclusion is that the neoclassical production function model underlying the construction of the TFP measurement is least likely to work when technological change is embedded in a GPT. During these transitions, as emphasized in related theoretical and historical work, disentangling TFP growth from the consequences of developing new capital goods is conceptually impossible.[36] Changes in labour productivity, which is what drives economic growth, is the only productivity measure in these circumstances that has an unambiguous intrepretation.[37] IT investments are undoubtedly a manifestation of the broader ICT revolution, but only partly so. The dollar value of IT investments does not tell us anything about the way in which the distribution system is transformed by technological changes.

Figure 4
Labour Productivity Growth in the Canadian Business Sector, 1995-Q1 to 2000-Q3



Source: Statistics Canada website.

The *New Economy*: Wage Inequality

The evidence on wage inequality plays a major role in understanding this complex set of phenomena. There is a large literature on this issue, and to review it adequately would take us far from the basic object of this paper. Recent surveys include Acemoglu (2000), Gottschalk and Smeeding (1997), Johnson (1997) and Katz and Autor (2000). The data on wage inequality reveal three major facts that seem to be common to number of OECD countries, but particularly Canada, the United States, Germany and the United Kingdom:

1. A slowdown in average real wage growth, which corresponds to a slowdown in measured average labour productivity. The orders of magnitude are considerable, particularly for low-skilled workers. In the United States, workers at the 10th percentile of the wage distribution (i.e. low-skill workers) have seen their earnings fall in real terms to levels below those of 1963.[38]

2. There has been a substantial increase in the education premium for more highly educated workers. The college premium — the wages of college graduates relative to the wages of high school graduates — increased by over 25 percent between 1979 and 1995 in the United States. Canada has witnessed a smaller but qualitatively similar increase in skill premiums.

3. Overall, earnings inequality increased sharply. In 1971, a worker at the 90th percentile of the wage distribution earned 266 percent more than a worker at the 10th percentile. By 1995, this number had risen to 366 percent.[39] A substantial part of this increase in inequality is not explained by education but by some unknown factor. When controlling for education, experience and other variables, there is a remarkable increase in measured within-group or residual wage inequality. Many studies point to an rise in wage inequality of up to 60 percent within groups who have apparently the same education and age.

The trends in Canada have been similar but with some differences. Murphy, Riddell and Romer (1998) note that part of the Canada-U.S. differences in skill premiums can be accounted for by the relatively larger increase in the supply of educated workers in Canada over the last two decades. Also, the productivity evidence suggests that the new GPT was entering Canada at a somewhat slower pace than in the United States. There is no precise way one can yet prove this, but one piece of supporting evidence is the relatively lower rate of IT investment in Canada than in the United States during the 1990s.[40] Recently, Beaudry and Green (1999) have put forward an alternative explanation of the OECD wage inequality trends, based on the arrival of a GPT characterized by a higher capital-labour intensity together with differences in the cost of capital across countries. While leading to slightly different implications, specifically with respect to the key role of investment, the general thrust of their results is consistent with other *new economy* theories.

Explaining the slowdown in measured productivity at the same time that technological change was accelerating has been attempted in a large number of theoretical papers, including Acemoglu (2000), Helpman and Trajtenberg (1998), Greenwood and Yorukoglu (1997), Hornstein and Krusell (1997) and Galor and Moav (2000). The theories all have a similar mechanism that involves a new technology slowly displacing an old technology. However, the new technology requires substantial learning-by-doing and investment in complementary skills and equipment. All of this, together with the obsolescence of the old technology, leads to a sustained period of slow to negative productivity growth. The slow growth in wages, particularly of unskilled workers, is a reflection of these factors. This theory may even *explain* part of the famous productivity slowdown of the mid-1970s. Moreover, a similar reasoning can be used to explain why the growth performance of a number of countries has differed from that of the United States due to lags in adoption. The slow growth in the United States during the 1980s is indicative of the type of productivity growth that is likely to be felt as the GPT hits the economy.

The general view of the current ICT-driven GPT is that it increases the returns to skills and leads to an increase in within-group wage inequality. There are a number of ways in which the GPT raises the returns to skills, but one of the simplest mechanisms is capital-skill complementary, as first argued by Nelson and Phelps (1966). One major historical GPT that has received a considerable amount of research attention is electricity. Goldin and Katz (1998) provide strong evidence of technology-skill complementarity during the 1910s and 1920s due to the increased demand for skills coming from the introduction of electricity in most manufacturing processes. This view of technological change is similar to that put forward today with respect to ICT innovations. The current GPT is a type of technological change inherently biased towards skilled workers, given that the skills required are complementary to the new capital goods. Collectively, the skill–capital mix tends to displace unskilled workers.

Explaining higher within-group inequality can be done by appealing to the interaction between education and learning-by-doing (LBD) on the new GPT. Aghion et al. (1999), for example, argue that with vintage-specific skills and vintage-specific LBD we get an increase in within-group inequality as the new GPT arrives. Workers choose between staying on old machines or moving to new machines and start LBD all over. When the rate of embodied technological progress rises, there is a greater heterogeneity in outcomes, as those choosing to move to the new technology are lucking out with higher *ex post* returns.[41] This within-group effect should begin to dissipate over time as the new technology embodied in the GPT becomes pervasive. However, the lags involved could be very long. Older workers in particular are those most likely to be adversely affected no matter what their skill level on the old GPT.

If the GPT view of wage inequality is correct, there is the distinct possibility that market wage inequality will fall as the GPT matures. There is some evidence in the United States that this is now happening, as witnessed by recent wage increases in traditional low-skilled service industries.

The markets for human capital respond by increasing the supply of those skills that are particularly scarce. In addition, there are usually trickle down effects across the skill spectrum. Both of these factors tend to reduce inequality.

The *New Economy*: Policy Implications

The implications for the link between social policy and productivity are considerable. First, the *new economy* perspective provides a coherent explanation of both growth and inequality trends as endogenous reactions to a common cause — an acceleration in the rate of technological change. The good news is that these effects are highly non-linear in time. As the *new economy* matures and diffuses, productivity growth increases. What will happen to wage inequality in the future will have a major influence on the future course of social policy, human capital policy and, more generally, on income inequality. At this point we can only hope that high rates of economic growth will tend to *raise all boats* and that, in the long run, income inequality will fall.

Over the very long term, social and economic policy is part of a set of framework policies that condition how a national economy will respond to global technological forces. Judging the relative merits of alternative policies in terms of a productivity payout, or the cost-benefit ratio on an additional dollar spent in a particular form of program, will depend critically on the extent to which each policy will facilitate the medium-term structural adjustment to these technological changes.

6. CONCLUSION

The linkages between economic growth and productivity are both complex and subject to a variety of potential causal mechanisms. This paper has reviewed the evidence and theory linking the social determinants of productivity growth and contrasted these with more conventional economic determinants such as investment and innovation. The social determinants include such factors as the distribution of income and wealth in society, the set of social policies existing in a country, including social insurance and redistributive programs, the education and health systems, and the degree of social cohesion. The complexity in uncovering a link running from social factors to productivity growth is compounded by the fact that these broad institutional arrangements, including the social determinants but also the political and legal systems, may have indirect effects in the long run that are difficult if not impossible to detect in conventional economic data. In spite of these problems, there is a new body of research, both theoretical and empirical, that attempts to identify the relationship between social policies, economic inequalities and productivity growth.

The traditional economic debate on these matters was usually framed in terms of the equity–efficiency tradeoff, in which more economic growth could only be obtained at the expense of increased economic inequality. The newer literature suggests that, in fact, growth and social objectives may be complements rather than substitutes. This certainly provides a more optimistic view of the choices facing governments than has been the case based on the existence of a growth–equity tradeoff.

While these recent empirical and theoretical contributions are interesting and suggest some important new areas for research, it is premature to assume that this literature proves a robust linkage running from social policy and inequality to productivity growth. One cannot conclude that reduced income inequality leads to increased productivity growth, or that more social spending leads to increased productivity growth. The empirical evidence establishing such a linkage, which at this point is largely based on macroeconomic cross-country comparisons, is simply either not in the data, or statistically fragile. Moreover, much of what has been offered as evidence in favour of this hypothesis rests on developing-country data, which is of questionable relevance to an advanced industrial country like Canada. It is important to emphasize the recent origins of this research. Virtually all of it has been done in the last ten years, and the total number of studies is still quite limited. It is possible, therefore, that our views based on the weight of evidence will change in the next few years. The one major exception to these observations concerns education. There is a very large body of evidence showing that increasing education has a substantial effect on productivity. The role of human capital in Canada's economic growth has been an enduring theme of both social and economic policy. The evidence surveyed in this paper provides a strong endorsement of this view. For example, Tom Courchene in his recent book *A State of Minds: Toward a Human Capital Future for Canadians* (2001), comes to very similar conclusions but from a different perspective. The evidence on health expenditures is less convincing, but in general the productivity case for improving human capital is compelling and requires further research.

The paper also discusses other research linking the economic determinants of productivity and the consequences of major technological change for both inequality and growth. This very recent literature associated with the *new economy* hypothesis carries some potentially interesting implications for both social and economic policy, in that it offers a coherent explanation of why inequality rose and growth slowed during the 1975-95 period, and why there is now an apparent acceleration of productivity. If this view is correct, it also offers some potential clues as to the future pressures on wage inequality and their consequences for social policy.

In summary, the major conclusions of the paper are as follows:

1. The general case linking social policies or inequality to productivity growth remains unproven. Justification for any particular social policy innovation must rest on its cost-effectiveness in reaching its stated social goals. What little evidence we have suggests that social policies promoting labour market participation, rather than passive cash-transfer programs, are most likely to generate productivity benefits, although the magnitude of the effects remains uncertain. A great deal more research is necessary to link social policies to productivity, particularly at the micro level, before a productivity argument could to be used to promote a particular social policy.
2. Policies that have been proven to most likely increase productivity are those focused on the proximate economic levers to productivity growth — those that stimulate investment, innovation and competition, and facilitate the international diffusion of knowledge.
3. The one social policy for which there is ample evidence of positive productivity effects is education. A substantial portion of Canada's economic growth appears to be attributable to the country's high levels of educational attainment.
4. The *new economy* perspective provides a coherent explanation of both recent growth and inequality trends as endogenous reactions to a common cause — the acceleration of technological change. The growing evidence linking both recent and past productivity data, together with evidence on wage inequality trends in industrial countries, provides a more coherent perspective from which to assess policies linking productivity and inequality. A growth-oriented policy must both promote technological adaptation through investment and skill acquisition, and facilitate the required structural change across regions, industries, firms and workers. Social policy can help facilitate these adjustments by providing the least well-off with the necessary resources to make the required investments in human capital both for themselves and for their children.

The major rationale underlying social policies in the modern mixed economy has never been higher productivity growth. The general concerns for social justice, and the political demands of an increasingly wealthy society for improved education, health and social insurance have long been the major reasons voters have requested these policies in Canada. This will undoubtedly continue to be true provided economic growth is sustained. Failure to increase or keep pace with living standards in other advanced countries is ultimately the most serious threat to Canada's social programs. In that sense, productivity issues and social policy will always be linked.

NOTES

1 For a recent review of these arguments in a Canadian perspective, see Osberg (1995).

2 Krugman (1994) provides a very readable statement of this argument.

3 See Lindbeck (1975, 1985).

4 Also referred to as endogenous growth theory. Surveys of this field are presented in Aghion and Howitt (1998) and Jones (1999).

5 On aging and social security reform, see OECD (1998). The literature subsequent to the *OECD Jobs Study* is voluminous. A review is provided by Disney (2000).

6 This section draws on material in Harris (1999).

7 For a brief and non-technical review of productivity measurement, see Harris (1999). For an extensive review of the literature and a history of the subject, see Hulten (2000).

8 In the Canadian data, the majority of productivity growth is accounted for by TFP growth or multifactor productivity (MFP) growth. MFP growth data are published regularly by Statistics Canada.

9 A good example is Mokyr (1990).

10 For a recent survey, see Ritzen, Easterley and Woolcock (2000).

11 See Levine and Renelt (1992) and Sala-i-Martin (1997).

12 For the non-OECD sample, the model was actually somewhat more successful, although this result has been criticized on a number of fronts.

13 See Temple (1999).

14 These models almost always ignore adjustment costs, which is a serious problem in using them for welfare evaluations. With high adjustment costs, fast convergence is not always a good thing.

15 Both are covered in greater detail in the chapter entitled *The Human Capital Dimension of Growth*.

16 See, for example, Benhabib and Spiegel (1994).

17 See Mokyr (1990), for example.

18 It is also consistent with other comparative international micro-based evidence. For example, for education beyond the 8th year, a value of 6.8 percent was estimated for the OECD.

19 The results of this study were subsequently reversed by a number of authors. See Acemoglu and Angrist (1999), for example.

20 There also is an active critique of the human capital literature based on the well-known signalling argument — education does not add to productivity, but in a world of imperfect information it signals to employers those who have higher ability. Virtually all of the literature referred to above ignores this issue. See Weiss (1995) for further discussion.

21 On East Asia, see Young (1995), and on Ireland, see Barry (1999).

22 Fogel (2000) pp. 1-21.

23 An increases in the Gini coefficient corresponds to an increase in inequality.

24 Beach and Slotsve (1996) document these trends for Canada.

25 A survey of this literature is provided in Benabou (1996).

26 Contributions to the analysis of growth using panel data sets and fixed-effects estimation include Barro and Lee (1994), and Barro and Sala-i-Martin (1995).

27 An exception is Perotti (1996) who looks at the effect of inequality on female education and fertility for developing countries and finds a significant effect. This suggests that it may be the important causal channel in developing country data.

28 See Levine and Renelt (1992) and Sala-i-Martin (1997).

29 For a comprehensive survey, see Aghion and Howitt (1998).

30 Aghion, Caroli and Garcia-Penalosa claim that this is inconsistent with evidence showing that redistribution has a positive effect on growth and that measures of redistribution are uncorrelated with inequality — they cite Perotti (1994) whose Tables 4 and 8 report regression results. The measure of redistribution is the marginal tax rate.

31 There are a few older studies that claim to focus on the links between social expenditure and growth. Unfortunately, they rely on the cross-sectional approach and most suffer from data deficiencies. Results have generally been mixed, but most come to the conclusion that social expenditure is bad for growth. See, for example, Landau (1985), Gwartney, Lawson and Holcombe (1998), Hansson and Henrekson (1994), Lindert (1996) and Weede (1986, 1991).

32 This is the literature on fiscal policy and growth. A modern example is Easterly and Rebelo (1993). Temple (1999) covers the evidence in his survey.

33 Results reported in Table 6.4, column 2.

34 This class of theories is a major focus of Aghion and Howitt (1998). The Schumpeterian perspective gives prominence to the process of creative destruction that technological change leads to.

35 See Lipsey, Bekar and Carlaw (1998) for a discussion of the uncertainty surrounding GPT transitions.

36 In one of the early theoretical GPT papers, Helpman and Trajtenberg (1998) noted that the diffusion of a GPT would lead to an acceleration in conventionally measured TFP. However, the cause of that acceleration lies with the adoption and diffusion of the GPT itself.

37 Even this conclusion has to be qualified if output cannot be measured correctly. For example, labour productivity statistics in service industries are thought to be unreliable because of the inability to measure quality changes in their output. This problem does not, however, undermine the evidence on productivity acceleration. The service measurement problems have been present for a number of decades.

38 This is a summary of Acemoglu (2000) on the U.S. wage evidence.

39 From Acemoglu (2000).

40 Schreyer (1999) calculates that, from 1990 to 1996, ICT contributed 0.26 percentage points to the average 1.30 percent labour productivity growth. For the United States, he calculates that ICT account for 0.41 percentage points of the average 1.0 percent labour productivity growth. Note that this data predates the acceleration phase referred to earlier.

41 Note that in this framework, increased education or training — if it facilitates greater mobility across vintages — will tend to reduce wage inequality, thus offsetting in part the growth effect of the GPT on inequality.

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