

Appendix 2: Business Sector Data on Outputs and Inputs for Canada, 1961-2011

Introduction

The Appendix discusses the underlying data used to measure multifactor productivity growth in the article “New Estimates of Real Income and Multifactor Productivity Growth for the Canadian Business Sector, 1961-2011” published in the Fall 2012 issue of the *International Productivity Monitor*. Our approach is to use Statistics Canada information on the outputs produced by the Canadian business sector from the national accounts along with Statistics Canada information on labour and capital inputs used by the business to construct “top down” measures of the multifactor productivity performance of the Canadian business sector.¹ We also make extensive use of Statistics Canada’s National Balance Sheet estimates for information on various capital inputs used by the business sector along with the more disaggregated information on business sector investment and capital stocks that is listed in CANSIM Table 310003. Our business sector labour information for 36 types of labour for the years 1961-2011 comes from CANSIM Table 3830024.

The present approach to productivity measurement is an aggregate “top down” approach as opposed to the usual industry “bottom up” approach which makes use of detailed data on inputs used and outputs produced by industrial sectors and aggregates up sectoral productivity growth rates in order to obtain national business sector estimates.² With reliable data, the two approaches should give very similar answers.³ Unfortunately, data on industry inputs and outputs are not likely to be as reliable as the corresponding national data for a variety of reasons⁴ so it is useful to provide a check on the industry approach to productivity measurement by using the national aggregate approach.

There is another reason for undertaking a productivity study using final demand data and this reason is that the effects of changes in a country’s terms of trade can be measured in this framework whereas these effects cannot be measured in the industry accounts framework using the System of National Accounts 1993 (SNA 1993) (Eurostat, IMF, OECD, UN and World Bank, 1993, chapter 15). In particular, the Input Output accounts as outlined in Table 15.1 in the SNA 1993 do not show the role of international trade in goods and services by industry. Exports and imports enter the main supply and use tables (Table 15.1) as additions (or subtractions) to total net supply or to total domestic final demand in the familiar $C+I+G+X-M$ setup. This means that Table 15.1 in the main production accounts of *SNA 1993* does not elaborate on which

¹ The present data base was constructed from national accounts information that was available prior to the recently released revised national accounts data. Our reason for not using the newly revised data is that the trade data were extensively revised, but the new data only extended back to 1981 whereas our present data base extends back to 1961.

² The bottom up approach is used by the Statistics Canada KLEMS program; see Baldwin, Gu and Yan (2007) for an overview and Baldwin and Gu (2007) for additional information on the construction of the Statistics Canada KLEMS capital services aggregates.

³ In fact, if indirect tax effects could be ignored and if nominal and real input output tables were perfectly consistent, the two approaches should give exactly the same answer; see Chapter 19 in the IMF, ILO, OECD, Eurostat, UNECE and the World Bank (2004), Diewert (2005c and 2006) and Moyer, Reinsdorf and Yuskavage (2006).

⁴ For a detailed discussion of these reasons, see Diewert (2001).

industries are actually using the imports or on which industries are actually doing the exporting by commodity.⁵ Thus at present, data difficulties prevent us from looking at the effects of changes in the terms of trade using the bottom up industry aggregation approach.

Diewert and Lawrence (2000) undertook a study of Canada's business sector productivity using the national approach for the years 1962-1996 and Diewert (2002) extended their data to cover the years 1962-1998. Diewert (2008) updated these early studies that used the top-down approach, noting that there were some differences in his study compared to the earlier studies:

- Statistics Canada provided new data on national expenditure aggregates back to 1961 using annual *chained* index numbers and so it was no longer necessary to work with the old fixed base data on the most disaggregated level possible and then use chain indexes to aggregate up these data.
- Statistics Canada also provided new data on the outputs produced and inputs used by the Canadian business sector back to 1961 using chained Fisher indexes as part of their KLEMS productivity measurement program. In particular, Statistics Canada provided new estimates of labour input, which were a major improvement over the estimates of labour input used by Diewert and Lawrence.
- Diewert and Lawrence (2000) worked with a rather narrow definition of the government sector; their definition included only the public administration industry. In Diewert (2008), the Statistics Canada definition of the non-business sector was used (except that Diewert also added the residential rental housing industry to the non-business sector). The Statistics Canada definition of the non-business sector includes the general government sector and the publicly funded defense, hospital and education sectors in the non-business sector.⁶ Since output in the non-business sector is measured by input, the use of the broader definition of the government sector should lead to higher estimates of productivity growth in the business sector compared to the estimates tabled in Diewert and Lawrence (2000) and Diewert (2002).
- Statistics Canada reorganized its information on indirect taxes (less subsidies) into two categories: taxes that fall primarily on outputs and taxes that fall primarily on inputs. This new information was very useful in making adjustments to output prices for indirect tax effects.⁷

⁵ It should be noted that *SNA 1993* does have a recommended optional Table 15.5 which is exactly suited to our present needs; i.e. this table provides the detail for imports by commodity and by industry. However, *SNA 1993* does not provide a recommendation for a corresponding commodity by industry table for exports. The situation is remedied in *SNA 2008* but statistical agencies generally do not have the data base to construct these detailed export and import matrices by industry and commodity. Thus for Canada, the necessary detailed trade data by industry and commodity are not publically available.

⁶ The non-business sector consists of the following industries: (1) Government funding of hospitals; (2) Government funding of residential care; (3) Government funding of universities; (4) Government funding of other education; (5) Defense services; (6) Other municipal government services; (7) Other provincial government services and (8) Other federal government services.

⁷ In early studies of the Total Factor Productivity of an economy like those done by Solow (1957) and Jorgenson and Griliches (1967), outputs were priced at final demand prices, which include indirect taxes. However, Jorgenson and

However, since Diewert (2008) appeared, there has been a substantial revision of the Statistics Canada data used in his study. Thus the *IPM* article uses more recent published Statistics Canada data as well as some unpublished disaggregated capital data made available to us from the Statistics Canada KLEMS database.⁸ Note that the business sector used here differs from the Statistics Canada business sector in that we have excluded all residential housing services (Owner Occupied Housing services plus Rental Housing services) from our business aggregate whereas Statistics Canada includes the services of rental housing in its business aggregate.⁹

The main conceptual changes in our present data base from the data tabled in Diewert (2008) are as follows:

- The trade data were disaggregated;
- Machinery and equipment investment in Diewert (2008) has been disaggregated into 10 types of machinery and equipment and 4 types of structure using the information in CANSIM Table 310003;
- We used the Statistics Canada KLEMS data on the price of inventory stocks in the present study whereas before, we used another Statistics Canada price series to value inventory stocks;
- The depreciation rates for the 10 types of machinery and equipment and the 4 types of structure were re-estimated using information on capital stocks and investments contained in CANSIM Table 310003;
- We were able to construct disaggregated estimates for the price and quantity of 36 types of labour for the years 1961-2011 using information from CANSIM Table 3830024. These 36 types of labour were aggregated to form quality adjusted aggregate labour price and quantity series. The resulting business sector labour aggregate should be comparable to the KLEMS program labour aggregate.

In section 2 of this Appendix, we will list the basic final demand expenditure series that were used in this study. Section 3 lists the prices and quantities for the 36 types of business sector labour input that are available in three published business sector measures of quality adjusted

Griliches (1972; 85) noted that this treatment was not consistent with competitive price taking behavior on the part of producers, since producers do not derive any benefit from indirect taxes that fall on their outputs and thus these taxes should be removed.

⁸ These data were downloaded on October 1, 2012.

⁹ Our reason for excluding the services of rental housing from our business sector aggregate is due to the lack of accurate data on residential structures investment on rental housing and the lack of information on the quantity and value of land that is occupied by rental housing. Our measure of business sector labour input is the conceptually the same as that used by the Statistics Canada KLEMS program since we ignore the labour inputs used by the residential rental market. In practice, our labour estimates for the business sector (which are based on CANSIM Table 3830024) turn out to be substantially different from the KLEMS estimates. Our output measures and capital services input measures also differ from the corresponding KLEMS estimates because we have dropped rental housing inputs and outputs from our definition of the business sector.

labour input for the Canadian business sector that are available on CANSIM Table 3830024. Section 4 studies the problems associated with forming estimates for capital inputs. Section 5 concludes by forming estimates of tax rates on primary inputs. This information is used to calculate estimates of balancing after tax real rates of return. Then this information is used along with the information developed in previous sections in order to calculate user costs for 17 classes of capital input: 10 types of machinery and equipment, 4 types of nonresidential structures, agricultural land, nonagricultural and nonresidential business land and inventories. Section 6 concludes with some observations on the weak points in the data and recommendations for further work on developing a set of productivity accounts for Canada.

Estimates of Canadian Final Demand Expenditures

Much of the information tabled in this section was downloaded from CANSIM Table 3800002, Gross Domestic Product; Expenditure Based. The July 17, 2012 version of these data were used, using the Statistics Canada online data service CANSIM, which were listed as quarterly data. If the quarterly data were seasonally adjusted, then the data for a year were summed and divided by 4 in order to obtain annual data. If the quarterly data were not seasonally adjusted, then they were simply summed in order to obtain annual data. In what follows, we will use the CANSIM individual series label to identify the exact series used.

The first two series are Personal Expenditures on Goods and Services in current and constant chained 2002 dollars, CANSIM Series V498087 and V1992044 respectively. Dividing the current dollar series V_{CT} by the constant dollar series Q_{CT} gives us an implicit price series P_{CT} for (total) personal consumption.

We would like to exclude the imputed expenditures on Owner Occupied Housing (OOH) from the above series since there is no possibility of productivity gains occurring in this sector. However, if we exclude imputed rent from the business sector output series, we also need to exclude the services of the owner occupied housing capital stock as an input into the business sector. Unfortunately, we are not able to construct a reliable measure of the Owner Occupied Housing capital stock from available data; we can only construct a more reliable residential housing capital stock which includes the housing capital stock that is rented. We also were not able to split residential land input into reliable owner occupied and rental components.¹⁰ Hence we excluded both imputed and paid rents from our list of business sector outputs and we excluded the entire residential housing stock and the associated land as an inputs into the business sector.¹¹ Information on current dollar expenditures on imputed rents and paid rents (V_{IMR}^t and V_{PR}^t) for the years 1961-2011 is available from CANSIM Series V498532 and

¹⁰ The determination of the structures and land inputs into the production of rented residential housing is a difficult task since the investment data on residential housing is not decomposed into owned and rented investments. This lack of information was also a problem for the Statistics Canada KLEMS program: "Data on investment in rental residential buildings are not available. For the annual MFP programs, we divide the total investment in residential building into rental building and owner-occupied dwelling using paid rents for rental buildings and imputed rents for owner occupied dwelling as the split ratios. The investment in residential buildings and paid and imputed rents are available from the Income and Expenditure Accounts. On average, we find that about 30 per cent of total rents are paid rents and the remaining 70 per cent are imputed rents." Baldwin, Gu and Yan (2007: 43).

¹¹ This means our productivity estimates will be biased downward slightly since the labour inputs that are used in the rental housing market are incorrectly included in our estimates of labour input.

V498533 respectively. The corresponding information on chained 2002 constant dollar expenditures on imputed rents and paid rents (Q_{IMR} and Q_{PR}) is available from CANSIM Series V1992078 and V1992079 only for the years 1981-2011. We divide V_{IMR} by Q_{IMR} and V_{PR} by Q_{PR} in order to form price index series for imputed and paid rents, P_{IMR} and P_{PR} for the years 1981-2011.

From the Input-Output accounts, we can obtain alternative estimates for the value of imputed rents for owner occupied dwellings, V_{OOH}^t , for the years 1961-2008 from CANSIM Series V3859926. We can also obtain alternative series for the value of imputed rents for owner occupied dwellings, V_{OOHI}^t , from CANSIM Series V334072 and we can obtain the corresponding constant 1992 dollar estimates Q_{OOHI}^t from CANSIM Series V328857 for the years 1961-1997. We used these two series to form a price series for owner occupied housing rents, P_{OOH}^t , for the years 1961-1997. We divided the earlier more accurate value series V_{OOH} by P_{OOH} to form Q_{OOH} for the years 1961-1997. The Q_{OOH} series was extended from 1997 to 2006 using CANSIM Series V14183160 from CANSIM Table 3790018 which had estimates in chained 1997 dollars for owner occupied housing. The Q_{OOH} series was further extended from 2006 to 2011 using the chained 2002 dollar estimates from Series V41881435 using CANSIM Table 3790027. Using this Q_{OOH} series, we were able to construct the implicit price index for imputed owner occupied housing rents, P_{OOH} , for 1961-2008 by dividing V_{OOH} by Q_{OOH} . P_{OOH} was extended to cover the years 2009-2011 by using the movements in P_{IMR} . Finally, V_{OOH} was extended to cover the years 2009-2011 by multiplying together P_{OOH}^t times Q_{OOH}^t . We decided to use the industry oriented V_{OOH}^t series rather than the final demand oriented series V_{IMR}^t so that our business sector output concept would better align with the Statistics Canada KLEMS output aggregate.

Recall that we had a paid rent value series V_{PR}^t that covered the years 1961-2011 but the corresponding price series P_{PR}^t covered only the years 1981-2011. We linked P_{PR} to P_{OOH}^t at 1981 to obtain continuous price series for paid rents for the years 1961-2011.¹² The resulting imputed and paid rent series are listed in Table 1 below.

Recall the price and quantity series, P_{CT} and Q_{CT} , for a consumption aggregate (which includes all rents, paid and imputed) along with the two price and quantity series for imputed and paid rents in Table 1 (all tables are found at the end of the Appendix). We changed the sign of the rent quantity series from plus to minus and then calculated a chained Fisher net consumption aggregate by aggregating all consumption (plus sign for these quantities) and rents (negative signs for these quantities). The resulting price and quantity series should closely approximate the price and quantity of consumption excluding housing services. However, the price series includes indirect taxes (less subsidies) on outputs but for productivity measurement purposes, as mentioned earlier, these tax wedges should be excluded. Statistics Canada has a series for indirect taxes less subsidies on products V_{IT}^t , CANSIM II series V1997473, for the years 1961-2011. We subtracted two other tax series from this indirect tax series because these other tax series will be taken into account separately in the price of exports of goods (this is the Oil Export Tax series, CANSIM series V499746) and in the price of imports of goods (this is the Customs Import Duties series, CANSIM series V499741). The resulting indirect taxes less subsidies on

¹² Thus we are assuming that the price movements in paid rents for the years 1961-1981 followed the movements in imputed rents for those years.

products (less trade taxes) series was used to remove the tax wedges on the price of consumption series. The resulting prices and quantities of consumption, P_C^t and Q_C^t , are listed in Tables 2 and 3.

We turn our attention to the investment components of final demand. Current dollar government gross fixed capital formation is available as CANSIM series V498093 for the years 1961-2011. The corresponding chained 2002 dollar series is CANSIM II series V1992050 and we use these two series to form price and quantity series for general government sector investment, P_{IG}^t and Q_{IG}^t , which are listed in Tables 2 and 3 below.¹³

The current and constant chained dollar series for the years 1961-2011 for residential structures investment can be obtained as CANSIM series V498096 and V1992053 respectively, the current and constant 2002 chained dollar series for nonresidential structures investment can be obtained as CANSIM series V498098 and V1992053 respectively and the current and constant chained dollar series for machinery and equipment investment can be obtained as CANSIM series V498099 and V1992056 respectively. The resulting price and quantity series are denoted by P_{IR}^t , P_{IN}^t , Q_{IR}^t , Q_{IN}^t and are listed in Tables 2 and 3 below. These Tables also include the price and quantity of inventory change, P_{II}^t and Q_{II}^t , the price and quantity of business sector net deliveries to the non-business sector, P_{GN}^t and Q_{QN}^t , the export and import price indexes P_X^t and P_M^t and the corresponding quantity indexes Q_X^t and Q_M^t but the description of how these series were constructed is deferred until later.

With the exceptions of Q_{GN} and Q_M , all of the quantities listed in Table 3 can be regarded as outputs produced by the business sector and sold to final demanders. However, the business sector also sells goods and services to the non-business sector and it also purchases smaller amounts of goods and services from the non-business sector. We now describe how we formed price and quantity estimates for the net sales of the business sector to the non-business sector, Q_{GN} .

For the years 1961-2011 from the National Income and Expenditure Accounts, CANSIM II series V498092; Government Current Expenditure on Goods and Services, Table 3800002, we have estimates of total government gross current expenditures on goods and services (less sales of goods and services to the business sector) in current dollars. From the same Table and for the same years, CANSIM II series V1992049; Government Current Expenditure on Goods and Services, Table 3800002, we have estimates of total government gross current expenditure on goods and services (less sales of goods and services to the business sector) in chained 2002 dollars. We use these two series to form price and quantity series for final demand government sector net expenditures on goods and services, P_G^t and Q_G^t , which are listed in Table 4.

Recall that the Statistics Canada KLEMS productivity program business sector value added aggregate *includes* rental residential housing but *excludes* the services of owned residential housing (whereas our business sector value added aggregate *excludes* all forms of residential rents). The Industry Division of Statistics Canada produces yet another business sector estimate

¹³ The price series for investment should be adjusted for indirect taxes that fall on investment outputs. Since these taxes are relatively small and it is difficult to collect consistent information on these taxes over our sample period, we neglect these indirect tax wedges on investment components of final expenditure.

of nominal and real value added (at factor cost) which *includes* all residential rents, both imputed and paid. We will denote this value added aggregate by V_B^t in year t . Statistics Canada also produces a companion non-business sector value added aggregate (at factor cost) which we will denote by V_N^t in year t . If the value of indirect taxes less subsidies on products for year t , V_{IT}^t , is added to the sum of these two industry value added aggregates, we get an estimate of the value of GDP at final demand prices in year t ; i.e., we have the following identity:

$$(1) V_B^t + V_N^t + V_{IT}^t = V_{GDP}^t .$$

We will now describe how we formed estimates for V_B^t and V_N^t along with the corresponding price and quantity decompositions. From Table 3790024, Gross Domestic Product (GDP) at Basic Prices in Current Dollars, SNA, Benchmark Values, Special Industry Aggregations Based on the North American Industry Classification System (NAICS), we can obtain the V_B^t series (series title is Canada: Business Sector Industries) for the years 1961-2008 from CANSIM II Series V3860037. From the same Table 3790024, we can obtain the V_N^t series (series title is Canada: Non-Business Sector Industries) for the years 1961-2008 from CANSIM II Series V3860040. We can obtain price indexes P_B^t , P_N^t and quantity indexes Q_B^t , Q_N^t for V_B^t and V_N^t for the years 1961-1997 by using the series V334562, V335071, V334565 and V335074 from CANSIM Table 3790002, Gross Domestic Product (GDP) at Factor Cost, System of National Accounts Benchmark Values by Industry (Special Aggregations).

These series give business and non-business sector value added at basic prices in current dollars and in constant 1992 dollars. Using CANSIM Table 3790020, we can find estimates for Q_B^t (Series V14182646) and for Q_N^t (Series V14182651) in chained 1997 dollars for the years 1997-2006. The Q_B series can be extended to 2011 by aggregating the monthly data in CANSIM Table 3790027, Series V41881176, which has the title: Gross Domestic Product at Basic Prices, by North American Industry Classification System, Canada, Seasonally Adjusted at Annual Rates, Chained 2002 Dollars, Business Sector Industries. The Q_N series can be extended to 2011 by aggregating the monthly data in CANSIM Table 3790027, Series V41881179. Thus we now have enough information to define the P_B^t and P_N^t series through to 2008. We extend the price series P_N^t from 2008 using an implicit price index for government goods and services, P_G^t , which was constructed using CANSIM Table 3800002, Series V498092 in current dollars and Series V1992049 for chained 2002 dollars, Q_G^t , which are listed in Table 4. It turns out that the total of V_B^t and V_N^t is available in CANSIM Series V3860274, Canada, Gross Domestic Product (GDP) at Basic Prices in Table 3800030: GDP and GNP at Market Prices and Net National Income at Basic Prices. Thus we have enough information to deduce the price P_B^t and the value of business sector output V_B^t for the years 2009-2011. The business and nonbusiness sector price and quantity series, P_B^t , P_N^t and Q_B^t , Q_N^t are listed in Table 4 below.

Recall the GDP identity defined by (1) above, which expressed the nominal value of GDP, V_{GDP}^t , at final demand prices as being equal to the value added of the Industry Division business sector value added at basic prices, V_B^t , plus non-business sector value added, V_N^t , plus the value of indirect taxes less subsidies on products, V_{IT}^t . We can also express the value of GDP at final demand prices as the familiar sum of final demand values; i.e. as the following sum of final

demand expenditures on consumption plus investment plus government expenditures on goods and services plus exports less imports:

$$(2) V_{\text{GDP}}^t = V_{\text{CT}}^t + V_{\text{I}}^t + V_{\text{G}}^t + V_{\text{X}}^t - V_{\text{M}}^t.$$

Define a new consumption aggregate at basic prices V_{CN}^t as the value of consumption at final demand prices, V_{CT}^t , less indirect taxes less subsidies on products, V_{IT}^t :

$$(3) V_{\text{CN}}^t \equiv V_{\text{CT}}^t - V_{\text{IT}}^t.$$

Now equate the two expressions for the value of GDP given by (1) and (2) and use the resulting equation to express business sector value added V_{B}^t in terms of final demand components and the value of non-business sector value added V_{N}^t . Making use of (3), the resulting equation is the following one:¹⁴

$$(4) V_{\text{B}}^t = V_{\text{CN}}^t + V_{\text{I}}^t + V_{\text{X}}^t - V_{\text{M}}^t + (V_{\text{G}}^t - V_{\text{N}}^t).$$

Conceptually, the aggregate $V_{\text{G}}^t - V_{\text{N}}^t$ should be equal to the sales of the business sector of goods and services to the non-business sector less the purchases of intermediate inputs of the business sector from the non-business sector. Put another way, the business sector's net sales of goods and services should equal its net deliveries to final demand sectors ($V_{\text{C}}^t + V_{\text{I}}^t + V_{\text{X}}^t - V_{\text{M}}^t$) plus its net deliveries to the non-business sector ($V_{\text{G}}^t - V_{\text{N}}^t$).

Recall that we did not use the Industry Division's concept of business sector value added; we subtracted the value of imputed and paid residential rent from our business sector aggregate. Let V_{R}^t be equal to the sum of imputed residential rent V_{OOH}^t and paid residential rent V_{PR}^t (see Table 1 for these series). Conceptually, if we subtract rents V_{R}^t from V_{CN}^t , we should obtain V_{C}^t , the consumption aggregate whose price and quantity is listed in Tables 2 and 3. Thus subtracting V_{R}^t from both sides of (4) leads to the following identity:

$$(5) V_{\text{B}}^t - V_{\text{R}}^t = V_{\text{C}}^t + V_{\text{I}}^t + V_{\text{X}}^t - V_{\text{M}}^t + (V_{\text{G}}^t - V_{\text{N}}^t).$$

Thus our business sector value added aggregate can be formed using either the left or right hand sides of the identity (5). We will use the right hand side of (5) to form our value measure of business sector net output since we want to focus on the effects of changing international prices on the performance of the business sector.

How should the corresponding real quantities that correspond to the value aggregates on either side of (5) be calculated? Obviously, each cell in the supply and use tables that correspond to the value aggregate on the left hand side of (5) could be aggregated up using a chained superlative

¹⁴ The identity (4) is not quite consistent with our treatment of indirect taxes less subsidies since we also made some indirect tax adjustments to the prices of exports and imports as explained above; i.e., since we used a slight modification of (3) to adjust final demand consumption prices for indirect tax wedges, we used a corresponding slight modification of the identity (4).

index number formula provided that an appropriate price deflator were available for each cell.¹⁵ On the other hand, the value cells that are components on the right hand side of (5) that correspond to final demand components (at basic prices) could be aggregated up using a chained superlative index number formula. We can then ask: under what conditions would the corresponding quantity aggregates be equal? This question is addressed by Moyer, Reinsdorf and Yuskavage (2006) and in more detail by Diewert (2005c and 2006). The answer to this question is that if the detailed data are constructed in an appropriate manner and the Fisher formula is used, then the direct industry aggregation and the aggregation of final demand component approaches are perfectly consistent.¹⁶ In addition, if two stage aggregation procedures are used and a superlative index number formula is used at each stage of aggregation, then the theoretical and empirical results in Diewert (1978) show that the commonly used single stage superlative indexes will approximate their two or more stage counterparts to a high degree of approximation if the chain principle is used.¹⁷

Using the above results, we will construct our measure of business sector real value added by aggregating up the value components on the right hand side of (5). Rather than work with both V_G^t and V_N^t as final demand components, we will aggregate over these two components to form the value aggregate V_{GN}^t equal to $(V_G^t - V_N^t)$, and conceptually, this value aggregate should be equal to the net deliveries of goods and services of our business sector to the non-business sector less the purchases of intermediate inputs by our business sector from the non-business sector. The year t price and quantity aggregates, P_{GN}^t and Q_{GN}^t , that correspond to these value aggregates V_{GN}^t are calculated using chained Fisher indexes with Q_N^t getting a negative weight in the index number formula. P_{GN}^t and Q_{GN}^t are listed in Table 4.

We now turn our attention to the export and import components of final demand. Current dollar exports of goods are available as CANSIM Series V498104 for the years 1961-2011. The corresponding chained 2002 dollar series is CANSIM Series V1992061 and these two series could be used to form price and quantity series for the exports of goods. However, in this study, we will form series for more detailed components of the exports and imports of goods. Current dollar exports of services are available as CANSIM Series V498105 for the years 1961-2011. The corresponding chained 2002 dollar series is CANSIM Series V1992062 and we use these two series to form price and quantity series for the exports of services, P_{15}^t and Q_{15}^t , which are listed in Tables 5 and 6.

Our starting point for obtaining disaggregated data on the exports and imports of goods is CANSIM Table 3800012, Exports and Imports of Goods and Services, Canada, Current Prices. It is possible to obtain disaggregated information on the value of exports for the following 7 classes for the years 1971-2011:

- Q₈: Exports of agricultural and fish products;

¹⁵ Quantities in the Make matrix would have a positive sign while quantities in the Use matrix would have a negative sign.

¹⁶ See Diewert (2005c and 2006) and the numerical examples in Chapters 19 and 20 in IMF, ILO, OECD, Eurostat, UNECE and the World Bank (2004 and 2009).

¹⁷ The results of Hill (2006) show that these approximation results will not necessarily hold for mean of order r superlative indexes if r is large in magnitude.

- Q₉: Exports of energy products;
- Q₁₀: Exports of forest products;
- Q₁₁: Exports of industrial goods and materials (excluding energy and forest product exports);
- Q₁₂: Exports of machinery and equipment (excluding automotive products);
- Q₁₃: Exports of automotive products;
- Q₁₄: Exports of other consumer goods (excluding automotive products);

The CANSIM Series numbers for the first 7 classes of exports are V498730-V498736. It is also possible to find corresponding constant dollar series in 1992 constant dollars over the period 1971-1997 in CANSIM Table 3800012 and the CANSIM Series numbers are V498767-V498773. Finally, constant dollar chained estimates for these export categories (in 2002 chained dollars) can be found for the years 1981-2011 in CANSIM Table 3800012 and the Series numbers are V1992162- V1992168. We used these series to form chained price and quantity series for these 7 export categories for the years 1981-2011. The constant dollar price series were linked to each chained price series at the year 1981 in order to extend the chained series back to 1971.¹⁸

There remains the problem of obtaining price series for the above 7 classes of exports to cover the years 1961-1971. From Leacy (1983), Series G415-428 Foreign trade, domestic exports, excluding coin and bullion, by main commodity sections, current values, we can obtain value series covering exports for the years 1946-1975 for the following 5 commodity classes:

- Live animals (G415);
- Food, feed, beverages and tobacco (G417);
- Crude materials (inedible) (G419);
- Fabricated materials (inedible) (G421);
- End products (inedible) (G423).

From the same source, price indexes for each of the above 5 classes of exports are available as Series K57-K61 in the Table with the title: Export price indexes, trade of Canada commodity classification, 1926-1975. Thus we can find price and quantity series for these 5 classes of exports that cover the years 1961-1971. Unfortunately, these price indexes are of the fixed base variety with a base year of 1948 so they are likely to differ substantially from the corresponding chain indexes (which are not publicly available). However, Leacy (1983) also lists as part of export price Series K57-K61 (Panel A) for the above 5 classes of exports some indexes that have a 1971 base year but these price indexes cover only the years 1968-1975. We use these latter price indexes to construct export price indexes for the years 1968-1971 and then we use the 1948 based indexes to further extend these 5 series back to 1961.

The above operations give us 5 disaggregated export price and quantity series for the period 1961-1971 but we have 7 classes of exports of goods for the years 1971-2011. We generated Fisher chained price and quantity indexes for exports of Live animals and for exports of Food,

¹⁸ There were two other categories in the export and import classifications: Special transactions and Other balance of payments adjustments. These categories were small and were omitted in our analysis.

feed, beverages and tobacco for the years 1961-1971 and linked these series to our earlier series, P_8 and Q_8 , exports of agricultural and fish products. But we need some additional series so that we can match the export and import series for the 1960s to the series that cover the post 1971 period. We will create separate export series for energy, forest products, automotive products and other consumer goods. Our sources for these extra series are the input output tables for the Canadian economy that cover the years 1961-1981 (Statistics Canada, 1987a and 1987b).

In order to create a price and quantity series for aggregate Energy exports for the years 1961-1971, we aggregated data for 6 classes of energy exports using the M level of aggregation: Coal, Crude mineral oils, Natural gas, Gasoline and fuel oil, Other petroleum and coal products and Electric power. These components were aggregated using Fisher (1922) chained indexes. The resulting price and quantity series were linked to our earlier price and quantity series, P_9 and Q_9 , for energy at the year 1971.

In order to create aggregate Forestry exports for the years 1961-1971, we aggregated data for 7 classes of forest product exports using the M level of aggregation: Lumber and timber, Veneer and plywood, Other wood fabricated materials, Furniture and fixtures, Pulp, Newsprint and other paper stock, and Paper products. These components were aggregated using Fisher (1922) chained indexes. The resulting price and quantity series were linked to our earlier price and quantity series, P_{10} and Q_{10} , for forest product exports at the year 1971.

We aggregated the input output data for 2 classes of automotive product exports using the M level of aggregation: Motor vehicles and Motor vehicle parts. These components were aggregated using Fisher (1922) chained indexes. The resulting price and quantity series were linked to our earlier price and quantity series, P_{13} and Q_{13} , for automotive product exports at the year 1971.

In order to create an aggregate for Exports of other consumer goods (excluding automotive products) for the years 1961-1971, we aggregated data for 8 classes of consumer goods type exports using the M level of aggregation: Leather and leather products, Other textile products, Hosiery and knitted wear, clothing and accessories, appliances and receivers (households), Pharmaceuticals, Other chemical products and Other manufactured products. These components were aggregated using Fisher (1922) chained indexes. The resulting price and quantity series were linked to our earlier price and quantity series, P_{14} and Q_{14} , for exports of other consumer goods at the year 1971.

We generate price and quantity series over the years 1961-1971 for Exports of industrial goods and materials (excluding energy and forest product exports), P_{11} and Q_{11} , as a chained Fisher aggregate of our price and quantity series for Crude materials (inedible) (G419) and Fabricated materials (inedible) (G421) less our series for Exports of energy products P_9 and Q_9) and Exports of forest products (P_{10} and Q_{10}).¹⁹ The resulting export price and quantity series for the years 1961-1971 are linked to our earlier series for P_{11} and Q_{11} at the year 1971.

¹⁹ All four prices are entered as positive numbers in the index number formula while the first two quantities are entered positively and the last two quantities are entered negatively.

Finally, we generate price and quantity series over the years 1961-1971 for Exports of machinery and equipment (excluding automotive products), P_{12} and Q_{12} , as a chained Fisher aggregate of our price and quantity series for Exports of end products (inedible) (G423) less our series for Exports of automotive products P_{13} and Q_{13}) and less Exports of other consumer goods (P_{14} and Q_{14}).²⁰ The resulting export price and quantity series for the years 1961-1971 are linked to our earlier series for P_{12} and Q_{12} at the year 1971.

There is one additional adjustment which affects the price of energy exports. During the years 1974-1985, Canada imposed an export tax on its energy exports, which is included in the price of exports. However, producers do not receive this export tax revenue and so it must be subtracted from the export price. This adjustment of the export price index for exports of goods can be accomplished using the Oil Export Tax series, CANSIM Series V499746 from the National Income and Expenditure Accounts. After making this adjustment, the resulting price and quantity series are P_9^t and Q_9^t , which are listed in Tables 5 and 6 along with the other price and quantity series for the 8 classes of exports. Aggregate price and quantity indexes for exports, P_X^t and Q_X^t , were formed as chained Fisher aggregates of the 8 classes of exports listed in Tables 5 and 6 and the resulting P_X^t and Q_X^t are listed in Tables 2 and 3.

We now turn our attention to imports.

Current dollar information on imports of services can be found as CANSIM Series V498108 for the years 1961-2011 and the corresponding constant 2002 chained dollar series is CANSIM Series V1992065. We use these two series to form price and quantity series for the imports of services, P_{22}^t and Q_{22}^t , which are listed in Tables 7 and 8. Note that since imported goods and services are inputs into the business sector, when we form a value added aggregate, we need to append a minus sign to any quantity series pertaining to imports.

As was the case for our treatment of exports, the starting point for obtaining disaggregated data on imports of goods is CANSIM Table 3800012, Exports and Imports of Goods and Services, Canada, Current Prices. Using this Table, it is possible to obtain disaggregated information on the value of imports for the same 7 classes of imported good that was used for exports for the years 1971-2011. However, imports of forest products was small throughout the sample period and so this import component was aggregated with imports of industrial goods and materials (excluding forest and energy imports).²¹ Thus we used CANSIM Table 38000012 in order to generate prices and quantities for the following 7 classes of imports for the years 1971-2011:²²

- Q_{16} : Imports of agricultural and fish products;
- Q_{17} : Imports of energy products;
- Q_{18} : Imports of industrial goods and materials (including imports of forest products but excluding imports of energy products);
- Q_{19} : Imports of machinery and equipment (excluding automotive products);
- Q_{20} : Imports of automotive products;

²⁰ All three prices are entered as positive numbers in the index number formula while the first quantity is indexed with a positive sign and the last two quantities are indexed with negative signs.

²¹ Chained Fisher indexes were used in order to do the aggregation.

²² As in the case of export indexes, we used chained indexes whenever they were available.

- Q_{21} : Imports of other consumer goods and
- Q_{22} : Imports of services.

There remains the problem of obtaining price series for the above 6 classes of imports to cover the years 1961-1971. From Leacy (1983), Series G429-442: Foreign trade, imports, excluding coin and bullion, by main commodity sections, current values, 1946-1975, millions of dollars (all countries), we can obtain value series covering imports for the years 1946-1975 for the following 5 commodity classes:

- Live animals (G429);
- Food, feed, beverages and tobacco (G431);
- Crude materials (inedible) (G433);
- Fabricated materials (inedible) (G435);
- End products (inedible) (G437).

From the same source, price indexes for each of the above 5 classes of imports are available as Series K62-K67 in the Table with the title: Import price indexes, trade of Canada commodity classification, 1926-1975. Thus we can find price and quantity series for these 5 classes of exports that cover the years 1961-1971. Unfortunately, these price indexes are of the fixed base variety with a base year of 1948 so they are likely to differ substantially from the corresponding chain indexes. However, as was the case for export price indexes, Leacy (1983) also lists as part of import price Series K62-K67 (Panel A) for the above 5 classes of imports counterpart indexes that have a 1971 base year but these price indexes cover only the years 1968-1975. We used these latter price indexes to construct import price indexes for the years 1968-1971 and then we used the 1948 based indexes to further extend these 5 series back to 1961.

The above operations give us 5 disaggregated export price and quantity series for the period 1961-1971 but we have 6 classes of imports of goods for the years 1971-2011. We generated Fisher chained price and quantity indexes for imports of Live animals and for exports of Food, feed, beverages and tobacco for the years 1961-1971 and linked these series to our earlier series, P_{16} and Q_{16} , imports of agricultural and fish products. As was the case for extending our export series back to the 1960s, we need some additional series so that we can match the import series for the 1960s to the series that cover the post 1971 period. We created separate import series for energy, automotive products and other consumer goods using the input output tables for the Canadian economy that cover the years 1961-1981 (Statistics Canada, 1987a and 1987b). The rest of our import series computations paralleled our export series computations, except that we did not generate a separate series for forest product imports due to their small size throughout the sample period.

The price of imports does not include import duties that are added to the international cost of these imported goods. Hence we must add these import duties to the price of imports. We assumed that energy, automotive and service imports were exempt from import duties and we assumed a uniform rate for the remaining import categories.²³ The series on customs import duties is CANSIM Series V499741 and after adjusting the price of imports using this series, the resulting price and quantity series for the imports of goods and services are listed in Tables 7 and

²³ This is only a very rough approximation to the “truth”.

8 below. Aggregate price and quantity indexes for imports, P_M^t and Q_M^t , were formed as chained Fisher aggregates of the 7 classes of imports listed in Tables 7 and 8 and the resulting P_M^t and Q_M^t are listed in Tables 2 and 3 above.

We turn our attention to forming estimates of business sector labour input.

Business Sector Labour Input Estimates

Statistics Canada has constructed detailed labour input data for the Canadian business sector for 36 types of labour for the years 1961-2010 in CANSIM Table 3830024 which we will make use of in this study. Labour input is classified according to a four way classification:

- By *education level* E. There are 3 categories in this classification: E=1 corresponds to Primary or Secondary Education; E=2 corresponds to Some or Completed Non-University Post-Secondary Education and E=3 corresponds to University Degrees or Above.
- By *age of worker* A. There are 3 categories in this classification: A=1 corresponds to 15-34 years old; A=2 corresponds to 35-54 years old and A=3 corresponds to 55 years old and over.
- By *sex* S. There are 2 categories in this classification: S=1 corresponds to a male worker and S=2 corresponds to a female worker.
- By *type of employment* T. There are 2 categories in this classification: T=1 corresponds to a paid worker and T=2 corresponds to a self employed worker.

Thus Table 3830024 provides annual hours and total compensation data for $3 \times 3 \times 2 \times 2$ or 36 types of worker in the Canadian business sector for the years 1961-2010. We aggregated over the age groups using Fisher chained indexes in order to form 12 price and quantity series for labour, P_{L1} - P_{L12} and Q_{L1} - Q_{L12} . These series are listed below in Tables 9 and 10. The characteristics of the 12 types of labour are as follows:

- Q_{L1} : E=1; S=1; T=1;
- Q_{L2} : E=1; S=2; T=1;
- Q_{L3} : E=1; S=1; T=2;
- Q_{L4} : E=1; S=2; T=2;
- Q_{L5} : E=2; S=1; T=1;
- Q_{L6} : E=2; S=2; T=1;
- Q_{L7} : E=2; S=1; T=2;
- Q_{L8} : E=2; S=2; T=2;
- Q_{L9} : E=3; S=1; T=1;
- Q_{L10} : E=3; S=2; T=1;
- Q_{L11} : E=3; S=1; T=2;
- Q_{L12} : E=3; S=2; T=2.

We have not explained how our estimates for the 12 types of labour input were constructed for 2011. From CANSIM Table 2820022, it is possible to estimate the total employment for the business sector for the years 2010 and 2011 by 4 types of labour: by employees and the self employed and by sex. From Table 3830010 and Series V15901071, the annual number of hours worked in the business sector over all jobs dropped from 1702 in 2010 to 1700 in 2011 so it appears that hours of work did not change much over the two years. Thus we estimated Q_{L1}^{2011} , Q_{L5}^{2011} and Q_{L9}^{2011} by the growth in employment of male business sector employees from 2010 to 2011, Q_{L2}^{2011} , Q_{L6}^{2011} and Q_{L10}^{2011} by the growth in employment of female business sector employees from 2010 to 2011, Q_{L3}^{2011} , Q_{L7}^{2011} and Q_{L11}^{2011} by the growth in male self employment from 2010 to 2011 and we estimated Q_{L4}^{2011} , Q_{L8}^{2011} and Q_{L12}^{2011} by the growth in female self employment from 2010 to 2011.

Our estimates for the prices of the 12 types of labour for 2011 were constructed in a very approximate manner. Define V_{Ln}^{2010} as $P_{Ln}^{2010} \times Q_{Ln}^{2010}$ for $n = 1, \dots, 12$. Estimates for aggregate employee wages and salaries and supplementary labour income from business are available in CANSIM Table 3800004, Series V498167. We used the ratio of the 2011 entry for this series to the 2010 series *times* V_{Ln}^{2010} to form estimates for V_{Ln}^{2011} for $n = 1, 2, 5, 6, 9, 10$. From CANSIM Table 3800004, Series V498170, we obtained estimates for unincorporated business net income for 2010 and 2011. We used the ratio of the 2011 entry for this series to the 2010 series *times* V_{Ln}^{2010} to form estimates for V_{Ln}^{2011} for $n = 2, 3, 7, 8, 11, 12$. Finally, we defined $P_{Ln}^{2011} \equiv V_{Ln}^{2011}/Q_{Ln}^{2011}$ for $n = 1, \dots, 12$.

The 12 labour price and quantity series listed in Tables 9 and 10 can be regarded as quality adjusted labour input series for the Canadian business sector. It should be noted that the KLEMS program has provided data for 3 types of quality adjusted labour; see CANSIM Table 3830021, Series V41713187, V41713204 and V41713221 for values for the years 1961-2008 and Series V41713000, V41713017 and V41713034 for the corresponding quantity indexes for the years 1961-2011.²⁴ The quantity series have the following titles: Canada: Labour Input of Workers with Primary or Secondary Education; Business Sector, Labour Input of workers with Some or Completed Post-Secondary Certificate or Diploma; Business Sector and Labour Input of Workers with University Degree or Above, Business Sector. When we aggregated our 12 types of labour input into the 3 categories used by the KLEMS program, we found that our value aggregates were very close to the corresponding KLEMS value aggregates for the 3 types of labour. However, our aggregated (Fisher chained) indexes of the 3 types of labour grew more slowly than the corresponding KLEMS 3 labour quantity indexes.²⁵

²⁴ It is not apparent to us why the KLEMS program posts quantity data for the years 1961-2011 but only posts the corresponding value data for the years 1961-2008.

²⁵ The differences between the 3 KLEMS labour quantity indexes and our counterpart indexes are substantial. The KLEMS program probably uses the same data base but on a more disaggregated basis that takes into account work experience; i.e., the KLEMS program distinguishes 56 types of labour whereas our data base distinguishes on 36 types of labour. The KLEMS method for aggregating over sectors may also be different. We prefer to use our labour estimates rather than the KLEMS estimates for two reasons: (i) the data base that we use is published (by Statistics Canada) and is readily available for researchers to check and (ii) the experience variable is a difficult one to quantify in a reproducible way.

The Statistics Canada productivity program aggregate labour input measure is described as follows:

“The labour input is an aggregate of the hours worked of all persons classified by their education, work experience and class of employment (paid versus self-employed workers). This aggregate labour input measure is constructed by aggregating hours at work data for each of 56 types of workers classified by their educational attainment (4), work experience (7) and class of workers (2) using an annual chained-Fisher index. The effect of Fisher aggregation is to produce a measure of labour input that reflects both changes in total hours of work and changes in the composition of workers.” John R. Baldwin, Wulong Gu and Beiling Yan (2007: 37).

Baldwin, Gu and Yan (2007: 26) describe their more disaggregated measures of labour input as follows:

“Labour input for MFP measures reflects the compositional shifts of workers by education, experience and class of workers (paid versus self-employed). The growth of labour input (labour services) is an aggregate of the growth of hours worked by different classes of workers, weighted by the hourly wages of each class.”

Thus each of the three types of labour classified by educational attainment Q_{L1}^t , Q_{L2}^t and Q_{L3}^t is a Fisher quantity aggregate over the other characteristics, holding constant the relevant educational levels. Baldwin, Gu and Yan (2007: 26) also comment on the difficulties associated with breaking up the net operating surplus generated by the self employed into labour and capital compensation components:

“We have modified the assumptions about the share of labour going to the self-employed workers to reflect changes that occurred during the 1990s. In the past, it had been assumed that the self-employed essentially earned incomes similar to the employed. The Census of Population up to 1990 showed that this was a reasonable assumption; however, during the 1990s, self-employed income fell behind that of production workers. The new measure of self-employed for calculating labour input assumes that the hourly earnings of self-employed workers is proportional to that of paid workers with the same level of education and experience. The proportional or scaling factor for each level of education and experience is based on the relative hourly earnings of paid versus self-employed workers derived from the Census of Population.”

We now turn our attention to the problems associated with the estimation of beginning of the year capital stocks for the business sector.

Business Sector Capital Stock Estimates

Our main source of information on beginning of the period capital stocks used by the Canadian business sector is CANSIM Table 310003, which has the title: Flows and stocks of fixed non-residential capital, by sector of North American Industry Classification System (NAICS) and asset, Canada, annually. This Table has a wealth of information on the reproducible capital stocks used by the business sector along with the corresponding annual investment and depreciation information by type of asset and by sector. This source of information on reproducible assets will be supplemented by the use of estimates from the Statistics Canada National Balance Sheets to obtain estimates of inventory and land stocks used by the business sector; see Statistics Canada (1997).

Table 310003 has estimates of current V_{In}^t and chained dollar Q_{In}^t business sector investment in the following 14 types of reproducible asset:

- Q_{11} : Office furniture;
- Q_{12} : Agricultural machinery;
- Q_{13} : Industrial machinery;
- Q_{14} : Automobiles;
- Q_{15} : Trucks;
- Q_{16} : Other transport equipment;
- Q_{17} : Other machinery and equipment;
- Q_{18} : Computers;
- Q_{19} : Telecommunications equipment;
- Q_{110} : Software;
- Q_{111} : Industrial buildings;
- Q_{112} : Commercial buildings;
- Q_{113} : Institutional buildings;
- Q_{114} : Engineering construction.

The annual current dollar investment that was used by the business sector for the years 1961-2011 for the above 14 assets, V_{In}^t for $n = 1, \dots, 14$ can be found in CANSIM Table 310003. The Series numbers are: V43985602, V43985603, V43985604, V43985607, V43985608, V43985609, V43985611, V43985606, V43985610, V43985612,²⁶ V43985613, V43985614, V43985615 and V43985616. The corresponding chained 2002 dollar series, Q_{In}^t , can also be found in Table 310003. The Series numbers are: V43993266, V43993267, V43993268, V43993271, V43993272, V43993273, V43993275, V43993270, V43993274, V43993276, V43993277, V43993278, V43993279 and V43993280. Implicit price indexes P_{In}^t for the 14 types of investment can be obtained by dividing the current dollar series by the corresponding chained dollar series; i.e., define P_{In}^t as follows:²⁷

$$(6) P_{In}^t \equiv V_{In}^t / Q_{In}^t; \quad n = 1, \dots, 14; t = 1961, \dots, 2011.$$

CANSIM Table 31003 also has chained 2002 dollar information on year end capital stocks for the Canadian business sector constructed using geometric depreciation rates for each of the above asset classes. We use these year-end stocks as beginning of the next year capital stocks by asset class and denote these year t starting stocks as Q_{Kn}^t for $n = 1, \dots, 14$ and $t = 1962-2012$. The Series numbers for these 14 stocks are as follows: V43993448, V43993449, V43993450, V43993453, V43993454, V43993455, V43993457, V43993452, V43993456, V43993458, V43993459, V43993460, V43993461 and V43993462.

Define the amount of depreciation for asset n in year t by Q_{Dn}^t . Using the geometric model of depreciation, the beginning of year $t+1$ capital stock for asset n , Q_{Kn}^{t+1} , should be related to the

²⁶ The software investment series (V_{110}^t and Q_{110}^t) start in 1981 and the corresponding beginning of the year capital stock series (Q_{K10}^t) starts in 1982.

²⁷ For $n = 10$ (software), t starts at 1981. After we estimate depreciation rates for the 14 classes of asset, the prices defined by (6) were normalized to equal 1 in 1961 (except the software price was normalized to equal 1 in 1981) and the units for the Q_{In}^t were adjusted accordingly. The price of software investment was artificially set equal to 1 for the years 1961-1980.

corresponding beginning of year t capital stock, Q_{Kn}^t , plus year t investment, Q_{In}^t , less year t depreciation, Q_{Dn}^t ; i.e., the following equations should hold:

$$(7) Q_{Kn}^{t+1} = Q_{Kn}^t + Q_{In}^t - Q_{Dn}^t; \quad n = 1, \dots, 14; t = 1962, \dots, 2011.^{28}$$

Equations (7) can be solved for the depreciation amounts Q_{Dn}^t and then these depreciation estimates can be divided by the corresponding year t starting stocks Q_{Kn}^t to give us estimates for the year t geometric depreciation rates δ_n^t :

$$(8) \delta_n^t \equiv Q_{Dn}^t / Q_{Kn}^t; \quad n = 1, \dots, 14; t = 1962, \dots, 2011.$$

The resulting depreciation rates were somewhat volatile and many asset depreciation rates had substantial trends.²⁹ We do not expect geometric depreciation rates to change much from year to year so we decided to smooth the rates which were generated by (8). The trends in the depreciation rates were not linear or even piecewise linear so we used a nonparametric smoothing method in order to reduce the volatility in the rates. We used the Lowess locally weighted nonparametric method due to Cleveland (1979) as implemented by White (2004) in the econometrics program Shazam.

We used the cross validation criterion to pick the best smoothing parameter.³⁰ We set the depreciation rates δ_n^{1961} for 1961 equal to the corresponding smoothed rates for 1962.³¹ The resulting smoothed depreciation rates δ_n^t are listed in Table 11.

We can use our estimated depreciation rates for 1961, the Statistics Canada estimated starting capital stocks for 1962 and the investment information for 1961 in chained 2002 dollars in order to generate estimated starting capital stocks for our 14 types of asset for 1961; i.e., consider the following equation:

$$(9) Q_{Kn}^{t+1} = (1 - \delta_n^t) Q_{Kn}^t + Q_{In}^t.$$

Rearrange the above equation for $t = 1961$ to solve for Q_{Kn}^{1961} for $n = 1, 2, \dots, 9, 11, \dots, 14$. A similar equation can be used to generate the starting stock for asset 10 for 1981, Q_{K10}^{1981} .

Now use equations (9), the smoothed depreciation rates listed in Table 11 and the investment information Q_{In}^t along with the starting capital stocks Q_{Kn}^{1961} in order to generate capital stock

²⁸ For $n = 10$, $t = 1982, \dots, 2011$. The same years t also apply to equations (8) for $n = 10$.

²⁹ The sample average depreciation rates were as follows: $\delta_1 = 0.19583$; $\delta_2 = 0.32578$; $\delta_3 = 0.19064$; $\delta_4 = 0.39929$; $\delta_5 = 0.31457$; $\delta_6 = 0.18500$; $\delta_7 = 0.12853$; $\delta_8 = 0.45736$; $\delta_9 = 0.20666$; $\delta_{10} = 0.37454$; $\delta_{11} = 0.08088$; $\delta_{12} = 0.06641$; $\delta_{13} = 0.04787$; $\delta_{14} = 0.08308$.

³⁰ In case of a tie in the criterion between two smoothing parameters, we chose the higher parameter, which led to slightly smoother depreciation rates. The smoothing parameter choices varied between 0.09 and 0.23 except that the best smoothing parameter for institutional buildings turned out to be 0.55. The sample averages for the smoothed depreciation rates turned out to be as follows: 0.19584; 0.32574; 0.19063; 0.39927; 0.31429; 0.18502; 0.12854; 0.45733; 0.20668; 0.37445; 0.08088; 0.06640; 0.04802; 0.008307. These smoothed average rates are very close to the raw average depreciation rates listed earlier.

³¹ The depreciation rates for software for the years 1961-1981 were set equal to the smoothed rate for 1982.

series Q_{Kn}^t for the 14 reproducible assets.³² We will value the starting capital stocks for year t at the average investment prices for year t , P_{In}^t , that were described earlier. We renormalized these prices to equal 1 in 1961 (instead of in 2002) and we changed the capital stock units to match these normalized investment prices.³³ These normalized prices for investment and the corresponding starting capital stocks, P_{Kn}^t are listed in Table 12. The corresponding normalized capital stocks, Q_{Kn}^t , are listed in Table 13.³⁴

We turn our attention to the problems associated with the construction of business inventory change and inventory stock. From CANSIM Table 3800002, we can obtain current dollar estimates for business sector investment in inventories from Series V498100 and in chained 2002 dollars from Series V1992057. However, division of the current value series by the constant dollar series produces nonsensical implicit price estimates for many years.³⁵ Thus a different method for constructing estimates of real inventory change must be used.

End of the year current market value³⁶ starting stocks of inventories for persons and unincorporated business and for corporations the entire economy and for the government sector are available from the National Balance Sheet Accounts; see CANSIM Table 3780051, Series V52229234 and Table 3780052, Series V52229291) for the years 1961-2011. Adding these two series will give us estimates for the value of the business sector beginning of the year inventory stocks for the years 1962-2012, V_{K15}^t . We can subtract the value of inventory change for 1961 (CANSIM Series V498100) from the starting stock of inventories in 1962 in order to extend the value of inventory stock series back to 1961. Statistics Canada provided us with a price index for business sector inventory stocks for the years 1961-2006, P_{K15}^t .³⁷ We extended this price series to the years 2007-2011 by using the January indexes for the Industrial Product Price Index for Canada and for All Commodities, CANSIM Series V53384722, Table 3290056. The inventory value series V_{K15}^t can be divided by the inventory stock price series P_{K15}^t , in order to obtain a real beginning of the year business sector stock of inventories, Q_{K15}^t . The resulting price and quantity series (after normalization so that the price is unity in 1961) are listed in Table 12 for P_{K15}^t and Table 13 for Q_{K15}^t .

³² The capital stock series for software start at 1981 rather than 1961.

³³ Define the constants $C_n = P_{In}^{1961}$ and define new investment and capital stock prices for period t as P_{In}^t/C_n and the corresponding beginning of year t capital stocks are rescaled to equal $Q_{Kn}^t \times C_n$ for $n = 1, \dots, 9, 11, \dots, 14$. The rescaling is of course a bit different for asset 10 which only starts in 1981. We denote the rescaled capital stock (and investment) prices as P_{In}^t and quantities Q_{Kn}^t in an abuse of notation.

³⁴ Note that our investment series for the 14 assets, Q_{In}^t , can be recovered from Tables 12 and 13 using equations (9). Thus we did not table the Q_{In}^t .

³⁵ Diewert (2005b) showed that traditional index number theory breaks down when the value aggregate can take both positive and negative signs and he suggested that indexes of inventory stocks be constructed (in place of indexes of inventory change) and then the stock estimates should be differenced in order to obtain estimates of inventory change. It is interesting to note that *SNA 2008* suggested this solution to the problem: "Index number formulae are generally not applicable to time series that can take positive, negative and zero values. Nevertheless, there are ways of deriving pseudo chain volume series expressed in terms of monetary values in such cases. The most commonly used approach is to identify two associated time series that take only positive values and are such that when differenced yield the target series." Eurostat, IMF, OECD, UN and the World Bank (2008: 302).

³⁶ These series are labelled as book value series but we believe that they are market value series.

³⁷ Our thanks to Wulong Gu on this point.

It is possible to generate an alternative value of inventory stock series by cumulating information on the value of inventory change from the System of National Accounts. Thus the CANSIM series V498100 estimates the current value of business investment in inventories, which conceptually, should equal the value of inventory change over the year. Using the balance sheet estimates of the starting stock of inventories for 1962 (which was \$13,698 million) and the above series, we can cumulate inventory changes and obtain an alternative SNA based estimated value of inventory change, which ended up at \$108,049 million at the start of 2012. However, using the balance sheet estimates for the beginning of 2012 value of business inventories, we obtain the estimate \$242,049 million, which is 2.42 times as big as the implied SNA estimate. Thus the SNA based estimates basically give us an inventory to output ratio that is implausibly low at the end of the sample period. It is true that inventory to output ratios have been falling due to just in time delivery and other inventory management techniques but the number of goods that are being produced has also been growing, which implies an increasing need for inventories. In any case, we will take the balance sheet estimates of inventory stocks as the “truth”.³⁸

A preliminary price series for inventory change P_{II}^t in year t is set equal to P_{K15}^{t+1} listed in Table 12.³⁹ A preliminary series for the quantity of inventory change in year t listed in Table 13, Q_{II}^t , is set equal to the stock at the beginning of year $t+1$, Q_{K15}^{t+1} , less the stock at the beginning of year t , Q_{K15}^t . These preliminary series, P_{II}^t and Q_{II}^t are then renormalized so that P_{II}^t equals unity in 1961 and Q_{II}^t is adjusted accordingly to offset this change in units and these renormalized series are the series which appear in Tables 2 and 3.

We need estimates for the price and quantity of agricultural land and other land that is used by the Canadian business sector. We will also construct estimates for the stock of residential housing and the stock of residential land. The National Balance Sheets have annual values for 5 classes of nonfinancial assets:⁴⁰

- Residential structures;
- Nonresidential structures;
- Machinery and Equipment;
- Inventories and
- Land.

There are estimates for the above 5 components for 3 sectors:

- Persons and unincorporated businesses;
- Corporate and government businesses and

³⁸ This choice will lead to an increase in measured multifactor productivity compared to estimates that rely on the SNA estimates of inventory change. See Diewert and Smith (1994) for a detailed accounting framework for inventories that is consistent with the Hicks (1961) and Edwards and Bell (1961) model of production and Diewert (2005b) for a critical review of SNA conventions for measuring inventory change.

³⁹ Diewert (2005b) showed that in order to obtain a user cost of inventories that is consistent with other user costs and the measurement of output, inventory changes should be valued at end of year prices.

⁴⁰ The CANSIM National Balance Sheet value estimates that we will use are labelled as book values but we note that these book value series which start in 1961 coincide with market value series that start in 1971. Thus we will interpret these “book value” series as market value series.

- The non-business government sector.

It can be seen that the Balance Sheet Sectors do not correspond exactly to our business sector. We have already formed estimates for business sector structures, machinery and equipment and inventories, which leaves agricultural land, other business land, residential land and residential structures to be estimated.

We first form estimates for the quantity and *value of agricultural land*. For the years 1981-2011, we can obtain end of year estimates for the value of agricultural land from CANSIM Table 20020 (Balance Sheet of the Agricultural Sector), Series V157699. This series will give us beginning of the year values for agricultural land V_{K16}^t for the years $t = 1982-2012$. For census years, we can obtain direct estimates for the quantity of agricultural land from CANSIM Table 1530038, Series V32166910, which provides estimates for the agricultural land area for Canada.⁴¹ To obtain estimates for non-census years, we interpolated between census years using an annualized geometric rate of growth.⁴² The resulting preliminary quantity series is Q_{K16}^t . For the years 1982-2011, we can obtain a preliminary price series for agricultural land, P_{K16}^t , by dividing V_{K16}^t by Q_{K16}^t . We linked P_{K16}^t to a value of farmland per acre series at 1982. This series was Series V381831 in CANSIM Table 2003. The resulting price series P_{K16}^t was normalized to equal 1 in 1961 (and Q_{K16}^t was renormalized as well); see Table 12 for a listing of P_{K16}^t and Table 13 for a listing of Q_{K16}^t .

From the National Balance Sheets, we can obtain estimates for the *market value of land held by corporations and government business enterprises* at the end of the year for the years 1961-2011; see CANSIM Table 3780052, Series V52229292.⁴³ We will convert these estimates into beginning of the year stocks of business land for the years 1962-2012 and label the resulting series V_{K17}^t for $t = 1962, \dots, 2012$. We assume that the stock of nonagricultural business land is fixed over the sample period. This is a very rough approximation to the actual situation but it is likely that land used for manufacturing has declined while land used for office space and warehousing has increased over time and so the assumption that the aggregate amount of nonagricultural land is fixed may be satisfactory.⁴⁴ Thus a preliminary price series for business nonagricultural land P_{K17}^t can be obtained for $t = 1962, \dots, 2012$ by dividing the year t value V_{K17}^t by V_{K17}^{1962} , which equals Q_{K17}^t . We use the rate of change of an average land cost series over the

⁴¹ These estimates for the census years 1971-2006 (at 5 year intervals) were as follows: 622,426.1; 619,900.4; 597,154.8; 611,111.6; 613,317.0; 616,541.4; 610,788.8; and 674,007.5. The 10 per cent jump in land area going from 2001 to 2006 does not seem possible. Hence we will use earlier data from this source (downloaded in 2008) augmented by information from Leacy (1983), Series M-23, Area of Land in Farm Holdings, Census Data, Canada (thousands of acres). The estimates for 1961 and 1966 were converted into hectares at 1 hectare = 2.471 acres.

⁴² We used the annualized 2001-2006 geometric growth rate to extrapolate our agricultural land estimates from 2006 to 2011.

⁴³ Unfortunately, the household sector owns a considerable amount of land that is used for business purposes; i.e., unincorporated persons own land used for business purposes and the land used in these enterprises should appear as inputs into the business sector. The corporate business sector also owns some land associated with residential rental properties but we are trying to exclude these inputs from our measure of business sector input. Thus our estimates for the value of business sector land are only approximate ones.

⁴⁴ We know of no accurate published source of information on the *quantity* of business land. The National Balance Sheets may have this information but it is not publically available.

years 1961-1962 to extrapolate our price series P_{K17}^t back to 1961.⁴⁵ The resulting P_{K17}^t series is normalized to equal 1 in 1961 (and the units of Q_{K17}^t are adjusted to offset the change in the units of measurement for P_{K17}^t). P_{K17}^t is listed in Table 12 and Q_{K17}^t is listed in Table 13.

From the National Balance Sheets, we can obtain estimates for the market value of land held by persons and unincorporated business at the end of the year for the years 1961-2011; see CANSIM Table 3780051, Series V52229235. We will convert these estimates into beginning of the year stocks of personal and unincorporated business land for the years 1962-2012 and label the resulting series V_{LP}^t for $t = 1962, \dots, 2012$. We will form an estimate of the *value of residential land held by households*, V_{K18}^t by subtracting the value of agricultural land V_{K16}^t from V_{LP}^t ; i.e., define V_{K18}^t as follows:

$$(10) V_{K18}^t \equiv V_{LP}^t - V_{K16}^t; \quad t = 1962, \dots, 2012.$$

We estimate the value of *household residential land* for 1961 by multiplying V_{K18}^{1962} by the same rate of change of an average land cost series over the years 1961-1962 that we used to extrapolate our price series P_{K17}^t back to 1961. We make the assumption that the quantity of household residential land Q_{K18}^t has remained fixed throughout the sample period so that $Q_{K18}^t \equiv V_{K18}^{1961}$ and $P_{K18}^t \equiv V_{K18}^t / Q_{K18}^t$ for $t = 1961-2012$. Finally, we normalize the price and quantity series so that $P_{K18}^{1961} = 1$. The resulting price and quantity series are listed in Tables 12 and 13. Note that we do not include this asset (and the following one) as inputs into our definition of the Canadian business sector; we include information on the price and quantity of housing assets in this data Appendix mainly for comparison purposes.⁴⁶

From the National Balance Sheets, we can obtain estimates for the market value of *residential structures* held by all sectors at the end of the year for the years 1961-2011; see CANSIM Table 3780049, Series V52229098. We will convert these estimates into beginning of the year stocks of residential structures for the years 1962-2012 and label the resulting (preliminary) series V_{K19}^t for $t = 1962, \dots, 2012$. From Table 2 above, we have a price series for residential investment, P_{IR}^t , for the years 1961-2011. We set the stock price equal to this flow price; i.e., define $P_{K19}^t \equiv P_{IR}^t$ for $t = 1961, \dots, 2011$. We can obtain a preliminary quantity series for residential housing stocks by setting $Q_{K19}^t \equiv V_{K19}^t / P_{K19}^t$ for $t = 1962-2011$. Recall that estimates of annual investment in residential structures, Q_{IR}^t , are available in Table 3. Thus we can solve the following equations to produce annual estimates for the residential housing depreciation rates, δ_{19}^t :

$$(11) Q_{K19}^{t+1} = (1 - \delta_{19}^t) Q_{K19}^t + Q_{IR}^t; \quad t = 1962, \dots, 2010.$$

We found that

$$(12) \delta_{19}^t = 0.04$$

⁴⁵ The series is the series S317 in Leacy (1983): NHA average land cost per dwelling unit, single detached dwelling units. This series matches up well with P_{K17}^t for the early 1960s.

⁴⁶ However, this residential housing information will prove to be useful in allocating property taxes to households and businesses.

fit the data very well; i.e., the geometric model of depreciation and a residential housing annual depreciation rate of 4 per cent fits the Balance Sheet and SNA information on residential structure stocks and flows very well. Thus we used equations (11) with δ_{19}^t defined by (12) to generate new estimates for Q_{K19}^t for $t = 1963-2012$, starting with our initial estimate for Q_{K19}^{1962} .⁴⁷ The price and quantity series P_{K19}^t and Q_{K19}^t are listed in Tables 12 and 13.

The units for the quantities in Table 13 are in millions of 1961 constant (mostly chained) dollars.

Primary Input Tax Rates, Balancing Real Rates of Return and User Costs

Nonresidential structures (office buildings, factories, etc.) and business land have to pay property taxes on these inputs whereas machinery and equipment and inventory stocks are generally exempt from paying these taxes. Thus it is necessary to take into account property taxes when constructing user costs of capital for business nonresidential structures and business land. Information on property taxes for the years 1961-2011 is available from Statistics Canada; see CANSIM Series V499942, Table 3800035 (Real Property Taxes of Local Governments) and CANSIM Series V499841, Table 3800033 (Real Property Taxes of Provincial Governments). We approximate the asset base on which these taxes fall as the total beginning of the year national value of land, residential structures and nonresidential structures. Data on these values are available for the years 1962-2012 from the National Balance Sheets: Series V52229098 for residential structures, Series V52229099 for nonresidential structures and Series V52229103 for land. These series were summed and the sum was used as the tax base for the sum of the two property tax series, V499942 plus V499841. The resulting *property tax rates* are reported as the series τ_P^t in Table 14⁴⁸ and it will be used in the construction of the user costs of business sector land and nonresidential structures.⁴⁹ Our estimated property tax rate starts at 1.5 per cent and trends down to 1 per cent⁵⁰ We will apply this property tax rate to assets 11-14 and 16 and 17. Thus define the *asset specific property tax rates* for year t and asset n , τ_{Pn}^t , as follows:

$$(13) \tau_{Pn}^t \equiv 0 \text{ for } n = 1-10 \text{ and } 15 \text{ and } \tau_{Pn}^t \equiv \tau_P^t \text{ for } n = 11-14 \text{ and } 16-17.$$

It is of some interest to calculate the average business tax rate for taxes that apply to the use of financial capital in the business sector so we provide estimates for this tax rate by year. These business taxes that fall on the return to capital are defined to be the sum of the following taxes:

- Taxes less subsidies on factors of production (CANSIM Series V1992216, Table 3800001) less local government and Provincial government property taxes;

⁴⁷ We also used equation (11) for $t = 1961$ to generate Q_{K19}^{1961} .

⁴⁸ The tax rate for 1961 was set equal to the corresponding rate for 1962.

⁴⁹ This is a very rough approximation to the actual property tax rates on business sector land and nonresidential structures since actual property tax rates are different across different sectors and assets. For example, business sector property assets are generally taxed more heavily than household property assets.

⁵⁰ This property tax rate is probably too high for residential property and too low for business property, which is generally taxed at higher rates than corresponding residential properties.

- Total government taxes on income from corporations and government business enterprises (CANSIM Series V499131, Table 3800007); and
- Total government taxes on income from nonresidents (CANSIM Series V499132, Table 3800007).

The sum of the above three sources of general business taxes that fall on capital stock components for year t was divided by the corresponding sum of the beginning of the year t value of assets for our 17 types of business sector asset, $V_{Kn}^t \equiv P_{Kn}^t Q_{Kn}^t$ for $n = 1, \dots, 17$. We denote the resulting business tax rate for year t as τ_B^t and it is listed in Table 14.

Using the asset specific property tax rates τ_{Pn}^t , the general business tax rates τ_B^t , the depreciation rates δ_n^t for $n = 1-14$ that are listed in Table 11⁵¹ and the asset prices P_{Kn}^t that are listed in Table 12, we can define *user costs* U_n^t for our 17 asset classes as follows:⁵²

$$(14) U_n^t \equiv [r^t + \tau_B^t + \tau_{Pn}^t + \delta_n^t] P_{Kn}^t; \quad n = 1, \dots, 17; t = 1961, \dots, 2011$$

where r^t is suitable after tax cost of capital that applies to the business sector in year t . In the present study, we will follow national income accounting conventions and will take r^t to be the *balancing real rate of return*;⁵³ i.e., it is the rate of return that is consistent with the year t value of business sector net output being equal to the value of primary inputs used by the business sector in year t , where the user costs defined by (14) are used as prices for the beginning of the year capital inputs. Thus r^t can be determined as the solution to the following linear in r^t equation for $t = 1961, \dots, 2011$:

$$(15) P_C^t Q_C^t + P_{GN}^t Q_{GN}^t + P_{IG}^t Q_{IG}^t + P_{IR}^t Q_{IR}^t + P_{IN}^t Q_{IN}^t + P_{IM}^t Q_{IM}^t + P_{II}^t Q_{II}^t + \sum_{n=8}^{15} P_n^t Q_n^t + \sum_{n=16}^{22} P_n^t Q_n^t = \sum_{n=1}^{12} P_{Ln}^t Q_{Ln}^t + \sum_{n=1}^{12} [r^t + \tau_B^t + \tau_{Pn}^t + \delta_n^t] P_{Kn}^t Q_{Kn}^t$$

where the various price and quantity series are defined in the tables.⁵⁴ The resulting series of balancing real rates of return are listed in Table 14. It should be noted that r^t can be interpreted as a real interest rate; i.e. it is the income earned by the business sector in year t relative to the starting capital stock, valued at the average investment prices for the period. This explains why we have not included a capital gains term in the user cost formulae defined by (14).⁵⁵

⁵¹ The depreciation rates δ_n^t for assets $n = 15-17$ are defined to be zero; i.e., we assume that inventories, agricultural land and non-agricultural business land does not depreciate.

⁵² For additional material on user costs and many historical references, see Hall and Jorgenson (1967), Christensen and Jorgenson (1969), Harper, Berndt and Wood (1980), Jorgenson (1989, 1996a, and 1996b), Diewert (1980 and 2005a) and Schreyer (2009).

⁵³ For most purposes, it is probably preferable to use an exogenous real rate of return in the user costs (14) since the resulting prices will probably approximate market rental prices better. However, when we used the sample average real rate of return in the user costs defined by (14), our results were basically unchanged.

⁵⁴ P_{XG}^t and Q_{XG}^t are chained Fisher aggregates of our 7 classes of exports of goods, P_{XS}^t and Q_{XS}^t are the price and quantity of exports of services, P_{MG}^t and Q_{MG}^t are chained Fisher aggregates of our 6 classes of imports of goods and P_{MS}^t and Q_{MS}^t are the price and quantity of imports of services.

⁵⁵ We have essentially absorbed the capital gains (or losses) term into r^t .

The sample average property tax rate was $\tau_P \equiv 0.01368$, the sample average business income tax rate was $\tau_B \equiv 0.03780$ and the sample average real after tax rate of return was $r \equiv 0.06133$. Once r^t has been determined, then the 17 series of user costs defined by (14) can also be calculated; these series are listed in Table 15. Note that r^t is a *real after tax rate of return* because we do not include a capital gains term in our user costs and all user costs are evaluated at the average prices for the corresponding investment good for year t .

Tables 13 and 15 provide estimates for the prices and quantities of business sector capital services for the 17 assets in our data base for the years 1961-2011.

As noted earlier, the sample average of the balancing after tax real rates of return r^t was a rather large 6.133 per cent per year. The average property tax rate τ_P^t was 1.368 per cent while the average business tax rate on assets was 3.780 per cent. The before business tax real rate of return averaged 9.913 per cent. Thus it appears that governments are taking about 38.1 per cent of the before tax return to capital assets on average.⁵⁶ However, it must be kept in mind that these balancing rates of return may not be very reliable; they contain the net effect of all the measurement errors that were made in constructing this data set.

The high average after-tax rates of return for the business sector are a source of concern. The corresponding balancing real rate of returns for Australia averaged around 3 per cent (Diewert and Lawrence, 2006). Normally, after-tax real rates of return are in the 1 to 3 per cent rate whereas our estimated average rate is over 6 per cent. This suggests that our estimates of the value of output may be too high⁵⁷ or that the value of labour input is too low or that our estimated asset values for business sector capital inputs are too small. We think that the last possibility is the most probable one. Using the data tabled in this Appendix, we calculated a business sector nominal and real value of business sector output, V_Y^t and Q_Y^t ,⁵⁸ and we also calculated the corresponding business sector nominal and real capital stock inputs, V_{KW}^t and Q_{KW}^t . Nominal and real business sector capital-output ratios were computed, V_{KW}^t/V_Y^t and Q_{KW}^t/Q_Y^t respectively. These capital-output ratios are listed in Table 14. We found that the nominal business sector capital-output ratio fell from 2.22 in 1961 to 1.85 in 2011 while the real capital-output ratio fell from 2.22 in 1961 to 1.33 in 2011. These falls in the capital-output ratio seem unlikely. It is very likely that the Statistics Canada depreciation rates for reproducible assets are too high. However, for the purposes of this study, we will accept these high depreciation rates.

⁵⁶ This relatively high rate of business taxation has two negative effects: (i) it raises the user cost of capital and hence lessens the beneficial effects of capital deepening and (ii) the high rates lead to a relatively large loss of productive efficiency; i.e. the deadweight losses of such large tax rates are likely to be large.

⁵⁷ See Diewert and Fox (2001) for a discussion of output mismeasurement problems.

⁵⁸ P_Y^t was computed as a chained Törnqvist price index of the 9 net output aggregates listed in Tables 2 and 3 (the sign of import quantities Q_M^t was changed from a positive sign to a negative sign) and Q_Y^t is the corresponding implicit quantity index of business sector value added at producer prices. P_{KW}^t and Q_{KW}^t are the chained Fisher index price and quantity of wealth stocks that are used as inputs into the business sector; see Tables 12 and 13 for a listing of the 17 components that were used in constructing these indexes. These price and quantity indexes are listed in Table 14.

Sources of Error

There are many problems with the data constructed in this Appendix. Some of the more important possible sources of error are listed as follows:

- Our adjustments for converting final demand prices (those facing the final demanders of the goods and services produced by the business sector) into basic prices (prices facing the producers of the goods and services) were rather crude and some aggregation error will be associated with our procedures. In particular, only crude adjustments for the effects of indirect taxes on the components of consumption were made. Also our method for estimating the net supplies of the business sector to the non-business sector are rather indirect and subject to some error.⁵⁹
- Our tax adjustments for the price of imports and exports were also not completely satisfactory due to various aggregation errors; i.e. we were not able to assign taxes accurately to the various components of imports and exports.
- Our measure of labour input relies on CANSIM Table 3830024, which provides price and quantity information for 36 separate types of labour. However, the KLEMS program makes use of even more disaggregated data and obtains significantly different rates of growth of quality adjusted labour input for the Canadian business sector and so our estimates may be subject to some aggregation error.
- Our estimates for 14 capital stock components relied on CANSIM Table 310003 and the estimates of business sector capital stocks and investment flows implied very high depreciation rates for these assets. These high depreciation rates are not really plausible since they essentially lead to a declining real capital-output ratio for the Canadian business sector, which seems unlikely.
- We also relied heavily on the Statistics Canada Balance Sheet estimates for the value of business land but the Balance Sheet estimates are highly aggregated in particular, there is not enough detail on the allocation of land. Moreover, there is a lack of accurate information on the quantity of land used by the business sector.
- Our treatment of property taxes and business income taxes is very approximate.
- Our user costs of capital were constructed using a particular set of assumptions (no capital gains and endogenous real rates of return) and these assumptions are not universally accepted.
- The roles of infrastructure capital and R&D investments were not taken into account.
- The role of resource depletion was also not taken into account.

⁵⁹ In particular, we did not have access to *chained* price indexes for the non-business sector for the years prior to 1997 and this will lead to some aggregation errors.

- We did not take into account the business sector's holdings of working capital including bank deposits and currency.

The latest international version of the System of National Accounts, *SNA 2008*, recognized the role of capital services in the production accounts. This is a big step forward since it allows inputs in the SNA production accounts to be decomposed into price and quantity components and hence the revised SNA will facilitate the development of productivity accounts for each country that implements the revised SNA. However, just introducing capital services into the SNA will not be sufficient in order to develop accurate sectoral productivity accounts. Some of the problems associated with the introduction of capital services into the SNA are as follows:

- More attention needs to be given to the development of basic prices by industry and by commodity; i.e. we need accurate information on the exact location of indirect taxes (and commodity subsidies) by commodity and industry on both outputs and intermediate inputs.
- In order to deal adequately with the complications introduced by international trade, the existing Input Output production accounts need to be reworked so that the role of traded goods and services can be tracked by industry.⁶⁰
- The treatment of inventory change in the present SNA seems inadequate for the needs of productivity accounts. Inventory change should be integrated with the balance sheet accounts and the user cost accounts.⁶¹
- The investment accounts need to be integrated with the corresponding balance sheet accounts, both in nominal and real terms.
- The treatment of land in the balance sheets requires additional work; i.e., there are problems in obtaining information on the quantity of land used by each industry and sector and valuing the land appropriately.⁶²
- Difficult decisions must be made on the exact form of the user cost formula to be used when measuring capital services; i.e., the revised SNA should make specific recommendations on how user costs should be constructed so that some measure of international comparability can be achieved in the accounts.
- The problems involved in making imputations for the labour input of the self-employed (and unpaid family workers) should also be addressed.

The introduction of capital services into the SNA framework will provide challenges for statistical agencies. However, as national statistical agencies make productivity accounts a part

⁶⁰ In principle, this problem is recognized in *SNA 2008*. However, implementation by national statistical agencies will be difficult.

⁶¹ Again, in principle, these problems are recognized in *SNA 2008*.

⁶² There are some difficult conceptual and practical problems involved in separating structure value from land value; see Diewert (2007) for a discussion of some of these problems.

of their regular production of the national accounts, there will be benefits to the statistical system as a whole since a natural output of the new system of accounts will be balancing real rates of return by sector or industry. These balancing real rates of return will provide a check on the accuracy of the sectoral data: if the rates are erratic or very large or very small, this can indicate measurement error in the sectoral data and hence will give the statistical agency an early indication of problems with the data.

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Appendix Table 1

Housing Value, Quantity and Price Series for Imputed and Paid Rents, 1961-2011

Year	V _{00H}	V _{PR}	Q _{00H}	Q _{PR}	P _{00H}	P _{PR}
	Value Series		Quantity Series		Price Series	
	Imputed Rents for Owner Occupied Dwellings	Paid Rents	Imputed Rents for Owner Occupied Dwellings	Paid Rents	Imputed Rents for Owner Occupied Dwellings	Paid Rents
	(millions, dollars)		(millions, 1961 dollars)		(index, 1961=1.000)	
1961	2,292	1,107	2,292	1,107	1.000	1.000
1962	2,436	1,176	2,380	1,149	1.024	1.024
1963	2,660	1,290	2,412	1,170	1.103	1.103
1964	2,832	1,396	2,477	1,221	1.143	1.143
1965	2,976	1,503	2,531	1,278	1.176	1.176
1966	3,249	1,658	2,620	1,337	1.240	1.240
1967	3,585	1,860	2,678	1,390	1.339	1.339
1968	3,985	2,091	2,707	1,420	1.472	1.472
1969	4,416	2,342	2,784	1,476	1.586	1.586
1970	4,897	2,645	2,833	1,530	1.729	1.729
1971	5,388	2,918	2,864	1,551	1.881	1.881
1972	5,757	3,183	2,866	1,584	2.009	2.009
1973	6,307	3,451	2,862	1,566	2.204	2.204
1974	7,107	3,787	2,923	1,558	2.431	2.431
1975	8,313	4,290	2,992	1,544	2.779	2.779
1976	10,038	4,842	3,072	1,482	3.267	3.267
1977	12,126	5,443	3,084	1,384	3.932	3.932
1978	14,090	6,106	3,051	1,322	4.618	4.618
1979	15,797	6,829	2,996	1,295	5.273	5.273
1980	17,869	7,686	3,053	1,313	5.853	5.853
1981	20,512	8,822	3,159	1,359	6.493	6.493
1982	23,489	10,082	3,213	1,410	7.310	7.152
1983	26,285	11,295	3,256	1,444	8.073	7.822
1984	28,446	12,181	3,294	1,471	8.636	8.281
1985	30,694	12,967	3,360	1,500	9.135	8.645
1986	33,386	13,955	3,463	1,539	9.641	9.069
1987	36,117	15,090	3,573	1,599	10.108	9.437
1988	39,587	16,419	3,801	1,662	10.415	9.877
1989	44,078	18,201	4,011	1,726	10.989	10.545
1990	48,016	19,786	4,221	1,798	11.376	11.004
1991	51,779	21,133	4,469	1,853	11.586	11.406
1992	54,872	22,269	4,627	1,899	11.859	11.729
1993	57,263	23,108	4,770	1,943	12.005	11.892
1994	60,557	24,056	4,887	1,982	12.391	12.135
1995	63,613	24,869	5,001	2,016	12.720	12.338
1996	65,418	25,632	5,116	2,049	12.787	12.511
1997	67,405	26,425	5,245	2,097	12.851	12.598
1998	69,835	27,223	5,389	2,139	12.959	12.728
1999	72,144	28,173	5,557	2,187	12.983	12.879
2000	74,582	29,059	5,704	2,231	13.075	13.025
2001	77,093	30,092	5,843	2,279	13.194	13.205
2002	80,895	31,491	6,074	2,341	13.318	13.449
2003	83,916	32,829	6,250	2,413	13.427	13.604
2004	87,609	34,133	6,482	2,487	13.516	13.723
2005	91,542	35,435	6,730	2,560	13.602	13.840
2006	96,748	37,137	6,985	2,638	13.851	14.078
2007	103,305	39,263	7,249	2,715	14.251	14.459
2008	109,860	41,381	7,528	2,797	14.594	14.797
2009	115,263	43,243	7,786	2,881	14.804	15.011
2010	120,256	44,955	8,049	2,966	14.940	15.155
2011	125,685	46,819	8,322	3,054	15.103	15.330
Compound Annual Growth Rates, per cent						
1961-2011	8.34	7.78	2.61	2.05	5.58	5.61
2000-2011	4.86	4.43	3.49	2.90	1.32	1.49
1961-1973	8.80	9.94	1.87	2.93	6.81	6.81
1973-1981	15.88	12.45	1.24	-1.76	14.46	14.46
1981-1989	10.03	9.48	3.03	3.03	6.80	6.25
1989-2000	4.90	4.34	3.25	2.36	1.59	1.94
2000-2008	4.96	4.52	3.53	2.87	1.38	1.61
2008-2011	4.59	4.20	3.40	2.97	1.15	1.19

Appendix Table 2

Price Indexes for Business Sector Net Outputs: Consumption, Investment and Trade, 1961-2011

Year	P _C	P _{GN}	P _{IG}	P _{IR}	P _{IN}	P _{IM}	P _{II}	P _X	P _M
	Consumption	Net Sales of the Nonbusiness Sector to the Business Sector	Government Investment	Residential Investment	Non-residential Investment	Machinery and Equipment Investment	Inventory Change	Exports	Imports
	(index, 1961=1.000)								
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.006	0.994	1.009	1.005	1.006	1.020	1.002	1.030	1.058
1963	1.020	0.976	1.039	1.028	1.033	1.034	1.013	1.041	1.096
1964	1.023	0.927	1.062	1.073	1.062	1.068	1.032	1.057	1.105
1965	1.036	0.912	1.139	1.134	1.123	1.093	1.055	1.080	1.102
1966	1.074	0.883	1.210	1.208	1.193	1.119	1.072	1.125	1.119
1967	1.107	0.891	1.232	1.285	1.242	1.132	1.084	1.154	1.144
1968	1.148	0.961	1.238	1.314	1.252	1.150	1.110	1.201	1.167
1969	1.185	0.968	1.285	1.381	1.325	1.195	1.135	1.231	1.196
1970	1.215	1.006	1.339	1.426	1.391	1.244	1.150	1.267	1.220
1971	1.242	1.103	1.409	1.532	1.468	1.281	1.203	1.286	1.248
1972	1.293	1.144	1.485	1.673	1.551	1.323	1.316	1.333	1.275
1973	1.384	1.221	1.648	1.971	1.719	1.372	1.427	1.515	1.360
1974	1.582	1.358	2.011	2.361	2.034	1.521	1.547	1.913	1.646
1975	1.820	1.484	2.234	2.561	2.273	1.703	1.651	2.167	1.890
1976	1.904	1.643	2.345	2.769	2.401	1.822	1.770	2.297	1.929
1977	2.028	1.787	2.490	2.878	2.530	1.954	1.927	2.502	2.172
1978	2.190	1.929	2.662	3.041	2.711	2.133	2.136	2.738	2.417
1979	2.403	2.185	2.885	3.280	2.963	2.315	2.341	3.208	2.730
1980	2.691	2.489	3.199	3.555	3.325	2.498	2.559	3.735	2.980
1981	2.898	2.794	3.683	3.993	3.687	2.797	2.758	3.998	3.266
1982	3.166	3.106	3.927	4.082	3.961	3.014	2.910	4.089	3.439
1983	3.407	3.374	4.015	4.254	3.931	3.088	3.044	4.151	3.423
1984	3.564	3.486	4.171	4.418	4.081	3.091	3.126	4.297	3.582
1985	3.676	3.672	4.208	4.556	4.214	3.129	3.158	4.381	3.677
1986	3.756	3.742	4.203	4.908	4.275	3.163	3.207	4.371	3.744
1987	3.852	3.797	4.224	5.408	4.473	3.110	3.263	4.458	3.692
1988	3.958	3.786	4.338	5.783	4.728	3.068	3.315	4.471	3.601
1989	4.071	3.826	4.437	6.132	4.925	3.078	3.363	4.560	3.594
1990	4.302	3.864	4.531	6.112	5.089	3.092	3.365	4.529	3.644
1991	4.540	3.926	4.318	6.323	5.003	2.938	3.519	4.371	3.580
1992	4.599	3.944	4.319	6.397	4.975	2.954	3.526	4.496	3.726
1993	4.689	3.970	4.343	6.584	5.038	3.016	3.700	4.694	3.925
1994	4.718	4.179	4.420	6.765	5.205	3.115	3.830	4.973	4.161
1995	4.735	4.299	4.516	6.767	5.273	3.127	3.919	5.291	4.277
1996	4.833	4.202	4.538	6.756	5.430	3.102	3.782	5.321	4.222
1997	4.913	4.103	4.579	6.875	5.567	3.103	3.807	5.327	4.237
1998	4.978	4.140	4.597	6.960	5.715	3.144	3.867	5.316	4.380
1999	5.069	4.290	4.572	7.132	5.830	3.048	3.956	5.379	4.360
2000	5.207	4.432	4.690	7.298	6.028	3.022	4.040	5.710	4.442
2001	5.365	4.459	4.680	7.488	6.079	3.060	4.109	5.803	4.584
2002	5.434	4.567	4.730	7.812	6.182	3.088	3.871	5.689	4.615
2003	5.571	4.569	4.727	8.213	6.305	2.888	3.910	5.648	4.315
2004	5.652	4.651	4.799	8.716	6.704	2.775	3.957	5.786	4.206
2005	5.777	4.749	4.914	9.125	7.125	2.677	4.022	5.952	4.156
2006	5.880	4.810	5.107	9.799	7.633	2.603	4.137	5.975	4.117
2007	5.989	4.954	5.282	10.510	8.100	2.526	4.149	6.031	4.014
2008	6.156	5.111	5.643	10.798	8.560	2.545	4.187	6.644	4.244
2009	6.183	5.273	5.686	10.811	8.713	2.683	4.191	5.991	4.283
2010	6.255	5.388	5.680	11.137	8.993	2.503	4.326	6.123	4.103
2011	6.392	5.558	5.840	11.440	9.286	2.425	4.430	6.559	4.175
Compound Annual Growth Rates, per cent									
1961-2011	3.78	3.49	3.59	4.99	4.56	1.79	3.02	3.83	2.90
2000-2011	1.88	2.08	2.01	4.17	4.01	-1.98	0.84	1.27	-0.56
1961-1973	2.75	1.68	4.25	5.82	4.62	2.67	3.01	3.52	2.60
1973-1981	9.68	10.90	10.57	9.23	10.01	9.31	8.59	12.90	11.57
1981-1989	4.34	4.01	2.36	5.51	3.69	1.20	2.51	1.66	1.20
1989-2000	2.26	1.35	0.51	1.60	1.85	-0.17	1.68	2.07	1.94
2000-2008	2.11	1.80	2.34	5.02	4.48	-2.12	0.45	1.91	-0.57
2008-2011	1.26	2.83	1.15	1.94	2.75	-1.60	1.90	-0.43	-0.54

Appendix Table 3

Quantity Aggregates for Business Sector Net Outputs: Consumption, Investment and Trade, 1961-2011

Year	Q _C	Q _{GN}	Q _{IG}	Q _{IR}	Q _{IN}	Q _{IM}	Q _{II}	Q _X	Q _M
	Consumption	Net Sales of the Nonbusiness Sector to the Business Sector	Government Investment	Residential Investment	Non-residential Investment	Machinery and Equipment Investment	Inventory Change	Exports	Imports
	(millions, 1961 dollars)								
1961	20,117	1,420	1,887	2,211	2,618	2,144	1	6,867	7,897
1962	21,175	1,447	2,094	2,271	2,545	2,322	560	7,195	8,033
1963	22,127	1,446	2,101	2,354	2,637	2,556	936	7,832	8,031
1964	23,357	1,596	2,141	2,715	3,050	3,027	532	9,105	8,989
1965	24,791	1,798	2,426	2,825	3,320	3,611	1,228	9,418	10,180
1966	26,048	2,320	2,668	2,699	3,802	4,337	1,313	10,696	11,579
1967	27,029	2,684	2,718	2,754	3,613	4,350	454	11,827	12,306
1968	28,317	2,950	2,758	3,132	3,593	3,984	619	12,910	13,527
1969	29,705	3,068	2,700	3,551	3,592	4,307	1,580	13,802	15,377
1970	30,227	3,858	2,645	3,254	3,946	4,419	180	15,211	15,293
1971	32,085	3,885	2,985	3,728	4,089	4,537	-232	15,929	16,480
1972	34,636	3,942	2,938	4,066	4,074	4,940	148	17,257	18,892
1973	37,401	4,247	2,781	4,371	4,396	5,993	2,542	19,008	21,754
1974	39,498	4,819	2,845	4,464	4,675	6,737	4,839	18,347	23,977
1975	41,166	5,397	2,962	4,386	5,286	7,121	-334	16,951	23,228
1976	43,591	5,254	2,855	5,172	5,168	7,363	250	18,390	24,774
1977	45,148	5,963	2,916	5,242	5,479	7,260	1,319	19,678	24,836
1978	46,909	5,833	2,875	5,291	5,626	7,492	1,300	21,544	26,197
1979	48,338	5,796	2,803	5,251	6,337	8,526	3,691	22,467	28,092
1980	49,160	6,062	2,869	4,977	7,055	9,054	167	22,548	28,715
1981	49,549	5,845	2,967	5,279	7,620	10,142	891	23,012	30,716
1982	47,858	6,019	3,095	4,340	6,929	8,597	-4,603	22,882	25,710
1983	49,205	5,998	2,991	5,079	6,361	8,207	-1,049	24,326	28,444
1984	51,575	5,838	3,124	5,131	6,288	8,696	1,744	28,444	33,270
1985	54,441	6,539	3,497	5,578	6,590	9,652	1,467	29,938	35,548
1986	56,557	6,635	3,485	6,267	6,210	10,605	1,029	31,456	37,965
1987	58,999	6,789	3,621	7,190	6,454	12,171	1,701	32,933	39,889
1988	61,384	7,814	3,789	7,340	7,110	14,394	2,078	35,371	45,163
1989	63,294	8,423	4,184	7,640	7,345	15,424	1,406	35,434	47,820
1990	63,534	9,043	4,463	6,835	7,346	14,706	-583	37,556	48,551
1991	61,649	9,508	4,692	5,824	7,075	14,271	-3,899	38,167	49,281
1992	62,362	9,458	4,621	6,238	5,960	14,120	-551	40,921	51,473
1993	63,317	9,223	4,560	6,024	5,993	13,731	-878	45,382	55,461
1994	65,342	8,537	4,894	6,271	6,533	15,058	709	51,076	60,606
1995	66,670	8,165	4,740	5,340	6,574	16,239	3,164	55,452	64,385
1996	68,463	8,263	4,536	5,852	6,696	17,230	2,417	58,646	67,340
1997	71,965	8,414	4,390	6,330	7,881	21,703	1,780	63,457	77,378
1998	73,991	9,511	4,361	6,106	7,906	23,575	2,329	69,086	81,755
1999	76,954	9,380	5,039	6,324	8,101	25,951	1,249	76,337	88,261
2000	80,310	10,022	5,229	6,656	8,266	27,580	2,915	83,350	95,661
2001	82,116	11,040	5,830	7,363	8,712	26,758	-1,856	80,654	90,649
2002	85,095	11,443	6,044	8,403	8,195	25,995	3,367	81,599	92,347
2003	87,666	12,088	6,370	8,854	8,651	27,991	-1,722	79,268	96,341
2004	90,491	12,331	6,773	9,519	9,257	30,529	1,058	83,281	104,558
2005	93,826	12,483	7,543	9,820	10,211	34,837	2,299	84,847	112,552
2006	97,845	13,197	8,058	10,023	11,167	38,396	1,693	85,213	118,273
2007	102,531	13,469	8,580	10,303	11,423	40,009	1,554	86,367	125,533
2008	105,442	14,353	9,237	9,977	12,322	39,824	2,911	82,650	126,364
2009	105,202	15,394	10,049	9,181	9,593	32,063	-3,031	71,414	108,643
2010	108,742	15,922	11,852	10,119	9,863	35,861	-1,410	76,559	123,691
2011	111,173	15,718	11,482	10,355	11,210	40,330	1,671	80,232	132,890
Compound Annual Growth Rates, per cent									
1961-2011	3.48	4.93	3.68	3.14	2.95	6.04	16.00	5.04	5.81
2000-2011	3.00	4.18	7.41	4.10	2.81	3.51	-4.93	-0.35	3.03
1961-1973	5.30	9.56	3.28	5.84	4.41	8.94	92.20	8.85	8.81
1973-1981	3.58	4.07	0.81	2.39	7.12	6.80	-12.28	2.42	4.41
1981-1989	3.11	4.67	4.39	4.73	-0.46	5.38	5.87	5.54	5.69
1989-2000	2.19	1.59	2.05	-1.25	1.08	5.43	6.85	8.09	6.51
2000-2008	3.46	4.59	7.37	5.19	5.12	4.70	-0.02	-0.11	3.54
2008-2011	1.78	3.07	7.52	1.25	-3.10	0.42	-16.89	-0.98	1.69

Appendix Table 4

Business Sector, Nonbusiness Sector, Government Final Demand and Net Sales of the Business Sector to the Nonbusiness Sector Price and Quantity Aggregates, 1961-2011

Year	Q _B	Q _N	Q _G	Q _{GN}	P _B	P _N	P _G	P _{GN}
	Quantity Series				Price Series			
	Business sector	Nonbusiness Sector	Government Final Demand	Net Sales of Business Sector to the Nonbusiness Sector	Business Sector	Nonbusiness Sector	Government Final Demand	Net Sales of Business Sector to the Nonbusiness Sector
	(millions, 1961 dollars)				index, 1961=1.000)			
1961	33,097	5,204	6,624	1,420	1.000	1.000	1.000	1.000
1962	35,338	5,480	6,928	1,447	1.009	1.039	1.029	0.994
1963	37,217	5,713	7,164	1,447	1.030	1.082	1.060	0.976
1964	39,810	5,952	7,542	1,596	1.049	1.142	1.098	0.927
1965	42,658	6,120	7,883	1,798	1.076	1.215	1.152	0.912
1966	45,529	6,409	8,581	2,320	1.122	1.345	1.243	0.883
1967	46,616	6,870	9,334	2,684	1.161	1.457	1.328	0.891
1968	49,335	7,263	9,944	2,950	1.193	1.548	1.416	0.961
1969	51,965	7,585	10,376	3,068	1.235	1.713	1.538	0.968
1970	52,968	7,962	11,287	3,858	1.294	1.841	1.643	1.006
1971	55,844	8,255	11,631	3,885	1.336	1.960	1.759	1.103
1972	59,086	8,549	11,995	3,942	1.403	2.128	1.893	1.144
1973	63,467	8,887	12,559	4,247	1.549	2.312	2.049	1.221
1974	65,346	9,295	13,357	4,819	1.796	2.658	2.339	1.358
1975	65,545	9,790	14,251	5,397	2.038	3.053	2.660	1.484
1976	70,082	10,097	14,525	5,254	2.176	3.453	2.995	1.643
1977	72,425	10,348	15,205	5,964	2.327	3.739	3.246	1.787
1978	74,875	10,644	15,473	5,833	2.515	3.969	3.457	1.929
1979	77,878	10,805	15,635	5,796	2.801	4.292	3.776	2.185
1980	79,169	11,138	16,169	6,062	3.130	4.668	4.149	2.489
1981	81,847	11,496	16,441	5,845	3.402	5.229	4.650	2.794
1982	78,970	11,693	16,767	6,019	3.660	5.836	5.185	3.106
1983	81,077	11,952	17,045	5,998	3.895	6.123	5.481	3.374
1984	86,041	12,198	17,222	5,838	4.039	6.373	5.695	3.486
1985	90,944	12,471	17,959	6,539	4.139	6.580	5.906	3.672
1986	93,580	12,708	18,283	6,635	4.199	6.813	6.094	3.742
1987	97,824	12,840	18,525	6,789	4.384	7.172	6.363	3.797
1988	102,723	13,057	19,370	7,814	4.581	7.531	6.604	3.786
1989	105,427	13,224	19,903	8,423	4.756	8.034	6.957	3.826
1990	106,128	13,541	20,605	9,043	4.852	8.602	7.349	3.864
1991	104,194	13,849	21,208	9,508	4.906	9.019	7.650	3.926
1992	105,171	14,045	21,414	9,458	4.922	9.362	7.882	3.944
1993	108,151	14,150	21,422	9,223	4.977	9.509	7.990	3.970
1994	113,766	14,218	21,156	8,537	5.083	9.559	8.111	4.179
1995	117,124	14,279	21,034	8,165	5.236	9.620	8.199	4.299
1996	119,744	14,025	20,786	8,263	5.340	9.728	8.234	4.202
1997	125,797	13,787	20,579	8,414	5.402	9.954	8.346	4.103
1998	131,475	13,890	21,240	9,511	5.374	10.075	8.442	4.140
1999	139,515	14,320	21,687	9,380	5.475	10.182	8.579	4.290
2000	147,808	14,614	22,356	10,022	5.712	10.652	8.950	4.432
2001	149,733	14,926	23,229	11,040	5.808	10.886	9.114	4.459
2002	153,895	15,241	23,802	11,443	5.826	11.297	9.429	4.567
2003	156,933	15,608	24,551	12,088	6.026	11.737	9.711	4.569
2004	162,130	15,921	25,044	12,331	6.237	11.937	9.878	4.651
2005	167,081	16,154	25,398	12,484	6.464	12.416	10.232	4.749
2006	171,718	16,519	26,169	13,197	6.640	12.963	10.608	4.810
2007	175,499	17,001	26,882	13,469	6.860	13.345	10.922	4.954
2008	176,113	17,640	28,064	14,353	7.192	13.754	11.259	5.111
2009	169,030	18,080	29,074	15,394	6.978	14.190	11.617	5.273
2010	175,238	18,467	29,786	15,922	7.180	14.500	11.870	5.388
2011	180,295	18,735	30,020	15,718	7.417	14.957	12.244	5.558
Compound Annual Growth Rates, per cent								
1961-2011	3.45	2.60	3.07	4.93	4.09	5.56	5.14	3.49
2000-2011	1.82	2.28	2.72	4.18	2.40	3.13	2.89	2.08
1961-1973	5.58	4.56	5.48	9.56	3.71	7.23	6.16	1.68
1973-1981	3.23	3.27	3.42	4.07	10.33	10.74	10.79	10.90
1981-1989	3.22	1.77	2.42	4.67	4.28	5.51	5.16	4.01
1989-2000	3.12	0.91	1.06	1.59	1.68	2.60	2.32	1.35
2000-2008	2.21	2.38	2.88	4.59	2.92	3.25	2.91	1.80
2008-2011	0.79	2.03	2.27	3.07	1.03	2.83	2.84	2.83

Appendix Table 5

Price Indexes for Eight Commodity Classes of Exports, 1961-2011

	P ₈	P ₉	P ₁₀	P ₁₁	P ₁₂	P ₁₃	P ₁₄	P ₁₅
	Agricultural and Fish Products	Energy Products	Forest Products	Industrial Goods and Materials (excluding energy and forest products)	Machinery and Equipment (excluding automotive products)	Automotive Products	Other Consumer Goods (excluding automotive products)	Services
Year	(index, 1961=1.000)							
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.057	0.985	1.037	1.020	1.035	1.012	0.999	1.019
1963	1.053	1.011	1.050	1.027	1.046	1.028	1.009	1.044
1964	1.061	0.999	1.069	1.043	1.065	1.038	1.029	1.077
1965	1.076	1.019	1.087	1.068	1.090	1.036	1.037	1.122
1966	1.139	1.024	1.108	1.124	1.129	1.050	1.059	1.184
1967	1.154	0.965	1.129	1.153	1.176	1.066	1.076	1.268
1968	1.149	1.005	1.158	1.227	1.252	1.088	1.104	1.346
1969	1.110	1.053	1.211	1.265	1.281	1.099	1.147	1.413
1970	1.075	1.067	1.204	1.340	1.365	1.122	1.140	1.501
1971	1.103	1.123	1.247	1.289	1.372	1.152	1.156	1.579
1972	1.166	1.156	1.346	1.302	1.417	1.174	1.185	1.665
1973	1.656	1.391	1.617	1.495	1.468	1.187	1.260	1.790
1974	2.476	3.445	1.980	1.941	1.650	1.279	1.422	2.023
1975	2.442	4.392	2.317	2.105	1.862	1.403	1.566	2.295
1976	2.275	5.079	2.394	2.227	1.906	1.488	1.667	2.519
1977	2.136	5.890	2.625	2.509	2.028	1.616	1.768	2.729
1978	2.377	6.283	2.902	2.771	2.116	1.782	1.883	2.903
1979	2.890	8.053	3.477	3.537	2.274	1.966	2.001	3.146
1980	3.284	11.287	3.738	4.451	2.414	2.177	2.249	3.497
1981	3.569	12.197	3.965	4.550	2.555	2.414	2.497	3.947
1982	3.467	12.362	3.853	4.319	2.723	2.633	2.670	4.341
1983	3.393	11.855	3.836	4.352	2.753	2.738	2.804	4.664
1984	3.530	11.842	4.263	4.455	2.693	2.905	2.887	4.873
1985	3.515	11.152	4.325	4.412	2.683	3.130	3.003	5.133
1986	3.436	7.754	4.780	4.597	2.978	3.015	3.287	5.404
1987	3.324	7.556	5.203	4.732	3.020	3.023	3.407	5.594
1988	3.494	6.356	5.363	5.057	3.043	2.911	3.520	5.727
1989	3.731	6.872	5.596	5.033	3.068	2.870	3.718	5.932
1990	3.477	7.847	5.244	4.749	3.116	2.880	3.740	6.082
1991	3.147	6.822	4.698	4.454	3.072	2.968	3.826	6.292
1992	3.488	7.073	4.845	4.474	3.063	3.152	3.830	6.332
1993	3.719	7.475	5.372	4.530	3.098	3.354	3.892	6.517
1994	3.964	7.254	6.186	5.119	3.173	3.524	3.999	6.667
1995	4.410	7.110	7.365	5.721	3.220	3.658	4.098	6.884
1996	4.716	8.770	6.806	5.328	3.183	3.747	4.169	7.037
1997	4.461	9.008	6.779	5.289	3.123	3.838	4.198	7.220
1998	4.384	7.352	7.029	5.133	3.132	4.057	4.260	7.346
1999	4.319	9.260	7.128	5.034	3.088	4.037	4.317	7.462
2000	4.375	15.289	7.165	5.392	3.069	4.028	4.363	7.725
2001	4.626	15.720	7.302	5.320	3.092	4.172	4.439	7.748
2002	4.634	13.379	6.823	5.269	3.106	4.211	4.465	7.872
2003	4.532	16.642	6.336	5.248	2.980	3.845	4.474	7.936
2004	4.469	18.363	6.823	5.799	2.920	3.670	4.487	8.100
2005	4.148	23.473	6.447	6.118	2.875	3.462	4.512	8.295
2006	4.094	22.976	6.086	6.857	2.827	3.312	4.540	8.448
2007	4.377	23.072	5.718	7.408	2.792	3.166	4.549	8.589
2008	5.176	31.124	5.839	7.884	2.815	3.245	4.563	9.000
2009	4.746	20.280	5.491	7.079	2.943	3.460	4.653	9.047
2010	4.518	22.396	5.677	7.764	2.842	3.231	4.651	9.114
2011	5.116	25.917	5.666	8.776	2.839	3.190	4.680	9.397
Compound Annual Growth Rates, per cent								
1961-2011	3.32	6.73	3.53	4.44	2.11	2.35	3.13	4.58
2000-2011	1.43	4.91	-2.11	4.53	-0.71	-2.10	0.64	1.80
1961-1973	4.29	2.79	4.09	3.41	3.25	1.44	1.94	4.97
1973-1981	10.07	31.18	11.86	14.93	7.17	9.28	8.93	10.39
1981-1989	0.56	-6.92	4.40	1.27	2.31	2.19	5.10	5.22
1989-2000	1.46	7.54	2.27	0.63	0.00	3.13	1.46	2.43
2000-2008	2.12	9.29	-2.53	4.86	-1.07	-2.67	0.56	1.93
2008-2011	-0.39	-5.92	-1.00	3.64	0.28	-0.57	0.85	1.45

Appendix Table 6

Quantity Aggregates for Eight Commodity Classes of Exports, 1961-2011

Year	Q ₈	Q ₉	Q ₁₀	Q ₁₁	Q ₁₂	Q ₁₃	Q ₁₄	Q ₁₅
	Agricultural and Fish Products	Energy Products	Forest Products	Industrial Goods and Materials (excluding energy and forest products)	Machinery and Equipment (excluding automotive products)	Automotive Products	Other Consumer Goods (excluding automotive products)	Services
	(millions, 1961 dollars)							
1961	1,432	252	1,574	2,057	402	50	64	1,036
1962	1,329	364	1,593	2,130	512	63	78	1,132
1963	1,572	364	1,685	2,243	582	94	91	1,204
1964	1,964	409	1,835	2,532	793	188	102	1,286
1965	1,799	426	1,870	2,721	791	348	112	1,360
1966	1,954	484	1,965	2,809	911	986	136	1,492
1967	1,613	579	1,928	2,998	1,147	1,620	147	1,865
1968	1,590	657	2,127	3,283	1,240	2,534	183	1,499
1969	1,493	757	2,291	3,091	1,378	3,182	215	1,657
1970	1,968	951	2,339	3,676	1,437	3,138	236	1,767
1971	2,168	1,154	2,374	3,611	1,437	3,614	243	1,747
1972	2,269	1,480	2,662	3,708	1,663	4,002	271	1,721
1973	2,217	1,790	2,826	4,086	1,951	4,539	320	1,893
1974	1,778	1,508	2,810	3,986	2,089	4,431	324	2,095
1975	1,880	1,216	2,186	3,513	2,165	4,555	290	1,998
1976	2,048	978	2,718	3,824	2,326	5,499	311	2,049
1977	2,445	920	3,001	3,955	2,345	6,388	338	2,052
1978	2,525	938	3,313	4,281	2,915	6,954	405	2,273
1979	2,538	1,102	3,370	4,293	3,881	6,004	507	2,556
1980	2,786	952	3,287	4,634	4,469	5,002	571	2,658
1981	2,924	950	3,127	4,529	4,810	5,586	548	2,738
1982	3,143	1,010	2,962	4,134	4,587	6,388	525	2,508
1983	3,256	1,079	3,284	4,170	4,413	7,748	547	2,535
1984	3,300	1,210	3,501	4,965	5,762	10,115	652	2,685
1985	2,979	1,461	3,545	5,179	6,361	10,539	666	2,839
1986	3,178	1,417	3,709	5,607	6,826	10,494	767	3,254
1987	3,566	1,701	4,031	5,791	6,884	10,541	776	3,295
1988	3,527	2,009	4,025	6,316	7,121	11,928	799	3,546
1989	3,102	1,997	3,836	6,413	7,810	11,839	709	3,704
1990	3,831	1,779	3,878	6,765	9,260	12,042	895	3,857
1991	4,169	2,068	3,958	7,016	9,537	10,950	908	3,893
1992	4,397	2,185	4,132	7,238	10,413	12,087	1,167	4,157
1993	4,343	2,375	4,352	7,774	11,895	14,491	1,441	4,519
1994	4,746	2,647	4,709	8,302	14,403	16,350	1,776	5,093
1995	4,754	2,868	4,989	8,896	17,402	17,200	2,030	5,396
1996	4,913	2,971	5,073	9,822	19,457	16,913	2,279	5,851
1997	5,554	3,017	5,178	10,709	22,070	18,100	2,555	6,264
1998	5,712	3,239	5,042	11,526	25,770	19,342	2,950	7,085
1999	5,930	3,226	5,623	11,889	28,713	24,098	3,240	7,400
2000	6,309	3,477	5,970	12,609	35,854	24,300	3,484	7,937
2001	6,718	3,548	5,517	12,744	33,170	22,176	3,674	7,967
2002	6,662	3,687	5,459	13,318	31,257	22,958	3,960	8,276
2003	6,450	3,637	5,448	12,730	29,761	22,728	3,842	7,983
2004	6,864	3,709	5,777	13,443	31,201	24,629	3,848	8,269
2005	7,256	3,703	5,653	13,762	32,346	25,419	3,801	8,345
2006	7,697	3,778	5,495	13,739	32,989	24,756	3,923	8,300
2007	7,937	3,957	5,119	14,144	33,463	24,325	4,119	8,335
2008	7,894	4,040	4,343	14,121	32,756	18,847	3,982	8,257
2009	7,847	3,937	3,556	11,180	27,240	12,664	3,854	7,758
2010	8,176	4,058	3,849	12,429	26,771	17,572	3,532	8,042
2011	8,022	4,327	3,951	13,322	28,392	18,592	3,494	8,243
Compound Annual Growth Rates, per cent								
1961-2011	3.51	5.85	1.86	3.81	8.89	12.56	8.34	4.24
2000-2011	2.21	2.01	-3.68	0.50	-2.10	-2.40	0.03	0.34
1961-1973	3.71	17.73	5.00	5.88	14.06	45.58	14.39	5.15
1973-1981	3.52	-7.61	1.27	1.30	11.94	2.63	6.97	4.72
1981-1989	0.74	9.73	2.59	4.44	6.25	9.84	3.27	3.85
1989-2000	6.67	5.17	4.10	6.34	14.86	6.76	15.57	7.17
2000-2008	2.84	1.89	-3.90	1.43	-1.12	-3.13	1.68	0.50
2008-2011	0.54	2.32	-3.10	-1.92	-4.65	-0.45	-4.26	-0.06

Appendix Table 7

Price Indexes for Seven Commodity Classes of Imports, 1961-2011

	P ₁₆	P ₁₇	P ₁₈	P ₁₉	P ₂₀	P ₂₁	P ₂₂
	Agricultural and Fish Products	Energy Products	Industrial goods and Materials (including imports of forest products but excluding imports of energy products)	Machinery and Equipment (excluding automotive products)	Automotive Products	Other Consumer Goods	Services
Year	(index, 1961=1.000)						
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.037	1.029	1.044	1.086	1.052	1.001	1.052
1963	1.300	1.010	1.082	1.093	1.070	1.010	1.079
1964	1.284	1.005	1.109	1.099	1.094	1.025	1.098
1965	1.080	1.025	1.137	1.131	1.076	1.030	1.136
1966	1.060	1.054	1.141	1.161	1.093	1.045	1.170
1967	1.031	0.990	1.170	1.195	1.123	1.062	1.226
1968	1.067	1.048	1.161	1.213	1.160	1.080	1.288
1969	1.079	1.006	1.194	1.237	1.189	1.104	1.369
1970	1.142	1.016	1.206	1.237	1.201	1.109	1.429
1971	1.172	1.117	1.173	1.267	1.240	1.115	1.499
1972	1.259	1.203	1.169	1.280	1.270	1.158	1.540
1973	1.558	1.435	1.308	1.330	1.296	1.216	1.633
1974	1.932	4.222	1.712	1.466	1.407	1.338	1.751
1975	2.032	5.434	1.889	1.721	1.635	1.492	1.981
1976	1.898	5.634	1.904	1.719	1.715	1.558	2.044
1977	2.299	6.421	2.140	1.854	1.932	1.754	2.341
1978	2.578	7.148	2.499	1.893	2.210	2.013	2.698
1979	2.916	9.229	3.055	2.022	2.444	2.239	3.042
1980	3.205	14.045	3.569	1.798	2.718	2.566	3.393
1981	3.370	16.895	3.723	1.685	3.264	2.813	3.816
1982	3.249	16.654	3.761	1.808	3.525	2.913	4.104
1983	3.195	15.354	3.788	1.750	3.624	2.958	4.308
1984	3.446	15.577	3.975	1.818	3.824	3.224	4.638
1985	3.368	16.060	3.933	1.852	4.026	3.348	4.989
1986	3.615	10.456	4.047	1.880	4.202	3.599	5.293
1987	3.540	10.916	4.061	1.795	4.157	3.631	5.289
1988	3.630	9.091	4.209	1.736	4.035	3.638	5.093
1989	3.597	9.696	4.232	1.702	4.089	3.671	5.094
1990	3.597	11.945	4.174	1.683	4.164	3.725	5.249
1991	3.587	10.193	4.036	1.653	4.127	3.752	5.317
1992	3.592	10.162	4.125	1.712	4.395	3.969	5.634
1993	3.666	9.840	4.312	1.818	4.681	4.280	6.198
1994	3.978	9.836	4.638	1.912	4.991	4.580	6.682
1995	4.253	10.177	5.092	1.892	5.157	4.756	6.902
1996	4.212	11.943	4.913	1.805	5.198	4.735	7.013
1997	4.366	11.847	4.944	1.780	5.261	4.789	7.261
1998	4.356	9.765	5.093	1.831	5.517	5.119	7.802
1999	4.242	11.435	5.014	1.793	5.521	5.137	7.975
2000	4.247	16.953	5.212	1.763	5.524	5.179	8.185
2001	4.395	16.323	5.394	1.796	5.670	5.409	8.646
2002	4.453	16.808	5.333	1.794	5.734	5.422	8.846
2003	4.290	18.583	5.019	1.600	5.396	4.924	8.396
2004	4.190	21.359	5.209	1.480	5.214	4.590	8.241
2005	4.094	27.042	5.296	1.390	5.003	4.409	8.158
2006	3.986	30.135	5.508	1.322	4.849	4.227	8.132
2007	4.095	30.847	5.398	1.260	4.631	4.036	8.098
2008	4.484	40.536	5.902	1.276	4.591	4.143	8.408
2009	4.654	27.569	5.704	1.389	4.842	4.528	8.660
2010	4.390	32.838	5.634	1.257	4.645	4.200	8.200
2011	4.501	40.354	5.974	1.209	4.560	4.180	8.211
Compound Annual Growth Rates, per cent							
1961-2011	3.05	7.68	3.64	0.38	3.08	2.90	4.30
2000-2011	0.53	8.20	1.25	-3.37	-1.73	-1.93	0.03
1961-1973	3.76	3.06	2.26	2.40	2.18	1.64	4.17
1973-1981	10.12	36.10	13.97	3.00	12.24	11.05	11.19
1981-1989	0.82	-6.71	1.61	0.13	2.86	3.38	3.68
1989-2000	1.52	5.21	1.91	0.32	2.77	3.18	4.41
2000-2008	0.68	11.51	1.57	-3.96	-2.29	-2.75	0.34
2008-2011	0.13	-0.15	0.40	-1.78	-0.23	0.30	-0.79

Appendix Table 8

Quantity Aggregates for Seven Commodity Classes of Imports, 1961-2011

	Q ₁₆	Q ₁₇	Q ₁₈	Q _{19t}	Q ₂₀	Q ₂₁	Q ₂₂
	Agricultural and Fish Products	Energy Products	Industrial goods and Materials (including imports of forest products but excluding imports of energy products)	Machinery and Equipment (excluding automotive products)	Automotive Products	Other Consumer Goods	Services
Year	(millions, 1961 dollars)						
1961	720	478	1,617	1,609	615	659	1,535
1962	735	481	1,684	1,572	699	710	1,480
1963	687	542	1,707	1,563	707	699	1,467
1964	709	548	1,955	1,829	857	736	1,619
1965	817	583	2,170	2,099	1,157	829	1,693
1966	898	593	2,331	2,471	1,573	933	1,850
1967	950	639	2,210	2,690	1,964	970	1,935
1968	986	686	2,384	2,741	2,650	1,084	2,014
1969	1,129	738	2,668	3,079	3,031	1,277	2,337
1970	1,119	766	2,659	3,102	2,759	1,276	2,472
1971	1,131	817	2,937	3,246	3,249	1,443	2,476
1972	1,245	896	3,371	3,891	3,819	1,758	2,586
1973	1,421	928	3,656	4,694	4,619	2,033	2,888
1974	1,464	789	4,146	5,558	4,931	2,310	3,278
1975	1,465	766	3,559	5,272	4,955	2,258	3,550
1976	1,696	720	3,652	5,411	5,417	2,621	3,971
1977	1,614	654	3,637	5,518	5,865	2,573	3,883
1978	1,637	626	3,933	6,688	5,919	2,612	3,824
1979	1,622	625	4,443	8,152	6,097	2,752	3,637
1980	1,680	599	4,299	10,726	4,900	2,637	3,760
1981	1,744	574	4,514	13,412	4,800	2,722	3,860
1982	1,674	405	3,624	10,470	4,129	2,527	3,595
1983	1,736	336	4,178	11,847	5,142	2,822	3,690
1984	1,896	394	4,781	14,574	6,668	3,159	3,775
1985	1,915	395	5,291	15,289	7,684	3,110	3,905
1986	2,000	486	5,568	16,643	7,845	3,327	4,268
1987	2,088	542	5,616	18,560	7,844	3,490	4,536
1988	2,082	569	6,380	23,461	8,226	3,730	5,185
1989	2,295	642	6,684	25,439	7,813	4,092	5,793
1990	2,430	686	6,624	25,497	7,319	4,256	6,406
1991	2,510	650	6,419	25,942	7,502	4,428	6,664
1992	2,710	637	6,950	27,260	7,664	4,773	6,739
1993	3,005	708	7,822	29,208	8,533	4,993	6,865
1994	3,162	708	8,839	34,377	9,583	5,118	6,755
1995	3,145	711	9,349	40,020	9,713	5,371	6,763
1996	3,356	804	9,851	42,310	9,832	5,457	7,111
1997	3,585	897	11,520	51,315	11,562	6,215	7,375
1998	3,961	884	12,330	55,221	12,105	6,754	7,367
1999	4,162	936	12,947	60,379	13,754	7,203	7,684
2000	4,369	1,053	13,875	69,709	14,017	7,747	8,114
2001	4,635	1,087	13,221	62,337	12,799	7,931	7,954
2002	4,890	986	13,506	59,066	14,208	8,572	8,091
2003	5,014	1,066	13,605	61,665	14,176	9,404	8,831
2004	5,107	1,160	14,720	70,313	14,840	10,397	9,363
2005	5,384	1,245	15,423	79,792	15,667	11,225	9,858
2006	5,888	1,153	15,840	86,790	16,465	12,303	10,247
2007	6,236	1,209	16,365	92,508	17,264	13,574	11,036
2008	6,359	1,312	16,086	96,094	15,674	13,905	11,284
2009	6,306	1,231	13,579	77,689	11,426	12,704	10,537
2010	6,738	1,235	15,900	90,579	14,794	13,755	11,564
2011	7,250	1,289	16,827	103,132	15,631	14,263	12,283
Compound Annual Growth Rates, per cent							
1961-2011	4.73	2.00	4.80	8.68	6.68	6.34	4.25
2000-2011	4.71	1.86	1.77	3.62	1.00	5.71	3.84
1961-1973	5.82	5.69	7.03	9.33	18.30	9.84	5.41
1973-1981	2.59	-5.84	2.67	14.02	0.48	3.71	3.69
1981-1989	3.50	1.41	5.03	8.33	6.28	5.23	5.20
1989-2000	6.03	4.61	6.87	9.60	5.46	5.97	3.11
2000-2008	4.80	2.78	1.86	4.09	1.41	7.59	4.21
2008-2011	4.46	-0.58	1.51	2.38	-0.09	0.85	2.87

Appendix Table 9
Price Indexes for 12 Types of Business Sector Labour

Year	P _{L1}	P _{L2}	P _{L3}	P _{L4}	P _{L5}	P _{L6}	P _{L7}	P _{L8}	P _{L9}	P _{L10}	P _{L11}	P _{L12}
	Primary or Secondary Education				Some or Completed Non-University Post-Secondary Education				Completed University Degrees or Above			
	Paid Worker		Self Employed		Paid Worker		Self Employed		Paid Worker		Self Employed	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
(index, 1961=1.000)												
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.009	1.015	1.220	1.161	1.192	1.262	1.307	1.397	1.024	1.067	1.005	1.224
1963	1.043	1.040	1.254	1.186	1.251	1.299	1.370	1.410	1.067	1.104	1.028	1.269
1964	1.089	1.073	1.303	1.220	1.280	1.310	1.403	1.372	1.117	1.166	1.062	1.238
1965	1.163	1.136	1.454	1.313	1.323	1.351	1.517	1.403	1.192	1.217	1.134	1.239
1966	1.250	1.210	1.532	1.366	1.371	1.400	1.529	1.389	1.292	1.269	1.207	1.237
1967	1.352	1.269	1.605	1.420	1.418	1.427	1.564	1.405	1.372	1.330	1.280	1.257
1968	1.450	1.340	1.748	1.503	1.461	1.466	1.623	1.433	1.474	1.471	1.365	1.279
1969	1.580	1.445	1.864	1.595	1.529	1.543	1.674	1.494	1.596	1.550	1.521	1.384
1970	1.699	1.524	1.985	1.667	1.581	1.592	1.698	1.531	1.697	1.583	1.643	1.479
1971	1.815	1.658	2.047	2.208	1.760	1.776	1.888	1.910	1.630	1.675	1.659	1.617
1972	1.975	1.838	2.232	2.884	1.915	1.953	2.082	2.344	1.618	1.720	1.724	1.807
1973	2.183	2.022	2.531	3.762	2.072	2.100	2.325	2.873	1.632	1.697	1.821	2.051
1974	2.560	2.349	2.968	4.935	2.356	2.376	2.610	3.519	1.786	1.824	2.028	2.362
1975	3.024	2.694	3.390	6.162	2.677	2.666	2.833	4.177	1.974	1.968	2.375	2.811
1976	3.549	3.110	4.103	7.942	3.002	2.970	3.174	5.060	2.144	2.083	2.578	3.234
1977	3.931	3.493	4.573	9.745	3.228	3.240	3.412	5.926	2.162	2.125	2.835	3.729
1978	4.082	3.731	4.807	11.025	3.348	3.472	3.485	6.542	2.360	2.380	2.953	4.161
1979	4.352	4.069	4.980	12.540	3.570	3.809	3.516	7.230	2.609	2.694	3.055	4.600
1980	4.771	4.468	5.519	15.104	3.943	4.357	3.862	9.051	2.800	3.039	3.391	5.648
1981	5.378	4.968	5.725	15.287	4.396	4.865	3.970	9.416	3.500	3.813	3.872	6.759
1982	6.132	5.431	5.539	14.450	4.943	5.267	3.942	9.761	3.711	3.770	4.361	7.164
1983	6.109	5.785	5.251	14.691	5.227	5.924	3.979	10.766	4.036	4.325	4.416	8.137
1984	6.496	6.279	5.706	16.817	5.324	6.144	4.003	11.987	4.267	4.593	4.708	8.749
1985	6.842	6.431	5.969	17.752	5.712	6.378	4.118	12.404	4.585	4.630	5.028	9.134
1986	6.878	6.754	6.995	22.097	5.759	6.776	4.643	14.567	4.842	5.254	5.105	10.417
1987	7.283	7.124	6.260	20.249	5.918	7.068	4.324	13.700	4.873	5.376	5.328	10.414
1988	7.810	7.520	7.819	25.535	6.328	7.467	5.074	16.155	5.088	5.550	5.584	10.910
1989	8.011	7.892	7.004	23.632	6.544	7.896	4.772	15.506	6.094	6.820	5.958	12.040
1990	8.010	7.842	7.246	24.708	7.292	8.273	5.305	17.186	6.395	7.383	5.930	13.332
1991	8.163	8.301	6.893	26.891	7.547	8.890	5.108	18.397	7.285	8.505	5.956	14.575
1992	8.257	8.751	6.803	31.148	7.632	9.545	5.035	20.702	7.233	9.002	5.597	16.128
1993	8.445	8.815	7.023	31.951	7.551	9.488	4.827	20.498	7.141	8.519	5.309	14.649
1994	8.398	8.853	6.577	32.818	7.563	9.516	4.637	20.035	6.886	8.250	5.032	14.520
1995	8.584	8.667	8.097	36.590	7.743	9.717	5.297	22.461	7.086	7.783	5.002	14.271
1996	8.668	8.796	8.801	36.731	7.683	9.762	5.361	21.294	7.197	9.357	4.796	15.722
1997	8.925	9.042	8.237	33.228	7.930	10.019	5.487	20.198	8.168	9.701	4.356	13.636
1998	9.196	9.221	8.650	32.616	8.181	10.285	5.606	19.544	8.563	10.132	4.492	13.415
1999	9.344	9.399	9.545	35.034	8.382	10.410	5.989	20.542	8.945	10.484	4.668	13.889
2000	9.832	9.858	10.141	36.745	8.753	10.987	6.564	22.646	9.324	10.997	5.118	15.164
2001	10.021	10.040	9.554	36.529	9.027	11.346	6.422	23.059	9.714	11.511	5.577	17.260
2002	10.138	10.186	9.533	36.988	9.147	11.477	6.496	23.964	9.975	11.770	6.064	17.780
2003	10.390	10.457	9.469	37.826	9.367	11.777	6.531	24.565	9.998	11.990	6.038	18.525
2004	10.725	10.822	9.897	38.532	9.567	12.286	6.689	24.623	10.295	12.364	6.162	18.088
2005	11.335	11.487	10.350	43.423	9.983	12.708	7.027	27.600	10.568	12.682	6.351	19.490
2006	11.927	11.871	11.189	40.929	10.466	13.339	7.309	25.304	11.211	13.405	6.141	18.436
2007	12.235	12.248	12.142	42.611	10.870	13.902	7.938	26.417	11.457	13.741	6.386	18.342
2008	12.610	12.590	12.475	43.633	11.204	14.114	8.263	26.351	11.781	13.824	6.501	18.423
2009	12.686	13.015	12.785	44.922	11.316	14.626	8.327	27.479	11.881	14.406	6.737	19.011
2010	12.991	13.565	13.343	46.131	11.437	14.916	8.435	27.282	11.876	14.508	6.529	19.098
2011	13.269	14.160	14.355	48.387	11.681	15.570	9.075	28.616	12.130	15.144	7.024	20.031
Compound Annual Growth Rates, per cent												
1961-2011	5.31	5.44	5.47	8.07	5.04	5.64	4.51	6.94	5.12	5.59	3.98	6.18
2000-2011	2.76	3.35	3.21	2.53	2.66	3.22	2.99	2.15	2.42	2.95	2.92	2.56
1961-1973	6.72	6.04	8.05	11.67	6.26	6.38	7.28	9.19	4.17	4.51	5.12	6.17
1973-1981	11.93	11.89	10.74	19.16	9.86	11.07	6.92	16.00	10.01	10.65	9.89	16.08
1981-1989	5.11	5.96	2.55	5.60	5.10	6.24	2.33	6.43	7.18	7.54	5.53	7.48
1989-2000	1.88	2.04	3.42	4.09	2.68	3.05	2.94	3.50	3.94	4.44	-1.37	2.12
2000-2008	3.16	3.10	2.62	2.17	3.13	3.18	2.92	1.91	2.97	2.90	3.04	2.46
2008-2011	1.71	4.00	4.79	3.51	1.40	3.33	3.17	2.79	0.98	3.09	2.61	2.83

Appendix Table 10

Quantity Aggregates for 12 Types of Business Sector Labour, 1961-2011

Year	Q _{L1}	Q _{L2}	Q _{L3}	Q _{L4}	Q _{L5}	Q _{L6}	Q _{L7}	Q _{L8}	Q _{L9}	Q _{L10}	Q _{L11}	Q _{L12}
	Primary or Secondary Education				Some or Completed Non-University Post-Secondary Education				Completed University Degrees or Above			
	Paid Worker		Self Employed		Paid Worker		Self Employed		Paid Worker		Self Employed	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	(millions, 1961 dollars)											
1961	12,608	2,758	1,738	46	554	66	91	2	768	55	550	3
1962	12,796	2,835	1,678	48	934	144	114	5	809	65	567	4
1963	12,687	2,885	1,617	49	1,296	220	136	7	833	75	568	5
1964	12,847	2,985	1,578	50	1,683	299	161	9	877	83	594	6
1965	13,189	3,095	1,443	48	2,103	381	177	10	930	93	611	7
1966	13,433	3,203	1,469	49	2,544	463	212	13	991	104	673	8
1967	13,218	3,308	1,413	52	2,902	546	232	15	1,030	113	674	9
1968	12,944	3,359	1,287	52	3,228	621	239	17	1,053	118	641	9
1969	12,860	3,440	1,260	52	3,591	703	265	18	1,095	125	658	10
1970	12,573	3,458	1,159	51	3,889	771	280	20	1,119	133	679	11
1971	12,353	3,494	1,124	53	4,283	868	306	22	1,227	162	705	13
1972	12,268	3,595	1,047	50	4,729	982	326	23	1,362	194	689	15
1973	12,606	3,795	1,002	47	5,349	1,124	345	23	1,538	233	640	16
1974	12,550	3,892	1,006	49	5,832	1,241	389	26	1,676	265	678	19
1975	11,964	3,936	967	49	6,073	1,338	418	28	1,761	293	684	21
1976	11,575	3,947	902	47	6,367	1,415	434	30	1,839	316	618	21
1977	11,384	3,920	831	47	6,742	1,489	441	31	1,947	334	647	24
1978	11,430	4,091	805	50	7,297	1,618	486	35	2,090	365	695	28
1979	11,653	4,340	793	51	8,031	1,792	539	38	2,322	409	729	31
1980	11,511	4,591	724	47	8,557	1,955	540	39	2,502	448	752	35
1981	11,494	4,662	757	48	8,773	2,132	566	39	2,689	524	729	37
1982	10,533	4,404	741	48	8,162	2,144	547	41	2,544	535	780	43
1983	10,446	4,329	748	49	8,190	2,219	550	44	2,535	556	834	51
1984	10,597	4,385	756	50	8,473	2,389	568	48	2,701	627	945	68
1985	10,820	4,437	848	53	8,835	2,543	634	55	2,858	693	1,035	76
1986	11,039	4,634	794	48	9,253	2,761	620	51	3,111	811	1,042	74
1987	11,435	4,778	790	49	9,820	2,940	643	54	3,376	895	1,046	79
1988	11,663	4,942	792	49	10,315	3,132	664	57	3,650	995	1,112	90
1989	11,739	5,019	795	53	10,626	3,273	693	62	3,851	1,085	1,124	94
1990	11,383	4,984	798	57	10,578	3,402	695	64	4,045	1,110	1,080	85
1991	10,603	4,715	787	56	10,150	3,391	718	64	4,073	1,121	1,135	95
1992	10,216	4,498	779	59	10,019	3,399	703	68	4,184	1,244	1,199	91
1993	10,012	4,310	751	62	10,392	3,503	757	72	4,605	1,369	1,296	115
1994	10,133	4,194	767	61	11,237	3,719	775	88	4,870	1,504	1,335	125
1995	10,070	4,180	736	57	11,929	3,969	822	91	5,053	1,604	1,241	124
1996	10,207	4,145	730	62	12,259	4,153	915	103	5,218	1,716	1,403	138
1997	9,888	4,049	722	58	13,262	4,427	1,025	113	5,511	1,835	1,392	152
1998	9,748	4,183	758	60	13,563	4,665	1,029	119	5,864	1,984	1,540	174
1999	10,128	4,369	719	59	14,000	4,809	1,047	121	6,008	2,189	1,522	161
2000	10,229	4,536	690	55	14,539	4,996	982	115	6,405	2,393	1,479	179
2001	10,138	4,452	628	48	14,730	5,183	945	115	6,722	2,514	1,525	169
2002	10,221	4,519	589	49	15,090	5,259	940	116	6,931	2,538	1,470	170
2003	9,930	4,471	580	47	15,637	5,476	980	116	7,072	2,721	1,563	170
2004	10,119	4,547	588	47	16,144	5,656	991	117	7,538	2,882	1,581	180
2005	10,194	4,455	589	47	16,145	5,582	927	118	7,984	3,194	1,489	187
2006	10,286	4,573	565	45	16,265	5,615	901	115	8,399	3,294	1,603	198
2007	10,256	4,455	567	46	16,713	5,836	967	123	8,773	3,500	1,606	212
2008	10,222	4,448	554	44	16,933	5,906	933	120	8,881	3,641	1,597	202
2009	9,392	4,109	535	44	16,059	5,779	888	123	8,817	3,640	1,539	217
2010	9,507	4,086	509	41	16,812	5,763	890	122	9,143	3,855	1,573	227
2011	9,776	4,111	503	41	17,288	5,799	879	123	9,402	3,879	1,554	230
Compound Annual Growth Rates, per cent												
1961-2011	-0.51	0.80	-2.45	-0.25	7.12	9.38	4.64	8.29	5.14	8.87	2.10	9.06
2000-2011	-0.41	-0.89	-2.83	-2.70	1.59	1.36	-1.00	0.63	3.55	4.49	0.45	2.30
1961-1973	0.00	2.69	-4.49	0.12	20.80	26.72	11.74	21.33	5.96	12.70	1.26	14.67
1973-1981	-1.15	2.61	-3.45	0.31	6.38	8.33	6.37	6.56	7.23	10.69	1.64	11.64
1981-1989	0.26	0.93	0.63	1.12	2.42	5.50	2.55	5.91	4.59	9.52	5.56	12.18
1989-2000	-1.24	-0.91	-1.28	0.44	2.89	3.92	3.23	5.86	4.73	7.45	2.53	6.05
2000-2008	-0.01	-0.24	-2.71	-2.78	1.92	2.11	-0.64	0.50	4.17	5.39	0.97	1.52
2008-2011	-1.47	-2.60	-3.16	-2.47	0.69	-0.61	-1.96	0.96	1.92	2.13	-0.91	4.41

Appendix Table 11

Smoothed Depreciation Rates for 14 Business Sector Reproducible Assets, 1961-2011

Year	δ_1	δ_2	δ_3	δ_4	δ_5	δ_6	δ_7	δ_8	δ_9	δ_{10}	δ_{11}	δ_{12}	δ_{13}	δ_{14}
	Office Furniture	Ag. Machinery	Industrial Machinery	Automobiles	Trucks	Other Transport Equipment	Other Machinery and Equipment	Computers	Telecom Equipment	Software	Industrial Buildings	Comm. Buildings	Inst. Buildings	Engineering Construction
	(depreciation rates)													
1961	0.132	0.278	0.163	0.307	0.230	0.135	0.102	0.279	0.145	0.284	0.074	0.061	0.045	0.066
1962	0.132	0.278	0.163	0.307	0.230	0.135	0.102	0.279	0.145	0.284	0.074	0.061	0.045	0.066
1963	0.131	0.288	0.166	0.314	0.235	0.136	0.102	0.286	0.147	0.284	0.074	0.061	0.045	0.066
1964	0.130	0.297	0.170	0.321	0.241	0.138	0.102	0.292	0.149	0.284	0.075	0.062	0.045	0.067
1965	0.129	0.303	0.174	0.332	0.246	0.142	0.102	0.299	0.151	0.284	0.077	0.062	0.045	0.067
1966	0.130	0.305	0.176	0.345	0.251	0.146	0.101	0.300	0.153	0.284	0.077	0.062	0.045	0.068
1967	0.132	0.303	0.175	0.352	0.257	0.147	0.101	0.301	0.153	0.284	0.077	0.062	0.045	0.068
1968	0.135	0.298	0.173	0.358	0.261	0.148	0.102	0.305	0.153	0.284	0.076	0.062	0.045	0.069
1969	0.137	0.293	0.174	0.364	0.266	0.148	0.102	0.309	0.152	0.284	0.076	0.062	0.045	0.070
1970	0.139	0.294	0.175	0.367	0.271	0.150	0.103	0.316	0.153	0.284	0.077	0.062	0.045	0.071
1971	0.139	0.301	0.176	0.374	0.277	0.152	0.103	0.323	0.154	0.284	0.077	0.062	0.045	0.071
1972	0.137	0.315	0.176	0.394	0.283	0.156	0.102	0.331	0.155	0.284	0.076	0.063	0.045	0.072
1973	0.135	0.331	0.179	0.415	0.289	0.163	0.101	0.339	0.158	0.284	0.077	0.063	0.045	0.072
1974	0.136	0.342	0.180	0.431	0.294	0.169	0.101	0.348	0.161	0.284	0.077	0.064	0.045	0.073
1975	0.140	0.349	0.180	0.435	0.298	0.172	0.101	0.358	0.163	0.284	0.077	0.064	0.045	0.073
1976	0.145	0.349	0.179	0.434	0.301	0.171	0.102	0.372	0.162	0.284	0.077	0.064	0.045	0.074
1977	0.148	0.345	0.179	0.434	0.301	0.172	0.103	0.391	0.160	0.284	0.077	0.064	0.045	0.074
1978	0.152	0.343	0.178	0.442	0.301	0.176	0.105	0.415	0.159	0.284	0.077	0.064	0.045	0.075
1979	0.157	0.343	0.179	0.448	0.300	0.180	0.107	0.443	0.159	0.284	0.078	0.063	0.045	0.076
1980	0.163	0.343	0.181	0.456	0.299	0.183	0.110	0.459	0.160	0.284	0.079	0.063	0.046	0.077
1981	0.169	0.340	0.183	0.457	0.300	0.180	0.113	0.462	0.161	0.284	0.080	0.063	0.046	0.078
1982	0.176	0.338	0.182	0.465	0.301	0.175	0.115	0.463	0.161	0.284	0.079	0.063	0.046	0.079
1983	0.183	0.340	0.180	0.486	0.304	0.173	0.116	0.461	0.160	0.294	0.078	0.063	0.046	0.079
1984	0.192	0.348	0.179	0.508	0.308	0.176	0.119	0.469	0.161	0.303	0.078	0.064	0.046	0.080
1985	0.202	0.354	0.181	0.520	0.314	0.178	0.123	0.482	0.162	0.312	0.078	0.064	0.047	0.081
1986	0.212	0.358	0.184	0.530	0.320	0.179	0.128	0.490	0.164	0.319	0.078	0.064	0.047	0.081
1987	0.220	0.361	0.187	0.552	0.325	0.181	0.133	0.490	0.168	0.326	0.079	0.065	0.047	0.082
1988	0.223	0.364	0.190	0.569	0.328	0.187	0.137	0.486	0.172	0.333	0.079	0.065	0.047	0.082
1989	0.221	0.365	0.192	0.566	0.331	0.190	0.138	0.475	0.177	0.340	0.080	0.065	0.047	0.083
1990	0.217	0.362	0.191	0.531	0.333	0.189	0.138	0.473	0.182	0.345	0.080	0.065	0.048	0.083
1991	0.216	0.354	0.188	0.490	0.335	0.193	0.136	0.482	0.189	0.347	0.080	0.065	0.048	0.083
1992	0.219	0.355	0.186	0.463	0.337	0.193	0.133	0.497	0.196	0.351	0.080	0.064	0.048	0.083
1993	0.223	0.358	0.186	0.450	0.338	0.188	0.131	0.520	0.203	0.359	0.080	0.064	0.048	0.084
1994	0.225	0.355	0.189	0.433	0.340	0.185	0.131	0.541	0.210	0.367	0.081	0.064	0.048	0.085
1995	0.225	0.343	0.192	0.410	0.343	0.190	0.132	0.560	0.219	0.372	0.082	0.065	0.049	0.087
1996	0.229	0.337	0.195	0.384	0.346	0.195	0.134	0.579	0.233	0.377	0.084	0.065	0.049	0.088
1997	0.235	0.338	0.199	0.365	0.349	0.203	0.137	0.596	0.247	0.384	0.085	0.066	0.049	0.090
1998	0.238	0.335	0.202	0.356	0.350	0.210	0.140	0.604	0.263	0.390	0.086	0.066	0.050	0.091
1999	0.238	0.322	0.203	0.352	0.351	0.215	0.144	0.600	0.278	0.394	0.087	0.067	0.050	0.092
2000	0.241	0.308	0.204	0.340	0.353	0.219	0.150	0.581	0.291	0.399	0.088	0.068	0.051	0.094
2001	0.243	0.301	0.204	0.328	0.354	0.219	0.155	0.561	0.297	0.408	0.088	0.071	0.051	0.097
2002	0.247	0.298	0.205	0.322	0.355	0.215	0.159	0.552	0.298	0.417	0.088	0.073	0.052	0.098
2003	0.252	0.297	0.208	0.321	0.357	0.211	0.162	0.557	0.300	0.421	0.088	0.075	0.052	0.099
2004	0.258	0.300	0.213	0.317	0.359	0.214	0.165	0.566	0.303	0.425	0.088	0.077	0.053	0.101
2005	0.263	0.303	0.219	0.314	0.360	0.221	0.169	0.571	0.307	0.427	0.088	0.078	0.054	0.102
2006	0.265	0.307	0.224	0.314	0.359	0.230	0.173	0.568	0.309	0.430	0.088	0.078	0.054	0.104
2007	0.265	0.311	0.227	0.311	0.357	0.237	0.174	0.556	0.311	0.431	0.088	0.078	0.055	0.104
2008	0.262	0.309	0.227	0.302	0.355	0.236	0.173	0.541	0.312	0.427	0.088	0.078	0.055	0.105
2009	0.261	0.304	0.226	0.295	0.353	0.229	0.172	0.535	0.314	0.420	0.089	0.077	0.056	0.105
2010	0.262	0.301	0.227	0.295	0.351	0.228	0.173	0.539	0.318	0.417	0.089	0.077	0.057	0.104
2011	0.262	0.303	0.229	0.296	0.348	0.232	0.175	0.545	0.322	0.417	0.089	0.077	0.057	0.104
Average Depreciation Rates														
1961-2011	0.19	0.32	0.19	0.40	0.31	0.18	0.13	0.45	0.21	0.34	0.08	0.07	0.05	0.08
2001-2011	0.26	0.30	0.22	0.31	0.36	0.22	0.17	0.55	0.31	0.42	0.09	0.08	0.05	0.10
1961-1973	0.13	0.30	0.17	0.35	0.26	0.15	0.10	0.30	0.15	0.28	0.08	0.06	0.04	0.07
1974-1981	0.15	0.34	0.18	0.44	0.30	0.18	0.11	0.41	0.16	0.28	0.08	0.06	0.05	0.07
1982-1989	0.20	0.35	0.18	0.52	0.32	0.18	0.13	0.48	0.17	0.31	0.08	0.06	0.05	0.08
1990-2000	0.23	0.34	0.19	0.42	0.34	0.20	0.14	0.55	0.23	0.37	0.08	0.07	0.05	0.09
2001-2008	0.26	0.30	0.22	0.32	0.36	0.22	0.17	0.56	0.30	0.42	0.09	0.08	0.05	0.10
2009-2011	0.26	0.30	0.23	0.30	0.35	0.23	0.17	0.54	0.32	0.42	0.09	0.08	0.06	0.10

Appendix Table 12

Price Indexes for 19 Capital Stock Components, 1961-2011 (beginning of the year estimates)

Year	P _{K1}	P _{K2}	P _{K3}	P _{K4}	P _{K5}	P _{K6}	P _{K7}	P _{K8}	P _{K9}	P _{K10}	P _{K11}	P _{K12}	P _{K13}	P _{K14}	P _{K15}	P _{K16}	P _{K17}	P _{K18}	P _{K19}
	Office Furniture	Ag. Machinery	Industrial Machinery	Automobiles	Trucks	Other Transport Equipment	Other Machinery and Equipment	Computers	Telecom Equipment	Software	Industrial Buildings	Comml. Buildings	Inst. Buildings	Engineering Construction	Inventory Change	Ag. Land	Business Non-ag. Land	Household Res. Land	Res. Structures
	(index, 1961=1.000)																		
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.011	1.057	1.001	0.973	1.020	1.006	1.029	0.964	0.998	1.000	0.996	0.995	0.994	1.016	1.008	1.040	1.070	1.070	1.005
1963	1.068	1.080	1.040	0.970	1.021	1.006	1.087	1.017	0.983	1.000	1.013	1.012	1.010	1.049	1.010	1.100	1.142	1.131	1.028
1964	1.024	1.083	1.097	0.973	1.041	1.076	1.059	0.997	0.989	1.000	1.027	1.028	1.028	1.088	1.021	1.220	1.230	1.175	1.073
1965	1.051	1.100	1.153	0.967	1.047	1.094	1.108	1.054	1.004	1.000	1.077	1.073	1.072	1.158	1.040	1.360	1.339	1.281	1.134
1966	1.050	1.131	1.178	0.964	1.058	1.116	1.129	1.025	1.025	1.000	1.146	1.146	1.143	1.220	1.063	1.520	1.509	1.402	1.208
1967	1.093	1.180	1.163	0.976	1.073	1.134	1.124	1.052	1.083	1.000	1.194	1.189	1.186	1.274	1.080	1.720	1.721	1.532	1.285
1968	1.099	1.222	1.163	1.002	1.111	1.170	1.107	1.059	1.139	1.000	1.195	1.187	1.180	1.296	1.093	1.900	1.904	1.659	1.314
1969	1.118	1.281	1.203	1.005	1.137	1.229	1.113	1.060	1.194	1.000	1.249	1.243	1.247	1.369	1.118	1.940	2.064	1.857	1.381
1970	1.154	1.307	1.292	1.024	1.163	1.274	1.173	1.082	1.269	1.000	1.311	1.307	1.306	1.440	1.144	1.960	2.308	2.072	1.426
1971	1.229	1.318	1.322	1.042	1.194	1.343	1.245	1.100	1.304	1.000	1.376	1.376	1.386	1.533	1.159	2.000	2.575	2.294	1.532
1972	1.224	1.366	1.370	1.061	1.229	1.403	1.244	1.101	1.374	1.000	1.439	1.485	1.427	1.626	1.212	2.160	2.920	2.627	1.673
1973	1.212	1.415	1.460	1.055	1.266	1.406	1.264	1.112	1.432	1.000	1.671	1.632	1.706	1.763	1.326	2.620	3.378	3.074	1.971
1974	1.281	1.591	1.691	1.123	1.410	1.544	1.438	1.088	1.548	1.000	2.016	1.978	2.001	2.080	1.438	3.420	4.097	3.748	2.361
1975	1.383	1.848	2.017	1.195	1.507	1.743	1.681	1.128	1.698	1.000	2.151	2.231	2.143	2.399	1.559	4.340	5.140	4.453	2.561
1976	1.398	1.956	2.167	1.242	1.609	1.885	1.726	1.006	1.811	1.000	2.252	2.282	2.215	2.627	1.664	5.140	6.113	5.001	2.769
1977	1.393	2.079	2.404	1.349	1.786	2.130	1.833	0.877	1.945	1.000	2.337	2.336	2.337	2.830	1.783	5.920	6.867	5.541	2.878
1978	1.324	2.361	2.723	1.468	1.996	2.375	1.964	0.626	2.330	1.000	2.483	2.442	2.454	3.075	1.941	7.020	7.740	6.221	3.041
1979	1.403	2.681	3.068	1.627	2.245	2.646	2.137	0.548	2.480	1.000	2.727	2.627	2.704	3.373	2.152	8.680	8.753	6.894	3.280
1980	1.408	3.034	3.460	1.786	2.490	2.924	2.287	0.291	2.506	1.000	3.050	2.921	2.981	3.729	2.359	10.940	10.132	7.828	3.555
1981	1.484	3.275	3.882	2.000	2.758	3.284	2.531	0.324	2.511	1.000	3.350	3.373	3.264	4.174	2.578	12.300	11.805	9.462	3.993
1982	1.554	3.429	4.204	2.069	2.919	3.554	2.722	0.314	2.774	1.047	3.606	3.649	3.533	4.574	2.779	12.280	13.596	11.125	4.082
1983	1.490	3.578	4.291	2.129	3.039	3.794	2.716	0.219	2.954	1.042	3.701	3.632	3.558	4.740	2.932	12.007	14.679	10.977	4.254
1984	1.474	3.686	4.528	2.201	3.219	4.069	2.790	0.187	3.071	1.035	3.725	3.584	3.549	4.925	3.067	11.475	15.069	11.894	4.418
1985	1.501	3.720	4.780	2.301	3.440	4.374	2.900	0.154	3.151	1.041	3.866	3.671	3.615	5.078	3.150	10.771	15.919	13.045	4.556
1986	1.514	3.817	4.984	2.473	3.640	4.502	2.959	0.127	3.246	0.998	4.074	3.823	3.753	5.169	3.182	9.983	16.602	13.369	4.908
1987	1.516	3.797	4.977	2.493	3.688	4.510	2.939	0.104	3.280	0.986	4.310	4.047	3.922	5.246	3.231	9.386	17.788	15.515	5.408
1988	1.523	3.818	4.919	2.523	3.780	4.437	2.911	0.094	3.255	0.956	4.549	4.280	4.140	5.463	3.287	9.223	19.231	18.330	5.783
1989	1.543	3.881	5.065	2.648	3.950	4.488	2.969	0.077	3.161	0.905	4.837	4.585	4.463	5.609	3.340	9.826	21.059	20.910	6.132
1990	1.581	3.933	5.157	2.680	4.084	4.613	3.039	0.069	3.175	0.869	4.981	4.731	4.644	5.815	3.388	10.624	22.806	24.587	6.112
1991	1.414	3.999	5.110	2.408	4.068	4.583	2.920	0.051	3.002	0.849	4.855	4.574	4.521	5.809	3.390	10.910	24.329	24.221	6.323
1992	1.435	4.162	5.357	2.434	4.267	4.889	2.989	0.045	3.026	0.786	4.900	4.576	4.532	5.700	3.546	10.698	24.950	26.881	6.397
1993	1.464	4.396	5.642	2.483	4.457	5.199	3.076	0.043	3.044	0.776	4.993	4.591	4.549	5.740	3.552	10.753	25.420	28.750	6.584
1994	1.499	4.704	5.958	2.589	4.728	5.506	3.208	0.039	2.983	0.763	5.157	4.677	4.661	5.953	3.728	11.171	26.612	30.942	6.765
1995	1.556	4.938	6.213	2.742	5.074	5.863	3.356	0.034	2.864	0.749	5.292	4.894	4.811	6.009	3.859	12.030	28.079	33.027	6.767
1996	1.565	5.117	6.384	2.905	5.203	5.969	3.419	0.027	2.984	0.739	5.425	4.985	4.900	6.235	3.948	13.018	29.028	32.174	6.756
1997	1.564	5.329	6.598	2.953	5.323	6.117	3.558	0.023	3.074	0.724	5.560	5.086	5.007	6.439	3.811	14.077	30.407	33.048	6.875
1998	1.583	5.668	7.055	2.943	5.533	6.423	3.718	0.020	3.192	0.708	5.627	5.186	5.114	6.612	3.836	15.658	31.728	34.687	6.960
1999	1.577	5.811	7.177	2.885	5.647	6.529	3.736	0.016	3.163	0.702	5.790	5.302	5.215	6.657	3.896	16.571	33.120	36.347	7.132
2000	1.586	5.879	7.267	2.924	5.731	6.727	3.791	0.014	3.130	0.721	6.020	5.580	5.464	6.835	3.986	17.363	34.738	39.074	7.298
2001	1.607	6.135	7.542	2.926	5.754	6.974	3.917	0.012	3.227	0.730	6.176	5.735	5.617	6.935	4.071	18.103	36.731	41.539	7.488
2002	1.641	6.374	7.755	2.928	5.811	7.209	4.154	0.011	3.233	0.716	6.309	5.838	5.727	7.018	4.140	19.154	38.193	45.852	7.812
2003	1.565	5.888	7.178	2.865	5.666	6.844	3.787	0.010	2.879	0.674	6.555	6.047	5.898	7.079	3.901	20.513	39.904	52.026	8.213
2004	1.542	5.743	6.940	2.811	5.044	6.555	3.661	0.008	2.590	0.653	6.957	6.439	6.274	7.492	3.940	21.925	42.360	57.049	8.716
2005	1.529	5.667	6.794	2.781	4.768	6.462	3.564	0.007	2.421	0.634	7.394	6.831	6.612	8.031	3.987	23.443	45.976	65.835	9.125
2006	1.493	5.440	6.682	2.783	4.522	6.321	3.472	0.006	2.298	0.613	7.911	7.370	7.217	8.712	4.052	25.147	49.637	75.284	9.799
2007	1.475	5.418	6.590	2.727	4.407	6.218	3.411	0.006	2.170	0.609	8.566	8.087	7.838	9.208	4.168	26.986	54.787	85.690	10.510
2008	1.508	5.618	6.832	2.666	4.445	6.368	3.497	0.005	2.151	0.626	9.419	8.741	8.474	9.639	4.180	29.512	60.396	96.375	10.798
2009	1.574	6.089	7.381	2.717	4.803	6.794	3.744	0.005	2.260	0.648	8.872	8.378	8.268	9.914	4.219	31.569	66.280	101.983	10.811
2010	1.495	5.700	6.838	2.606	4.491	6.361	3.494	0.005	2.078	0.640	8.900	8.448	8.356	10.367	4.223	33.028	68.259	106.266	11.137
2011	1.466	5.630	6.654	2.504	4.338	6.172	3.411	0.004	1.981	0.637	9.250	8.731	8.645	10.791	4.359	34.747	71.882	111.737	11.440
Compound Annual Growth Rates, per cent																			
1961-2011	0.77	3.52	3.86	1.85	2.98	3.71	2.48	-10.50	1.38	-0.90	4.55	4.43	4.41	4.87	2.99	7.35	8.93	9.89	5.00
2000-2011	-0.71	-0.39	-0.80	-1.40	-2.50	-0.78	-0.96	-10.83	-4.07	-1.12	3.98	4.15	4.26	4.24	0.81	6.51	6.83	10.02	4.17
1961-1973	1.62	2.94	3.20	0.45	1.99	2.88	1.97	0.89	3.04	0.00	4.37	4.17	4.55	4.84	2.38	8.36	10.68	9.81	5.82
1973-1981	2.56	11.06	13.00	8.32	10.22	11.19	9.06	-14.28	7.27	0.00	9.08	9.50	8.45	11.37	8.67	21.33	16.93	15.09	9.22
1981-1989	0.50	2.14	3.38	3.57	4.59	3.98	2.02	-16.42	2.92	-1.24	4.70	3.91	3.99	3.76	3.29	-2.77	7.50	10.42	5.51
1989-2000	0.25	3.85	3.34	0.91	3.44	3.75	2.25	-14.51	-0.09	-2.05	2.01	1.80	1.86	1.81	1.62	5.31	4.66	5.85	1.59
2000-2008	-0.63	-0.57	-0.77	-1.15	-3.13	-													

Appendix Table 13

Quantity Aggregates for 19 Capital Stock Components, 1961-2011 (beginning of the year estimates)

Year	Q _{K1}	Q _{K2}	Q _{K3}	Q _{K4}	Q _{K5}	Q _{K6}	Q _{K7}	Q _{K8}	Q _{K9}	Q _{K10}	Q _{K11}	Q _{K12}	Q _{K13}	Q _{K14}	Q _{K15}	Q _{K16}	Q _{K17}	Q _{K18}	Q _{K19}
	Office Furniture	Ag. Machinery	Industrial Machinery	Automobiles	Trucks	Other Transport Equipment	Other Machinery and Equipment	Computers	Telecom Equipment	Software	Industrial Buildings	Comm. Buildings	Inst. Buildings	Engineering Construction	Inventory Change	Ag. Land	Business Non-ag. Land	Household Res. Land	Res. Structures
	(millions, 1961 dollars)																		
1961	975	1,147	4,326	535	934	1,909	2,656	313	1,360	0	4,365	5,136	536	14,959	13,594	5,954	6,376	10,680	28,710
1962	977	1,126	4,392	560	899	1,873	2,719	371	1,406	0	4,481	5,460	566	15,430	13,595	5,965	6,376	10,680	29,773
1963	981	1,153	4,478	598	898	1,866	2,780	409	1,465	0	4,599	5,770	589	15,934	14,151	5,976	6,376	10,680	30,853
1964	1,013	1,213	4,819	643	917	1,861	2,908	461	1,530	0	4,802	6,159	605	16,616	15,079	5,986	6,376	10,680	31,972
1965	1,063	1,293	5,294	698	954	1,950	3,071	522	1,629	0	5,073	6,637	624	17,350	15,607	5,997	6,376	10,680	33,409
1966	1,132	1,389	5,959	769	1,005	2,070	3,383	618	1,772	0	5,463	7,245	641	18,214	16,826	6,008	6,376	10,680	34,898
1967	1,208	1,451	6,355	823	1,047	2,228	3,728	703	1,899	0	5,675	7,686	651	19,086	18,130	5,977	6,376	10,680	36,201
1968	1,260	1,433	6,515	833	1,083	2,332	4,016	742	1,985	0	5,792	8,041	655	19,988	18,580	5,946	6,376	10,680	37,507
1969	1,326	1,379	6,786	928	1,135	2,402	4,359	829	2,075	0	5,979	8,367	648	20,773	19,195	5,916	6,376	10,680	39,139
1970	1,387	1,278	7,136	955	1,149	2,443	4,694	892	2,147	0	6,210	8,710	639	21,741	20,763	5,885	6,376	10,680	41,124
1971	1,427	1,239	7,398	1,004	1,210	2,447	4,987	938	2,263	0	6,353	9,119	624	22,735	20,942	5,854	6,376	10,680	42,733
1972	1,533	1,250	7,582	1,103	1,370	2,489	5,312	998	2,388	0	6,423	9,590	610	23,595	20,711	5,806	6,376	10,680	44,752
1973	1,690	1,339	7,981	1,242	1,618	2,719	5,739	1,094	2,530	0	6,521	10,280	596	24,467	20,858	5,759	6,376	10,680	47,028
1974	1,878	1,497	8,516	1,351	1,783	2,975	6,222	1,274	2,787	0	6,702	11,026	584	25,328	23,381	5,711	6,376	10,680	49,518
1975	2,050	1,653	8,910	1,508	1,954	3,091	6,705	1,451	3,069	0	6,856	11,910	583	26,460	28,184	5,664	6,376	10,680	52,001
1976	2,182	1,851	9,238	1,544	2,060	3,041	7,366	1,634	3,296	0	6,940	12,662	585	27,476	27,852	5,618	6,376	10,680	54,307
1977	2,316	1,918	9,475	1,547	2,143	2,971	7,921	1,890	3,442	0	7,113	13,332	584	28,632	28,101	5,634	6,376	10,680	57,307
1978	2,526	1,964	9,546	1,647	2,205	2,984	8,475	2,579	3,476	0	7,190	14,072	585	29,807	29,409	5,651	6,376	10,680	60,257
1979	2,814	2,076	9,761	1,806	2,360	3,166	9,008	3,471	3,522	0	7,368	15,104	593	31,129	30,700	5,667	6,376	10,680	63,138
1980	3,120	2,109	10,108	1,900	2,308	3,299	9,556	5,563	3,639	0	7,735	16,155	608	32,776	34,364	5,683	6,376	10,680	65,863
1981	3,471	2,180	10,918	2,282	2,233	3,467	10,028	9,732	3,830	797	8,177	17,103	624	34,514	34,529	5,700	6,376	10,680	68,205
1982	3,503	2,042	11,167	2,149	2,054	3,355	10,583	11,480	3,929	1,527	8,409	17,457	633	36,004	35,413	5,716	6,376	10,680	70,756
1983	3,726	1,854	10,986	2,233	1,962	3,323	10,845	16,736	3,882	2,217	8,404	17,908	647	36,762	30,845	5,733	6,376	10,680	72,266
1984	4,100	1,740	10,702	2,441	1,931	3,279	10,894	22,210	3,872	2,968	8,443	18,486	660	37,317	29,803	5,750	6,376	10,680	74,455
1985	4,628	1,617	10,660	2,292	1,850	3,416	11,069	28,441	3,858	3,710	8,601	19,290	677	37,836	31,534	5,766	6,376	10,680	76,607
1986	5,233	1,502	11,021	2,437	1,757	3,437	11,092	35,833	3,886	4,659	8,644	20,363	696	37,654	32,990	5,783	6,376	10,680	79,121
1987	6,125	1,385	11,478	2,504	1,721	3,299	11,380	54,457	4,060	5,660	8,707	21,647	709	37,451	34,011	5,782	6,376	10,680	82,223
1988	6,863	1,289	12,236	3,024	1,722	3,567	11,821	61,764	4,342	7,023	8,835	23,079	733	37,610	35,699	5,781	6,376	10,680	86,124
1989	7,451	1,201	13,161	3,477	1,675	3,689	12,133	77,686	4,688	8,501	9,029	24,561	746	37,762	37,161	5,779	6,376	10,680	90,019
1990	7,422	1,134	13,652	3,791	1,625	3,632	12,451	86,680	5,033	10,131	9,126	25,814	753	38,084	39,575	5,778	6,376	10,680	94,058
1991	7,465	1,051	13,755	3,750	1,539	3,705	12,901	102,617	5,283	11,474	9,080	26,545	748	38,622	38,578	5,777	6,376	10,680	97,130
1992	7,572	984	13,421	3,806	1,495	3,730	13,082	132,748	5,569	12,823	8,894	26,768	742	38,622	34,708	5,782	6,376	10,680	99,069
1993	8,078	1,090	12,986	4,102	1,438	3,427	12,835	144,592	5,658	14,902	8,717	26,962	725	38,708	34,162	5,787	6,376	10,680	101,344
1994	8,336	1,131	12,801	4,883	1,429	3,261	12,594	176,603	5,639	17,362	8,686	26,878	757	39,266	33,291	5,792	6,376	10,680	103,314
1995	8,354	1,152	12,817	5,421	1,481	3,125	12,430	222,674	5,614	18,979	8,684	26,728	753	39,692	33,994	5,797	6,376	10,680	105,453
1996	8,321	1,206	12,782	6,062	1,391	3,077	12,192	284,098	5,565	21,101	8,843	26,613	763	39,874	37,134	5,803	6,376	10,680	106,575
1997	9,082	1,336	13,294	6,480	1,411	3,265	12,160	365,549	5,847	23,824	8,999	27,058	774	40,542	39,533	5,793	6,376	10,680	108,164
1998	9,196	1,639	13,442	7,291	1,529	3,552	11,958	548,271	5,882	27,182	9,060	27,430	756	41,268	41,299	5,784	6,376	10,680	110,167
1999	9,020	1,741	13,453	8,796	1,683	3,839	11,833	755,557	6,155	29,843	9,157	27,900	723	41,872	43,611	5,774	6,376	10,680	111,867
2000	8,826	1,708	13,546	10,059	1,785	4,054	11,781	978,557	6,787	31,779	9,326	27,785	708	42,820	44,851	5,765	6,376	10,680	113,715
2001	9,016	1,713	13,152	10,146	1,577	4,455	12,229	1,055,585	7,230	33,827	9,290	27,761	710	43,880	47,744	5,755	6,376	10,680	115,823
2002	8,756	1,562	12,719	10,703	1,906	4,259	12,729	1,187,980	7,303	34,474	9,127	27,704	714	44,407	45,902	5,757	6,376	10,680	118,553
2003	9,128	1,519	12,764	11,202	1,858	4,055	13,409	1,375,561	7,326	35,644	8,909	27,606	702	45,330	49,244	5,758	6,376	10,680	122,214
2004	9,944	1,492	12,919	11,437	1,985	3,994	14,112	1,732,471	7,470	38,259	8,680	27,685	709	46,540	47,534	5,760	6,376	10,680	126,179
2005	10,488	1,468	13,824	11,113	2,318	4,157	14,801	2,156,580	7,617	42,475	8,406	27,646	708	48,566	48,584	5,761	6,376	10,680	130,651
2006	11,655	1,538	14,699	11,364	2,761	4,293	15,534	2,737,726	7,881	45,813	8,282	27,959	706	50,681	50,866	5,763	6,376	10,680	135,244
2007	12,326	1,605	15,401	11,480	2,839	4,670	16,071	3,144,545	7,916	51,425	8,168	28,087	701	52,815	52,546	5,764	6,376	10,680	139,857
2008	12,761	1,755	16,122	10,600	2,949	5,060	15,937	3,570,520	8,275	54,804	8,029	28,422	701	55,349	54,089	5,766	6,376	10,680	144,566
2009	12,920	1,692	15,629	8,983	2,871	4,767	15,462	3,448,026	8,279	55,870	7,840	28,625	697	55,605	56,978	5,767	6,376	10,680	148,760
2010	13,259	1,675	15,592	7,933	3,017	4,622	15,425	3,782,510	8,714	57,608	7,653	28,615	691	56,263	53,970	5,768	6,376	10,680	151,991
2011	13,572	1,682	15,695	7,146	3,179	4,518	15,687	4,497,614	9,331	59,617	7,510	28,642	682	57,383	52,570	5,770	6,376	10,680	156,030
Compound Annual Growth Rates, per																			

Appendix Table 14

Business Sector Property Tax Rates, Business Income Tax Rates, Balancing Real After Tax Rates of Return, Output Price and Quantity Indexes, Wealth Stock Price and Quantity Indexes and Nominal and Real Capital-Output Ratios, 1961-2011

Year	τ_p	τ_b	r	P_y	P_{KW}	Q_y	Q_{KW}	V_{KW}/V_y	Q_{KW}/Q_y
	Business Sector Property Tax Rates	Business Sector Income Tax Rates	Balancing Real After Tax Rates of Return	Output Price Index	Wealth Stock Price Index	Output Quantity Index	Wealth Stock Quantity Index	Nominal Capital-Output Ratio	Real Capital-Output Ratio
	(per cent)			(index, 1961=1.000)		(millions, 1961 dollars)		(ratios)	
1961	0.015	0.033	0.052	1.000	1.000	29,368	65,074	2.216	2.216
1962	0.016	0.034	0.055	0.999	1.017	31,585	66,186	2.135	2.095
1963	0.016	0.035	0.067	1.007	1.047	34,008	67,985	2.079	1.999
1964	0.016	0.036	0.068	1.019	1.083	36,591	70,874	2.060	1.937
1965	0.016	0.034	0.066	1.049	1.140	39,269	73,925	2.046	1.883
1966	0.016	0.033	0.069	1.097	1.203	42,286	78,410	2.034	1.854
1967	0.016	0.032	0.054	1.131	1.261	43,046	82,234	2.130	1.910
1968	0.017	0.034	0.056	1.173	1.299	44,645	84,583	2.098	1.895
1969	0.017	0.036	0.051	1.214	1.354	46,806	87,164	2.076	1.862
1970	0.017	0.033	0.050	1.256	1.421	48,260	90,627	2.125	1.878
1971	0.016	0.034	0.047	1.298	1.491	50,453	92,937	2.115	1.842
1972	0.016	0.036	0.045	1.366	1.582	53,041	94,972	2.075	1.791
1973	0.015	0.039	0.074	1.509	1.742	58,833	98,134	1.926	1.668
1974	0.014	0.043	0.075	1.752	2.040	61,729	103,385	1.950	1.675
1975	0.013	0.038	0.041	1.970	2.354	59,494	110,211	2.214	1.852
1976	0.013	0.034	0.045	2.111	2.569	63,195	112,964	2.176	1.788
1977	0.014	0.032	0.055	2.216	2.782	67,878	115,949	2.144	1.708
1978	0.014	0.032	0.059	2.374	3.059	70,536	119,537	2.184	1.695
1979	0.013	0.033	0.072	2.633	3.417	74,697	123,921	2.153	1.659
1980	0.013	0.034	0.058	3.003	3.842	73,053	130,218	2.281	1.783
1981	0.013	0.032	0.039	3.259	4.297	74,433	135,275	2.397	1.817
1982	0.013	0.029	0.022	3.494	4.648	70,178	138,323	2.622	1.971
1983	0.013	0.030	0.049	3.721	4.782	73,158	136,998	2.406	1.873
1984	0.013	0.034	0.060	3.851	4.887	78,124	137,639	2.236	1.762
1985	0.013	0.033	0.064	3.955	5.015	82,741	140,493	2.153	1.698
1986	0.013	0.032	0.056	4.015	5.105	85,022	142,988	2.138	1.682
1987	0.013	0.035	0.071	4.186	5.205	90,562	145,848	2.003	1.610
1988	0.013	0.035	0.065	4.347	5.367	94,673	150,432	1.962	1.589
1989	0.013	0.035	0.055	4.511	5.591	96,093	155,302	2.003	1.616
1990	0.013	0.035	0.047	4.647	5.800	95,614	158,744	2.072	1.660
1991	0.014	0.033	0.029	4.752	5.791	90,124	160,238	2.167	1.778
1992	0.014	0.033	0.043	4.773	5.851	93,353	158,327	2.079	1.696
1993	0.014	0.036	0.043	4.839	5.933	94,376	157,980	2.052	1.674
1994	0.014	0.038	0.060	4.915	6.155	100,399	158,425	1.976	1.578
1995	0.014	0.040	0.065	5.044	6.371	103,942	159,699	1.941	1.536
1996	0.014	0.044	0.065	5.152	6.563	107,236	162,378	1.929	1.514
1997	0.014	0.047	0.054	5.207	6.725	111,372	166,742	1.934	1.497
1998	0.014	0.043	0.049	5.170	6.949	117,549	170,681	1.951	1.452
1999	0.014	0.049	0.053	5.288	7.079	123,970	174,830	1.888	1.410
2000	0.013	0.054	0.068	5.553	7.297	131,759	178,130	1.777	1.352
2001	0.013	0.044	0.071	5.630	7.506	133,542	181,277	1.810	1.357
2002	0.013	0.043	0.084	5.625	7.683	140,612	180,822	1.757	1.286
2003	0.012	0.045	0.079	5.884	7.663	137,172	183,931	1.746	1.341
2004	0.012	0.049	0.093	6.139	7.911	142,915	185,502	1.673	1.298
2005	0.012	0.048	0.099	6.400	8.259	146,942	189,852	1.667	1.292
2006	0.011	0.051	0.087	6.590	8.680	150,611	195,631	1.711	1.299
2007	0.011	0.047	0.088	6.861	9.155	153,240	200,440	1.745	1.308
2008	0.010	0.043	0.096	7.218	9.675	154,370	205,062	1.781	1.328
2009	0.010	0.039	0.050	6.934	10.029	145,290	205,338	2.044	1.413
2010	0.010	0.040	0.072	7.202	10.158	149,905	204,637	1.925	1.365
2011	0.010	0.039	0.091	7.515	10.472	154,907	205,655	1.850	1.328
	Period Average			Compound Annual Growth Rates, per cent					
1961-2011	0.014	0.038	0.061	4.12	4.81	3.38	2.33	-0.36	-1.02
2000-2011	0.011	0.044	0.083	2.79	3.34	1.48	1.31	0.37	-0.17
1961-1973	0.016	0.035	0.058	3.49	4.74	5.96	3.48	-1.16	-2.34
1973-1981	0.013	0.035	0.056	10.10	11.94	2.98	4.09	2.77	1.08
1981-1989	0.013	0.033	0.055	4.15	3.35	3.24	1.74	-2.22	-1.46
1989-2000	0.014	0.041	0.052	1.91	2.45	2.91	1.25	-1.09	-1.61
2000-2008	0.012	0.046	0.087	3.33	3.59	2.00	1.78	0.03	-0.22
2008-2011	0.010	0.039	0.071	1.35	2.67	0.12	0.10	1.28	-0.02

Appendix Table 15
Business Sector User Costs for 17 Asset Classes, 1961-2011

	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	U13	U14	U15	U16	U17
	Office Furniture	Ag. Machinery	Industrial Machinery	Automobiles	Trucks	Other Transport Equipment	Other Machinery and Equipment	Computers	Telecom Equipment	Software	Industrial Buildings	Comm. Buildings	Inst. Buildings	Engineering Construction	Inventory Change	Ag. Land	Business Non-ag. Land
Year	(rental price (in dollars) of one dollar of capital services)																
1961	0.218	0.363	0.248	0.393	0.315	0.221	0.187	0.364	0.231	0.370	0.174	0.162	0.146	0.167	0.086	0.101	0.101
1962	0.224	0.388	0.252	0.386	0.325	0.225	0.196	0.354	0.234	0.373	0.178	0.165	0.149	0.173	0.090	0.109	0.112
1963	0.248	0.420	0.278	0.402	0.343	0.238	0.221	0.394	0.244	0.385	0.194	0.180	0.163	0.192	0.102	0.129	0.134
1964	0.239	0.433	0.300	0.413	0.358	0.260	0.218	0.395	0.250	0.387	0.200	0.186	0.169	0.202	0.106	0.146	0.147
1965	0.242	0.443	0.317	0.418	0.363	0.265	0.224	0.421	0.253	0.385	0.208	0.191	0.173	0.213	0.105	0.159	0.156
1966	0.244	0.461	0.328	0.431	0.374	0.277	0.230	0.413	0.262	0.386	0.225	0.207	0.186	0.227	0.109	0.180	0.179
1967	0.238	0.458	0.303	0.427	0.367	0.264	0.210	0.407	0.259	0.370	0.213	0.195	0.174	0.217	0.093	0.175	0.175
1968	0.248	0.476	0.307	0.450	0.391	0.279	0.214	0.419	0.278	0.375	0.219	0.201	0.179	0.229	0.099	0.204	0.205
1969	0.250	0.487	0.314	0.453	0.401	0.289	0.211	0.419	0.285	0.371	0.225	0.206	0.185	0.238	0.097	0.201	0.214
1970	0.256	0.493	0.335	0.462	0.412	0.297	0.218	0.432	0.300	0.368	0.232	0.212	0.189	0.246	0.096	0.197	0.232
1971	0.270	0.503	0.339	0.474	0.427	0.312	0.228	0.444	0.305	0.365	0.239	0.219	0.196	0.258	0.094	0.194	0.250
1972	0.266	0.541	0.352	0.503	0.447	0.332	0.228	0.453	0.324	0.365	0.249	0.237	0.201	0.274	0.098	0.208	0.282
1973	0.301	0.628	0.426	0.557	0.509	0.388	0.271	0.503	0.388	0.397	0.341	0.312	0.294	0.353	0.150	0.335	0.432
1974	0.325	0.732	0.504	0.616	0.580	0.443	0.315	0.506	0.431	0.402	0.420	0.385	0.352	0.424	0.169	0.449	0.538
1975	0.303	0.790	0.523	0.614	0.568	0.437	0.303	0.492	0.410	0.363	0.363	0.347	0.292	0.396	0.123	0.399	0.472
1976	0.313	0.837	0.560	0.637	0.611	0.472	0.312	0.454	0.436	0.363	0.382	0.357	0.304	0.436	0.132	0.476	0.566
1977	0.328	0.899	0.639	0.703	0.694	0.552	0.348	0.420	0.481	0.371	0.416	0.385	0.341	0.495	0.156	0.599	0.695
1978	0.322	1.025	0.734	0.783	0.783	0.634	0.386	0.317	0.582	0.375	0.453	0.412	0.369	0.552	0.177	0.738	0.813
1979	0.368	1.201	0.871	0.899	0.909	0.754	0.453	0.300	0.654	0.389	0.533	0.475	0.440	0.651	0.226	1.020	1.029
1980	0.359	1.319	0.945	0.978	0.974	0.802	0.461	0.215	0.632	0.376	0.560	0.490	0.447	0.676	0.216	1.142	1.057
1981	0.356	1.346	0.985	1.056	1.023	0.823	0.465	0.173	0.584	0.355	0.548	0.497	0.423	0.677	0.183	1.033	0.992
1982	0.352	1.333	0.978	1.068	1.028	0.803	0.450	0.161	0.587	0.351	0.513	0.463	0.387	0.651	0.142	0.782	0.865
1983	0.390	1.499	1.109	1.202	1.163	0.954	0.530	0.118	0.706	0.388	0.627	0.563	0.491	0.810	0.231	1.102	1.348
1984	0.420	1.624	1.234	1.324	1.292	1.092	0.592	0.105	0.779	0.410	0.685	0.607	0.540	0.915	0.285	1.215	1.596
1985	0.449	1.679	1.329	1.420	1.414	1.204	0.639	0.089	0.817	0.425	0.728	0.638	0.566	0.969	0.306	1.185	1.751
1986	0.455	1.704	1.357	1.529	1.487	1.203	0.640	0.074	0.821	0.407	0.734	0.635	0.558	0.947	0.282	1.017	1.691
1987	0.494	1.773	1.455	1.641	1.589	1.295	0.700	0.062	0.897	0.426	0.851	0.744	0.651	1.054	0.342	1.118	2.118
1988	0.493	1.773	1.427	1.689	1.620	1.275	0.689	0.055	0.886	0.414	0.876	0.763	0.664	1.070	0.330	1.046	2.181
1989	0.480	1.767	1.426	1.737	1.664	1.254	0.677	0.044	0.843	0.389	0.884	0.770	0.672	1.044	0.300	1.014	2.172
1990	0.472	1.741	1.401	1.639	1.693	1.245	0.665	0.038	0.836	0.370	0.869	0.754	0.660	1.034	0.275	1.005	2.157
1991	0.392	1.664	1.274	1.328	1.614	1.167	0.576	0.028	0.752	0.347	0.755	0.641	0.557	0.923	0.209	0.826	1.841
1992	0.423	1.794	1.401	1.312	1.762	1.315	0.624	0.026	0.823	0.335	0.834	0.709	0.627	0.989	0.270	0.968	2.258
1993	0.442	1.921	1.492	1.312	1.858	1.386	0.644	0.026	0.856	0.340	0.865	0.723	0.642	1.014	0.279	1.001	2.366
1994	0.484	2.129	1.707	1.374	2.071	1.559	0.734	0.025	0.918	0.355	0.996	0.826	0.747	1.174	0.365	1.253	2.985
1995	0.513	2.214	1.843	1.412	2.273	1.728	0.796	0.023	0.928	0.357	1.065	0.898	0.805	1.234	0.405	1.429	3.336
1996	0.530	2.285	1.946	1.434	2.370	1.819	0.833	0.018	1.020	0.359	1.123	0.938	0.843	1.318	0.432	1.605	3.578
1997	0.525	2.338	1.976	1.375	2.391	1.855	0.844	0.016	1.070	0.351	1.108	0.915	0.820	1.316	0.384	1.611	3.481
1998	0.522	2.417	2.068	1.316	2.442	1.938	0.861	0.014	1.131	0.341	1.077	0.890	0.795	1.300	0.352	1.654	3.353
1999	0.536	2.464	2.189	1.308	2.559	2.066	0.919	0.011	1.201	0.348	1.174	0.969	0.867	1.385	0.397	1.921	3.840
2000	0.576	2.535	2.376	1.353	2.726	2.300	1.032	0.010	1.296	0.376	1.345	1.141	1.020	1.573	0.489	2.361	4.723
2001	0.575	2.549	2.408	1.294	2.696	2.331	1.058	0.008	1.330	0.381	1.330	1.137	1.006	1.556	0.467	2.313	4.693
2002	0.613	2.707	2.578	1.315	2.800	2.465	1.189	0.008	1.374	0.389	1.433	1.239	1.097	1.666	0.526	2.675	5.334
2003	0.589	2.483	2.386	1.276	2.728	2.293	1.083	0.007	1.220	0.368	1.471	1.281	1.116	1.670	0.485	2.806	5.459
2004	0.616	2.537	2.461	1.288	2.527	2.332	1.122	0.006	1.152	0.370	1.681	1.486	1.298	1.908	0.558	3.374	6.518
2005	0.627	2.553	2.490	1.283	2.420	2.381	1.127	0.005	1.100	0.364	1.829	1.619	1.407	2.101	0.588	3.733	7.321
2006	0.601	2.418	2.416	1.257	2.245	2.321	1.076	0.004	1.026	0.348	1.877	1.669	1.465	2.199	0.557	3.743	7.388
2007	0.590	2.416	2.382	1.217	2.167	2.313	1.054	0.004	0.967	0.345	2.004	1.805	1.570	2.302	0.562	3.928	7.974
2008	0.606	2.518	2.502	1.177	2.199	2.391	1.094	0.004	0.971	0.354	2.245	1.989	1.740	2.456	0.583	4.426	9.057
2009	0.552	2.396	2.331	1.045	2.126	2.168	0.982	0.003	0.913	0.330	1.672	1.485	1.289	2.027	0.379	3.154	6.622
2010	0.558	2.351	2.318	1.061	2.078	2.159	0.997	0.003	0.893	0.338	1.878	1.685	1.494	2.346	0.472	4.037	8.344
2011	0.574	2.435	2.385	1.067	2.074	2.235	1.037	0.003	0.895	0.348	2.116	1.895	1.704	2.630	0.565	4.863	10.060
Compound Annual Growth Rates, per cent																	
1961-2011	0.42	1.53	1.30	1.02	1.42	1.20	0.61	0.18	0.72	0.37	0.85	0.74	0.66	1.00	0.28	1.40	2.65
2001-2011	0.59	2.49	2.42	1.21	2.37	2.31	1.07	0.01	1.08	0.36	1.78	1.57	1.38	2.08	0.52	3.55	7.16
1961-1973	0.25	0.47	0.32	0.44	0.39	0.28	0.22	0.42	0.28	0.38	0.22	0.21	0.18	0.23	0.10	0.18	0.20
1974-1981	0.33	1.02	0.72	0.79	0.77	0.61	0.38	0.36	0.53	0.37	0.46	0.42	0.37	0.54	0.17	0.73	0.77
1982-1989	0.44	1.64	1.29	1.45	1.41	1.14	0.61	0.09	0.79	0.40	0.74	0.65	0.57	0.93	0.28	1.06	1.72
1990-2000	0.49	2.14	1.79	1.38	2.16	1.67	0.78	0.02	0.98	0.35	1.02	0.85	0.76	1.21	0.35	1.42	3.08
2001-2008	0.60	2.52	2.45	1.26	2.47	2.35	1.10	0.01	1.14	0.36	1.73	1.53	1.34	1.98	0.54	3.37	6.72
2009-2011	0.56	2.39	2.34	1.06	2.09	2.19	1.01	0.00	0.90	0.34	1.89	1.69	1.50	2.33	0.47	4.02	8.34