Average Effective Tax Rates in Mexico

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Fecha de recepción: 27 de agosto de 2004; fecha de aceptación: 16 de marzo de 2005.

Abstract: The paper estimates average effective tax rates on consumption, labor and capital income for Mexico, using the method of Mendoza *et al*. (1994) and related extensions, including two novel refinements. On average, it is found that consumption taxes are roughly between 7 and 14%, whereas labor and capital income taxes are between 8 and 12.5%, and 8.5 and 15%, respectively. Tax estimates are found to be consistent with predictions from theory in general, both for Mexico as well as for a sample of OECD countries.

Keywords: effective tax rates, consumption tax, factor income taxes, international tax policy

Resumen: El artículo estima los impuestos efectivos promedio al consumo y a los ingresos al capital y al trabajo para México, de acuerdo con la metodología de Mendoza *et al*. (1994) y a extensiones del mismo, incluyendo dos refinamientos novedosos. En promedio, se encuentra que los impuestos al consumo se ubican entre 7 y 14%, mientras que los impuestos al trabajo y al capital están entre 8 y 12.5%, y 8.5 y 15%, respectivamente. En general, estas estimaciones son consistentes con las predicciones de la teoría, tanto para el caso de México como para una muestra de países de la OCDE.
Palabras clave: impuestos efectivos, impuesto al consumo, impuestos a ingresos factoriales, política fiscal internacional

Introduction

Tax estimates are a very important tool of analysis in modern macroeconomics. For this reason, during the last years some efforts have been made to estimate taxes on key macroeconomic variables that are fully consistent with the representative agent framework. The semi-

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nal paper by Mendoza *et al*. (1994) and the extensions made by Carey and Tchilinguirian (2000), OECD (2001) and Carey and Rabesona (2002a) are precisely devoted to such a task. These authors report estimates on consumption, labor and capital income taxes over time for the major industrial countries based on aggregate macroeconomic data at hand. The idea is to measure tax rates as *ad valorem* estimates, where tax rates are simply calculated as the ratio of total revenues over the total tax base for each variable.[1] A major advantage of this approach in general is that it does not require collecting detailed information on household income, statutory tax schedules and other aspects of the tax law, or even projections of real present values for investment projects for particular industries.

As well known, a problem with the general approach by Mendoza *et al*. (1994) is the lack of detailed data on national accounts. For example, income of the self-employed is not disentangled between its labor and capital components. The way Mendoza *et al*. (1994) circumvent this problem is by assigning all this income to capital. However, this assumption biases the estimates for labor (capital) income taxes upward (downward), as illustrated later in this paper. Thus, a major concern is how to provide alternative estimation methods for the labor component of self-employed income.

Despite the usefulness of these estimates for analysis, little is known about tax rates facing households and firms at the aggregate level in Mexico. Rico (1996) calculates average effective tax rates on consumption, capital and labor income taxes in Mexico for the period 1960-93, following the method by Mendoza *et al*. (1994) and using data from different sources. Dalsgaard (2000) also provides estimates for average effective tax rates on consumption, labor and capital income from 1980 to 1996 in Mexico. However, due to the lack of detailed data on national accounts at that time, estimation requires some assumptions on self-employment income and household property income using information from the 1994 Household Survey. The author does not consider alternative approaches to estimation either.

Given the discussion above, the goal of this paper is threefold. First, to provide alternative methods to calculate the labor component of self-employed income as a way of complementing the method by Mendoza *et al*. (1994). Second, to refine the tax estimates provided by Rico

[1] These taxes are usually known in the literature as "average effective tax rates", "implicit tax rates" or "tax ratios".

(1996) and Dalsgaard (2000) for Mexico by considering alternative methods of estimation based on both consistent and superior information now readily available. Finally, to test whether the results provided here yield macroeconomic implications in accord with theory.

As a first approximation, the seminal method of Mendoza *et al*. (1994) is used to estimate time series on consumption, labor and capital income taxes in Mexico. The method is then extended to incorporate the observations made by Carey and Tchilinguirian (2000), OECD (2001) and Carey and Rabesona (2002a). These studies basically point out the need both to include additional taxes into the analysis and to relax the assumption that all income of the self-employed is computed as capital income. However, as discussed later, the approach of Carey and Rabesona (2002a) may not reflect accurately the division of self-employed income into its labor and capital components. For this reason, two additional methods are presented following the suggestions of Gollin (2002) in order to calculate this labor component. As Gollin (2002) is only concerned about estimating income shares from national accounts, this paper ends up presenting two alternative approaches for measuring effective tax rates not previously considered in the literature.

Annual information required to estimate tax ratios in Mexico comes from public sources such as OECD *Revenue Statistics* and INEGI, *Cuentas por sectores institucionales, tomo II*. Unfortunately, this last publication is only available for the period 1993-2001, restricting severely the period of study especially for labor and capital income taxes as it will become clear later. As for consumption taxes, the period covered goes from 1988 to 2002 since consistent data from national accounts is only available for that period.

The results may be summarized as follows. Estimates for the consumption tax in Mexico are sensitive to the method used. For example, the approach by Mendoza *et al*. (1994) exhibits a gradual decline in taxes from 1988 to 1993 followed by a gradual increase since that date on, for an average of 7.1% over the whole period. On the other hand, the method by Carey and Rabesona (2002a) also exhibits a general decline from 1988 to 1994, but taxes rather fluctuate from that date on, yielding a total average of about 12 or 14% depending on the assumptions made for the tax base. In a similar manner, estimates on factor income taxes may also vary widely depending on the approach in use. In particular, the average labor income tax for the whole period is roughly between 8 and 12.5%, whereas the capital income tax

is between 8.5 and 15%. However, the four methods yield similar trends over time for labor and capital income taxes. For example, they unambiguously exhibit a gradual increase in both taxes since 1996. Overall, the findings illustrate that the levels of taxation in Mexico are far below the OECD average (see Mendoza *et al*., 1994; OECD, 2001; and Carey and Rabesona, 2002a). At the same time, they may also suggest that the Mexican tax system distorts less the incentives to work, save and invest compared with most other OECD countries (Dalsgaard, 2000).

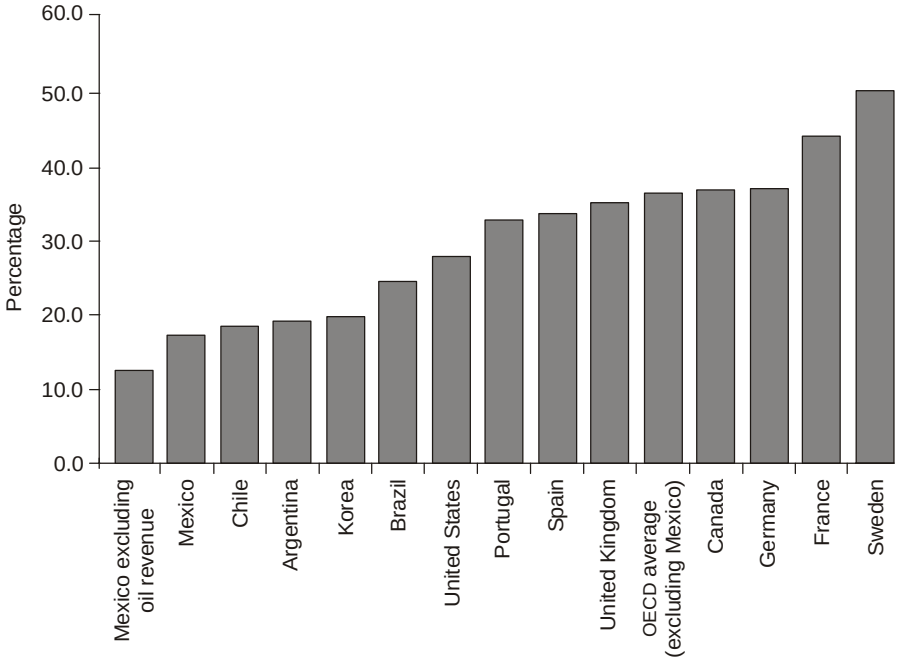
Tax estimates for Mexico are then used to test some macroeconomic implications from theory. In particular, two set of exercises are performed: the relationship between labor supply and labor taxation, and the effect of higher capital income taxes on the private investment ratio. These exercises are implemented both at the individual level for Mexico as well as for a sample of OECD countries for which information is available. With the exception of the relationship between labor supply and labor income taxes in Mexico, tax estimates are consistent with predictions found elsewhere. In particular, the result of Prescott (2004) where labor taxation may account for large differences in labor supply between the US and some major European countries is also suggested by the results presented in this paper using a larger sample of countries including Mexico. On the other hand, the negative relationship between investment ratios and capital income taxes reported in Mendoza *et al*. (1997) and Mendoza and Tesar (2005) using a smaller sample of OECD countries is also found here, both for the Mexican case in isolation as well as for a larger sample of OECD countries.

The rest of the paper is divided as follows. The next section mentions briefly some particularities of the Mexican tax system in an international context. Section II describes in detail the method by Mendoza *et al*., as well as the other three alternative approaches. Tax estimates for Mexico are reported and compared in section III. Section IV discusses some macroeconomic implications of tax rates. The last section concludes.

I. International Comparison of Tax Revenues

The tax system in Mexico is usually viewed as one of contrasting features. On the one hand, disincentives to work, save and invest appear less severe than in most other OECD countries. But at the same time

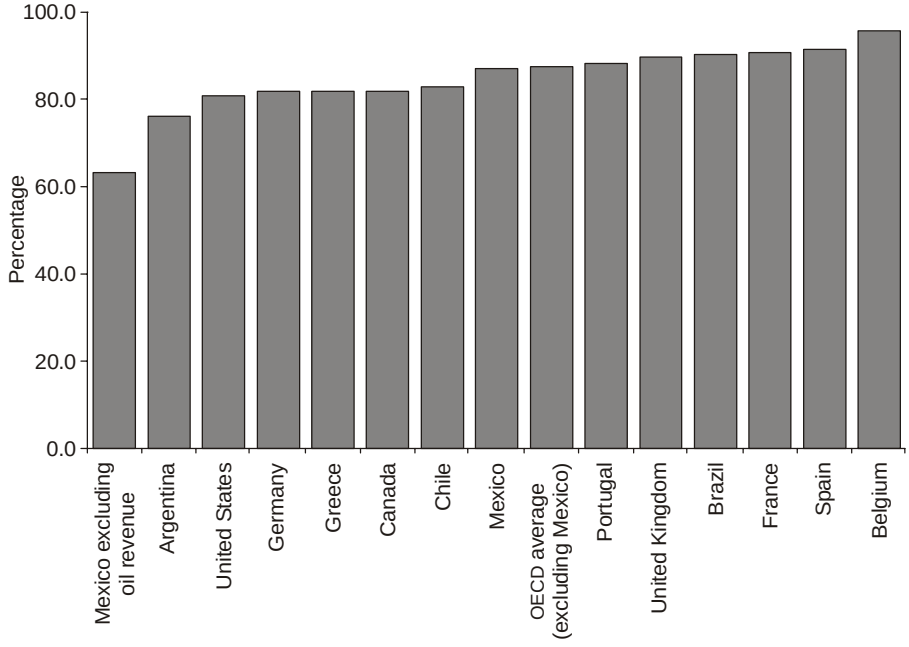
Figure 1. Tax Revenue/GDP, 1990-2000



the system also exhibits serious problems in terms of revenue capacity and efficiency (Dalsgaard, 2000). In a recent study of public debt among countries (IMF, 2003), Mexico stands as one with the lowest public revenue/GDP share. This assertion is supported by Figure 1, which shows the tax revenue/GDP ratio average for a sample of selected countries over the period 1990-2000. As noticed, the 17% ratio for Mexico is well below the OECD average of 37% and even below the corresponding ratio for similar countries such as Chile, Argentina and Brazil. If oil revenue is excluded from the analysis, the tax revenue share for Mexico decreases even further to 12.6%, a number four times smaller than Sweden's.

Some evidence on the composition of public revenue is presented in Figure 2. Here the share of tax revenue out of total revenue (i.e., tax plus non-tax revenue) is estimated over the period 1990-2000 for a sample of selected countries. If oil revenue is defined as tax revenue (following OECD, *Revenue Statistics* classification), such a share is about 87% for Mexico. This number is roughly the average for OECD countries excluding Mexico, and above the estimate for countries such as

Figure 2. Share to Tax Revenues out of Total Revenue, 1990-2000



the United States, Germany and Canada.[2] However, if oil revenue is now defined as non-tax revenue (following the classification of Mexico's Ministry of Finance), tax revenues only account for 63% of total revenues, the smallest number by far among the sample.

Overall, what Figures 1 and 2 indicate is that public revenue in Mexico heavily relies on oil revenue. Furthermore, the share of tax revenue in terms of GDP is very small according to international evidence, even if oil revenue is fully taken into account. For these two reasons, one should expect low average effective tax rates in Mexico relative to those in other countries, an issue addressed in the next two sections.

[2] Estimates for Figure 2 are based on the methodology set in the 1986 version of the *Manual on Government Finance Statistics* by the IMF. Estimates using the 2001 version of the *Manual* are not considered since long time series data are not available for several countries including Mexico.

II. Estimation Methods

To estimate average effective tax rates for Mexico, the method originally proposed by Mendoza *et al*. (1994) and later revised by Carey and Tchilinguirian (2000), OECD (2001) and Carey and Rabesona (2002a) is followed. The general idea under this approach is to estimate taxes on consumption, labor and capital income from aggregate information on tax revenues and tax bases for each of these components. This method thus produces aggregate effective tax rates that in fact correspond to average tax rates realized for the period of study. In particular, a major advantage of this approach is that these tax rates aggregate information on statutory taxes, credits, deductions and exemptions implicit in national accounts and revenue statistics. In addition, the method is fully consistent with the representative agent framework, so the results obtained provide valuable information for calibrating general equilibrium models of this type.

As explained in detail in Mendoza *et al*. (1994), tax rates are measured as *ad valorem* estimates by classifying all the forms of tax revenue at the general government level into one of the three taxes in question. Each measure of tax revenue is then expressed as a fraction of its corresponding tax base (i.e., consumption, wages and the overall operating surplus in the economy). The result of this ratio corresponds to the average effective tax ratio for each variable.

A major advantage of this approach is that information required to estimate tax ratios is readily available. For example, the OECD *Revenue Statistics* systematically collects data on tax revenue for member countries on an annual basis. All other data is provided by national accounts. In order to facilitate the interpretation of the equations presented below, Table 1 conveniently contains the key to tax revenue concepts as reported by OECD *Revenue Statistics*, whereas Table 2 describe the variables of interest from national accounts and other macroeconomic aggregates.

II.1. The Mendoza et al. *Method*

As a first approximation for estimating tax rates, the method of Mendoza *et al*. (1994) is described below. The authors calculate the average effective tax rates for consumption, labor and capital income as follows, based on the information provided in Tables 1 and 2:

Table 1. Key to Variables from *Revenue Statistics*, OECD

Key	*Variable name*
1100	Taxes on income, profits and capital gains of individuals or households
1200	Taxes on income, profits and capital gains of corporations
2000	Total social security contributions (2 100 is paid by employees; 2 200 by employers; 2 300 by the self-employed and persons outside the labor force; 2 400 is unallocated)
3000	Taxes on payroll and workforce
4000	Taxes on property
4100	Recurrent taxes on immovable property
4400	Taxes on financial and capital transactions
5110	General taxes on goods and services (5 111 VAT)
5120	Taxes on specific goods and services (5 121 excise taxes; 5 122 profits of fiscal monopolies; 5 123 customs and import duties; 5 124 taxes on exports; 5 125 taxes on investment goods; 5 126 taxes on specific services; 5127 other taxes on international trade and transactions; 5 128 other taxes)
5200	Taxes on use of goods and performances (5 212 taxes on motor vehicles paid by others than households)
6100	Other taxes paid solely by businesses

Table 2. Key to Macroeconomic Aggregates

Key	*Variable name*
CP	Private final consumption expenditure
EE	Dependent employment
ES	Self-employment
CG	Government final consumption expenditure
CGW	Government final wage consumption expenditure
OS	Net operating surplus of the overall economy
OSPUE	Unincorporated business net income (also called mixed income)
PEI	Interest, dividends and investment receipts
W	Wages and salaries of dependent employment
WSSS	Compensation of employees (including private employers' contributions to social security and to pension funds)

$$\tau_c = \left[\frac{5110 + 5121}{CP + CG - CGW - 5110 - 5121} \right] \times 100 \quad (1)$$

$$\tau_h = \left[\frac{1100}{OSPUE + PEI + W} \right] \times 100 \quad (2)$$

$$\tau_l = \left[\frac{\tau_h * W + 2000 + 3000}{W + 2000} \right] \times 100 \quad (3)$$

$$\tau_k = \left[\frac{\tau_h * (OSPUE + PEI) + 1200 + 4100 + 4400}{OS} \right] \times 100 \quad (4)$$

where τ_c, τ_h, τ_l and τ_k denote taxes on consumption, total household income, labor and capital income, respectively.[3] Notice that (1) – (4) simply capture the idea that each tax is estimated as the ratio of tax revenues over its corresponding tax base. As evident from (1), the estimation of consumption taxes under this approach is based mostly on VAT and excise taxes.

II.2. Alternative Methods

As it is well known, the method of Mendoza *et al.* (1994) is not exempt from criticisms (cf. Carey and Tchilinguirian, 2000; OECD, 2001; and Carey and Rabesona, 2002a). Among them, there are two concerns that deserve a special comment. First, Mendoza *et al*. only include a partial list of all the taxes available as reported by the *Revenue Statistics*. Second, the calculations provided above assign all the income of the self-employed to capital.[4] In order to account for these shortcomings, three alternative methods are proposed and discussed below in detail.

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[3] Data on household taxes do not make the distinction between taxes paid on labor and capital income. To deal with this problem, Mendoza *et al*. (1994) assume that households pay the same effective tax rates on capital and labor income, as reflected by (2) – (4).

[4] Typically the income of the self-employed is included as OSPUE in the national accounts. Unfortunately, this information is usually not divided between its labor and capital components for several countries including Mexico.

The first alternative follows the suggestion by Carey and Rabesona (2002a) to both include additional taxes and divide the self-employed income into its capital and labor components. Accordingly, taxes on consumption, labor and capital are now given by:

$$\tau_c = \left[\frac{5110 + 5121 + 5122 + 5123 + 5124 + 5126 + 5127 + 5128 + 5200 - 5212}{CP + CG - CGW} \right] \times 100 \quad (5)$$

$$\tau_l = \left[\frac{\tau_h * (W + WSE) + 2100 + 2200 + 3000}{WSSS + WSE + 3000} \right] \times 100 \quad (6)$$

$$\tau_k = \left[\frac{\tau_h * (OSPUE + PEI - WSE) + 1200 + 4000}{OS - WSE - 3000} \right] \times 100 \quad (7)$$

where

$$WSE = \frac{ES * (W - 2100)}{EE} \quad (8)$$

is the wage of the self-employed, and τ_h is estimated as before.

By comparing equations (1) and (5), the estimate for the consumption tax now includes additional indirect taxes, whereas the tax base is expressed in gross terms (i.e., including indirect taxes) in order to make it comparable with the denominator for labor and capital income taxes in (6) and (7), where the tax base is also expressed in gross terms.[5] Equation (6) now defines the tax base as the compensation of employees (including the contributions of private employers to social security and pension funds) plus payroll taxes as they are elements of wage compensation. The denominator in (6) also includes an additional term, the wage of the self-employed WSE defined by (8). Here, (8) implicitly captures the idea that the self-employed "pay themselves" the same annual salary net of social security contributions as that earned by the average employee. The term WSE is also used to calcu-

[5] See OECD (2001) and Carey and Rabesona (2002a) for a discussion on this issue. An alternative would be to subtract all the indirect taxes from the denominator in (5) so that consumption expenditures are evaluated at pre-tax prices, following the spirit of equation (1). Both alternatives are considered in the estimation section below.

late the tax revenue from total labor income as shown in the numerator of equation (6).[6]

Finally, expression (7) simply includes new taxes on capital income in the numerator and redefines the tax base in such a way that the denominators from expressions (6) and (7) are just equal to GDP. This specification thus captures the idea that taxes are entirely allocated to one or other of the factors of production. Overall, this alternative method is a good approximation to the extent that the self-employed earn essentially the same wages as people who work as employees.

As pointed out by Carey and Rabesona (2002a), the disadvantage of this last method is that it may not reflect accurately the division of self-employed income into its labor and capital components, given the diversity of such shares among the self-employed. In addition, this method is inappropriate if it is believed that there are systematic differences in earning abilities between employees and the self-employed.

An alternative approach takes thus into account the suggestion made by Gollin (2002) in which all the OSPUE is assigned to labor.[7] The idea captured by this assumption is that the self-employed provide almost pure labor services in low and middle-income countries like Mexico. If this assumption seems appropriate, the estimates for average effective tax rates on labor and capital income would now be given by:

$$\tau_l = \left[\frac{\tau_h * (W + OSPUE) + 2100 + 2200 + 3000}{WSSS + 3000 + OSPUE} \right] \times 100 \qquad (9)$$

[6] Equation (6) originally proposed by Carey and Rabesona (2002a) also includes the term $\alpha * 2400$ in the numerator, and the term 2300 in both numerator and denominator, where α is the fraction of total income that goes to labor (including labor income of the self-employed). Unfortunately, the information on social security contributions paid by the self-employed (2300) and others (2400) is not available for Mexico for the period under study. However, it seems reasonable to assume that the value for these items is approximately zero. For example, only 0.8% of all the social security contributions to IMSS was provided under the voluntary regime in 2002 (see IMSS, 2003). These contributions would typically fall into category (2300), (2400) or even both, depending on the particular situation. This explains why these terms are in fact ignored from the analysis, as reflected by (6) and (7).

[7] The remaining two last approaches are more concerned about estimating the labor income component out of total income from the self-employed. As such, the estimate for consumption taxes in (5) is not affected, so the last two methods reduce the discussion to the estimation of labor and capital income taxes. It is important to emphasize that Gollin (2002) is only concerned about estimating labor shares at the macroeconomic level and not on estimating taxes on the factors of production. In this sense, the remaining two approaches presented here are new in the literature on the estimation of average effective tax rates.

$$\tau_k = \left[\frac{\tau_h + PEI + 1200 + 4000 + 5125 + 5212 + 6100}{OS + 3000 - OSPUE} \right] \times 100 \qquad (10)$$

The difference between (6) and (9) is that the estimate for the imputed wage of the self-employed is replaced by OSPUE. Compared to (7), expression (10) is adjusted to take into account the new assumption and also includes new taxes, following the suggestion by Carey and Rabesona (2002a).

As the reader may have already noticed, the problem with this approach is that even in poor and middle income countries the self-employed tend to have substantial amounts of capital in their businesses. In other words, the former method tends to overstate the labor income received by the self-employed. Following Gollin (2002), a third alternative would assume that labor and capital income shares for the self-employed are just the same as for the rest of the economy. This method implicitly assumes that labor and capital shares are approximately the same in private unincorporated enterprises as they are in large corporations and the government sector. As in the case of the first alternative method, the problem of this approach is the assumption of assigning the same income shares to establishments that differ significantly in size and structure. Keeping this objection in mind, tax rates on labor and capital income (9) and (10) are adjusted accordingly so that:

$$\tau_l = \left[\frac{\tau_h * (W + \alpha * OSPUE) + 2100 + 2200 + 3000}{WSSS + 3000 + \alpha * OSPUE} \right] \times 100 \qquad (11)$$

$$\tau_k = \left[\frac{\tau_h * (PEI + (1 - \alpha) * OSPUE) + 1200 + 4000 + 5125 + 5212 + 6100}{OS - 3000 - \alpha * OSPUE} \right] \times 100 \qquad (12)$$

where

$$\alpha = \frac{WSSS}{GDP - IT - OSPUE} \qquad (13)$$

represents the labor share in total income, and *IT* denotes indirect taxes.

III. Results

As already mentioned, a major advantage for using the alternative methods presented above is that they rely on information readily available. In particular, data are taken from OECD *Revenue Statistics* and INEGI's *Sistema de cuentas nacionales de México: Cuentas por sectores institucionales, tomo II*. The first publication is extremely useful in the sense that it contains information on tax revenues at the general government level and on a cash basis.[8] The publication by INEGI has the advantage of providing information on national accounts disentangled among households, corporations and the general government. Unfortunately this information is only available starting 1993, so for tax estimates on capital and labor income below this is in fact the first year of the series. This is not the case for the estimation of consumption taxes, which do not require detailed information at the national level. In such a case, the series start in 1988 because consistent information from national accounts is only available from that date on.

III.1. Consumption Taxes

Time series estimates for consumption taxes using the Mendoza *et al*. approach (i.e., equation (1)) are presented in the second column of Table 3 for the period 1988-2002 in Mexico. Estimates show a steady decline in the consumption tax from 1988 to 1993, year in which it reaches its minimum. Thereafter, the tax follows an upward trend in general until reaching a level in 2002 similar to its level of 1988. Interestingly, the decrease in the general VAT rate from 15 to 10% in 1992 is well captured for 1993, but not for 1994.[9] Despite the increase in the general VAT rate from 10 to 15% in 1995, the estimate for the consumption tax remains constant in 1995 and 1996, and in fact decreases slightly relative to its 1994 value. According to this method, the reason is that the tax base increases at a larger rate than tax revenue.[10]

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[8] IMF, *Government Finance Statistics* is less appropriate for this type of exercises, since it typically contains data on central government (ignoring state and local taxes) and reports budget estimates rather than cash receipts.

[9] The VAT rate applying to border areas was raised from 6 to 10% in 1992. This 10% rate prevails until today. A summary of tax reform measures in Mexico for the period 1987-98 may be found in Dalsgaard (2000).

[10] The annual increase in VAT revenue was 34 and 39% in nominal terms during 1995 and 1996, respectively.

Table 3. Average Effective Tax Rates on Consumption (in Percentage)

Year	*Mendoza* et al.	*C&R1*	*C&R1 open*	*C&R2*
1988	8.2	13.2	0.7	15.2
1989	7.7	13.2	1.1	15.2
1990	7.2	12.9	1.3	14.8
1991	6.7	12.3	1.5	14.0
1992	6.1	11.5	1.6	13.1
1993	5.8	10.6	1.3	11.9
1994	6.5	10.4	1.2	11.6
1995	6.1	12.3	0.8	14.1
1996	6.1	13.2	0.8	15.2
1997	6.9	13.4	0.8	15.5
1998	7.5	11.2	0.8	12.6
1999	8.3	11.6	0.8	13.1
2000	7.2	13.1	0.8	15.1
2001	7.7	12.4	0.6	14.1
2002	8.1	11.5	0.6	13.0
Average	*7.1*	*12.2*	*1.0*	*13.9*

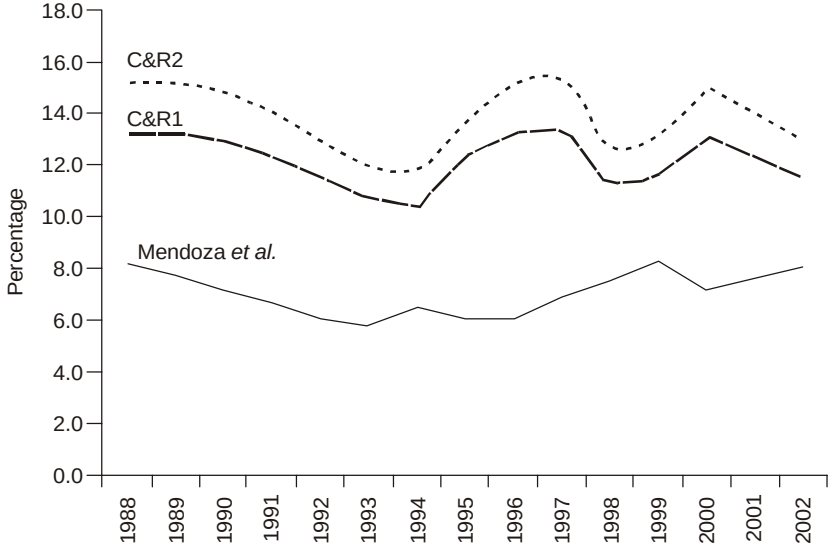
Source: Author's estimates as described in the text.
C&R1: Carey and Rabesona (2002a) method with tax base expressed in gross terms.
C&R1 open: includes consumption taxes related to international trade only.
C&R2: Carey and Rabesona (2002a) method with tax base expressed at pre-tax prices.

Estimates corresponding to the Carey and Rabesona (2002a) method (equation (5)) are presented in the third column of Table 3 (labeled as C&R1). Now the results for the consumption tax increase about five percentage points on average under the new method, mostly as a consequence of introducing additional taxes. Interestingly, the consumption tax under this alternative method follows a different trend for some particular years, as depicted more clearly in Figure 3. Noticeable, the VAT decrease of 1992 and its increase three years later are well captured under this method.

As pointed out earlier, an alternative to equation (5) is to estimate the tax base at pre-tax prices rather than in gross terms. For this reason, the last column of Table 3 (labeled C&R2) presents consumption taxes under this alternative. On average, taxes increases by 1.7 percentage points but the results are not qualitatively affected, as illustrated in Figure 3.

In their seminal paper, Mendoza *et al*. (1994) exclude import and export taxes as they represent a minimal fraction of taxes on goods and services in G–7 countries. However, for a small open economy like

Figure 3. Average Effective Tax Rates on Consumption. Alternative Methods



Mexico, it seems interesting to examine the relative importance of these taxes. Accordingly, the column labeled "C&R1 open" in Table 3 shows consumption taxes related to international trade only (items 5 123, 5 124 and 5 127 from *Revenue Statistics*) using the tax base in equation (5). The first row thus illustrates that slightly more than 5% out of total consumption taxes (i.e., 0.7 over 13.2) are collected from international trade in 1988. The relative importance of these taxes reaches a maximum of 14% in 1992 and declines to levels of roughly 6% from 1995 on. Overall, consumption taxes raised from international trade contribute between 5 and 14% out of total consumption taxes for the period 1988-2002.[11]

Now it seems pertinent to explore why the Mendoza *et al*. and Carey and Rabesona methods yield different trends for the consumption tax in some particular years. In order to give some hint over this difference, Table 4 presents how the consumption tax revenue is divided among its different components. General (including VAT) plus excise taxes amount to an average of more than 54% out of total consumption tax revenue, where this share takes values between 43 and

[11] Consumption taxes from international trade average 0.7% as a share of GDP for the period 1988-2002.

Table 4. Composition of Consumption Tax Revenue (in Percentage)

Year	*General + excise*	*International trade*	*Other taxes*	*Remaining taxes*
1988	57.6	5.0	34.4	3.0
1989	54.2	8.5	33.8	3.5
1990	51.9	10.0	37.0	1.1
1991	50.9	12.3	35.2	1.6
1992	49.5	14.0	34.1	2.4
1993	51.4	12.2	33.5	2.9
1994	58.8	11.1	27.0	3.1
1995	46.8	6.8	43.9	2.5
1996	43.3	6.3	48.0	2.4
1997	48.2	6.0	43.2	2.6
1998	62.5	6.7	28.1	2.7
1999	66.0	6.9	24.7	2.4
2000	51.3	6.2	40.6	1.9
2001	57.7	5.2	34.9	2.2
2002	65.3	5.1	27.5	2.1
Average	*54.3*	*8.2*	*35.1*	*2.4*

Note: General plus excise refer to items 5 110 (5111 VAT) and 5 121 from OECD *Revenue Statistics*, respectively; international trade include items 5 123, 5 124 and 5 127; other taxes refers to item 5 128, "other taxes on specific goods and services"; remaining taxes include all the remaining items (5 122, 5 126 and 5 200 excluding 5 212).

66% over the whole period. Remarkably, a substantial share (35% of total consumption tax revenue) is collected from other taxes on specific goods and services on average (item 5 128 in *Revenue Statistics*). This might not be surprising as item 5 128 for Mexico is entirely explained by taxes on oil production.

Since the method by Mendoza *et al*. does not include this item into the analysis, and the share of this item in total consumption tax revenue varies considerably over the period (ranging from 48 to 24.7% in just a three year period, for example), it might not be surprising to arrive at different results depending on the method in question.

III.2. Taxes on Factor Income

Now it is time to compare results among alternative methods for labor and capital income taxes. Before presenting the estimates for these taxes, some previous explanation is needed. Unfortunately, the infor-

mation available on Mexico for total taxes on income, profits and capital gains (item 1 000 in *Revenue Statistics*) is not divided between individuals and corporations (items 1 100 and 1 200, respectively). As a reference, about 75% of these total taxes are paid by households in OECD countries on average over the period 1995-2001, whereas the remaining 25% is paid by corporations (OECD, 2003). Dalsgaard (2000) shows evidence that the share of income taxation coming from corporations in Mexico is well above 50% in 1996. The author argues that the higher share reported by Mexico in comparison with the OECD average may be partially explained by differences in accounting practices (e.g., Mexico classifies payments from the self-employed as well as some withholding taxes as corporate taxes). Due to the lack of further evidence, the solution adopted here is to assume that 50% of total taxes on income, profits and capital gains are paid by households, whereas the remaining 50% is paid by corporations. An alternative solution also considered in computations below assumes that only 25% of these taxes are paid by households, a share roughly consistent with the corresponding average for a sample of Latin American countries (not including Mexico) for which data is available over the period 1990 to 1999 (Stotsky and WoldeMariam, 2002).

Average effective tax rates for labor income using the Mendoza *et al*. method are presented in the second columns of Tables 5A and 5B. These Tables assume that 50 and 25% of total taxes on income, profits and capital gains are paid by households, respectively. From Table 5A, the tax on labor income shows a slightly upward trend starting 1995 although the level in 2001 is still relatively low (about 13.4%). Assigning a lower share of taxes paid by households reduce the estimates in about 1.5 percentage points on average, as illustrated by the second column of Table 5B. Nevertheless, these alternative time series estimates are not affected qualitatively in general.

The third column of Tables 5A and 5B illustrate the estimates for labor income taxes under the Carey and Rabesona approach (equation (6)). These new estimates are lower as compared to those by Mendoza *et al*., and the decrease is about two percentage points on average for each case. The next column in Tables 5A and 5B now report tax estimates using equation (9), labeled as Gollin1. Here, it is important to recall that this approach assumes that all the OSPUE is assigned to labor. On average, the estimates for labor income taxes are even lower under this specification as compared to the previous two methods.

Finally, estimates using equation (11) (namely, assuming that only

Table 5A. Average Effective Tax Rates on Labor Income (in Percentage)

Year	*Mendoza* et al.	*C&R*	*Gollin1*	*Gollin2*
1993	12.1	10.0	9.0	10.3
1994	12.2	10.0	9.1	10.3
1995	11.8	9.4	8.4	10.0
1996	12.0	9.6	8.4	10.1
1997	12.6	10.3	9.1	10.9
1998	12.8	10.8	9.6	11.5
1999	13.2	11.6	10.3	12.5
2000	13.2	12.2	10.6	13.2
2001	13.4	12.4	11.0	13.7
Average	*12.6*	*10.7*	*9.5*	*11.4*

Table 5B. Average Effective Tax Rates on Labor Income (in Percentage)

Year	*Mendoza* et al.	*C&R*	*Gollin1*	*Gollin2*
1993	10.5	8.4	7.4	8.7
1994	10.6	8.4	7.5	8.7
1995	10.6	8.1	7.1	8.7
1996	10.7	8.3	7.0	8.8
1997	11.2	8.7	7.6	9.4
1998	11.3	9.1	7.9	9.9
1999	11.6	9.8	8.5	10.7
2000	11.6	10.3	8.8	11.3
2001	11.8	10.5	9.1	11.7
Average	*11.1*	*9.1*	*7.9*	*9.8*

Source: Author's estimates as described in the text.

Table 5A assumes that 50% of total taxes on income, profits and capital gains (item 1 000 in OECD, *Revenue Statistics*) are paid by households.

Table 5B assumes that 25% of total taxes on income, profits and capital gains (item 1000 in OECD, *Revenue Statistics*) are paid by households.

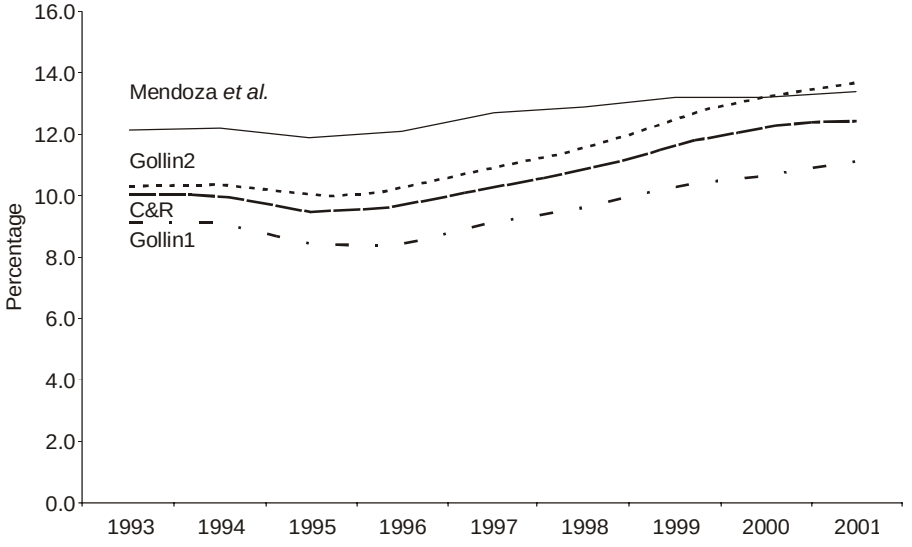
C&R: Carey and Rabesona (2002a) method.

Gollin1 and Gollin2: Alternative estimation methods following Gollin (2002).

a fraction of OSPUE goes to labor) are reported in the last column of Tables 5A and 5B, labeled as Gollin2. Compared to the former method (Gollin1), the tax on labor income is now roughly two percentage points higher on average in each scenario. The result might not seem surprising given the specification in (11) and (13) where α is between zero and one.

Overall, from this analysis one may conclude that tax estimates on labor are not qualitatively affected by alternative methods in gen-

Figure 4. Average Effective Tax Rates on Labor Income. Alternative Methods



eral. In addition, the differences among these methods are not quantitatively large on average: such differences are roughly at most of three percentage points. These results are conveniently illustrated in Figure 4, based on the information provided in Table 5A.

Now consider the case of taxes on capital income. Estimates for this variable under the alternative methods proposed are presented in Tables 6A and 6B. Now Table 6A assumes that 50% of total taxes on income, profits and capital gains are paid by corporations whereas Table 6B increases this share to 75%. Thus, Tables 5A (Table 5B) and 6A (6B) are fully consistent with each other. Results under each method are presented in columns as before. According to the approach by Mendoza *et al*., tax on capital income presented in Table 6A follows a decline of slightly more than three percentage points from 1993 to 1996. Thereafter it increases steadily until reaching a level in 2001 roughly similar to its level in 1994. This general result is also observed for the remaining three methods, although the fall in capital income taxes from 1993 to 1996 is even larger (about five percentage points) under the Gollin1 method. Overall, quantitative differences among methods may be as large as 5.5 percentage points on average. Figure 5 conveniently illustrates estimates for capital income taxes for all the meth-

Table 6A. Average Effective Tax Rates on Capital Income (in Percentage)

Year	*Mendoza* et al.	*C&R*	*Gollin1*	*Gollin2*
1993	10.1	12.4	15.0	11.9
1994	9.6	11.8	14.1	11.3
1995	7.6	9.2	11.0	8.7
1996	7.0	8.2	9.9	7.9
1997	7.8	9.3	10.9	8.8
1998	8.1	9.6	11.3	9.1
1999	8.6	10.2	11.9	9.6
2000	8.7	10.4	12.5	9.8
2001	9.3	11.5	13.6	10.5
Average	*8.5*	*10.3*	*12.2*	*9.7*

Table 6B. Average Effective Tax Rates on Capital Income (in Percentage)

Year	*Mendoza* et al.	*C&R*	*Gollin1*	*Gollin2*
1993	11.3	14.5	18.3	13.9
1994	10.8	14.0	17.4	13.2
1995	8.5	10.8	13.4	10.0
1996	7.8	9.6	12.1	9.1
1997	8.7	11.0	13.5	10.2
1998	9.1	11.4	13.9	10.6
1999	9.6	12.2	14.8	11.1
2000	9.8	12.3	15.5	11.3
2001	10.4	13.7	16.9	12.2
Average	*9.6*	*12.2*	*15.1*	*11.3*

Source: Author's estimates as described in the text.

Table 6A assumes that 50% of total taxes on income, profits and capital gains (item 1 000 in OECD, *Revenue Statistics*) are paid by corporations.

Table 6B assumes that 75% of total taxes on income, profits and capital gains (item 1 000 in OECD, *Revenue Statistics*) are paid by corporations.

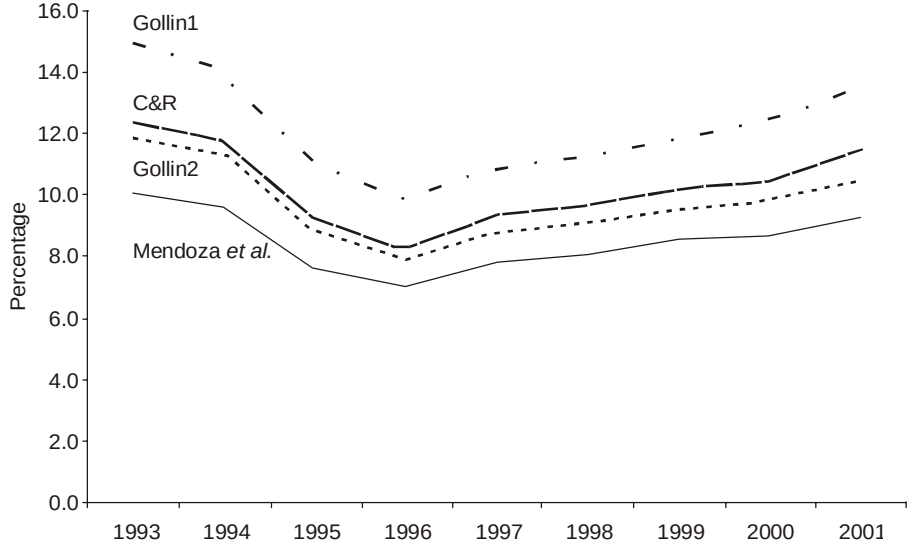
C&R: Carey and Rabesona (2002a) method.

Gollin1 and Gollin2: Alternative estimation methods following Gollin (2002).

ods in question assuming that 50% of total income taxes are paid by corporations.

Overall, the conclusion derived from Tables 3-6 and Figures 3-5 is that all the alternative methods under study do not deliver tax estimates that differ sharply in qualitative terms among them, with the exception of consumption. For example, all the methods show that taxes on labor income remained roughly constant during 1993-95 in Mexico, whereas capital income taxes fell significantly during the same

Figure 5. Average Effective Tax Rates on Capital Income. Alternative Methods



period. Thereafter, both labor and capital income taxes have steadily increased over time. Nonetheless, the levels estimated in 2001 are still relatively low as compared with other OECD countries.[12] Less can be said about consumption taxes: they decrease steadily since 1988 until reaching its minimum level either in 1993 or 1994, and thereafter they either increase slightly or remain constant, depending on the approach considered. As mentioned earlier, the difference is basically explained by additional taxes in the Carey and Rabesona method not considered in the Mendoza *et al*. approach.

[12] See, for example, Mendoza *et al*. (1994), OECD (2001) and Carey and Rabesona (2002a). Carey and Rabesona (2002a) find that the average effective tax rates on labor and capital income in OECD countries (not including Mexico) for which information is available over the period 1990-2000 are 32 and 46%, respectively.

Table 7. Contemporaneous Correlation between Hours Worked and Taxation, 1993-2001

Method	*Corr.* (τ_l)	*Corr.* ($\tau_l + \tau_{c1}$)	*Corr.* ($\tau_l + \tau_{c2}$)
Mendoza *et al.*	0.33	0.44	0.66
C&R	0.14	0.31	0.48
Gollin1	0.09	0.30	0.49
Gollin2	0.17	0.31	0.46

Note: τ_{c1} and τ_{c2} denote taxes on consumption estimated according to the Mendoza *et al.* and Carey and Rabesona methods, respectively.
C&R: Carey and Rabesona (2002a) method.
Gollin1 and Gollin2: Alternative estimation methods following Gollin (2002).

IV. Macroeconomic Implications

IV.1. Labor Supply and Labor Income Taxes

Now, it is time to check whether the tax estimates reported above are consistent with predictions from theory. In a standard neoclassical framework with a labor/leisure choice, steady-state labor supply may be shown to be a function of income and consumption taxes, as well as preference and technology parameters (cf. Mendoza and Tesar, 2005). In particular, theory predicts a negative effect of labor income taxes on labor supply. Thus, the purpose of this section is to confirm if this prediction is observed in the data, both at the individual level for Mexico and for a sample of countries. For that purpose, data on worked hours for Mexico is taken from the OECD Labour Force Statistics Database, where worked hours is defined as the average annual worked hours per working-age person in employment. Data on labor income taxes is provided by estimates in Table 5A.

Results on the relationship between these two variables are presented in Table 7 for the Mexican case. The first column reports the contemporaneous correlation coefficient between hours worked and taxes on labor income under alternative methods for the period 1993-2001 (missing data on worked hours for 1994). Surprisingly, the correlation coefficient is positive under all methods, ranging from 0.09 to 0.33. To check for the robustness of this result, an alternative approach measuring the correlation between hours worked and the sum of labor income and consumption tax rates is considered, as suggested by Mendoza *et al.* (1994). Results are presented in columns 3 and 4 of Table 7 depending on whether the consumption tax is defined follow-

ing the Mendoza *et al*. or the Carey and Rabesona method, respectively. Once again, the correlation is positive and relatively large in magnitude for all the cases.[13]

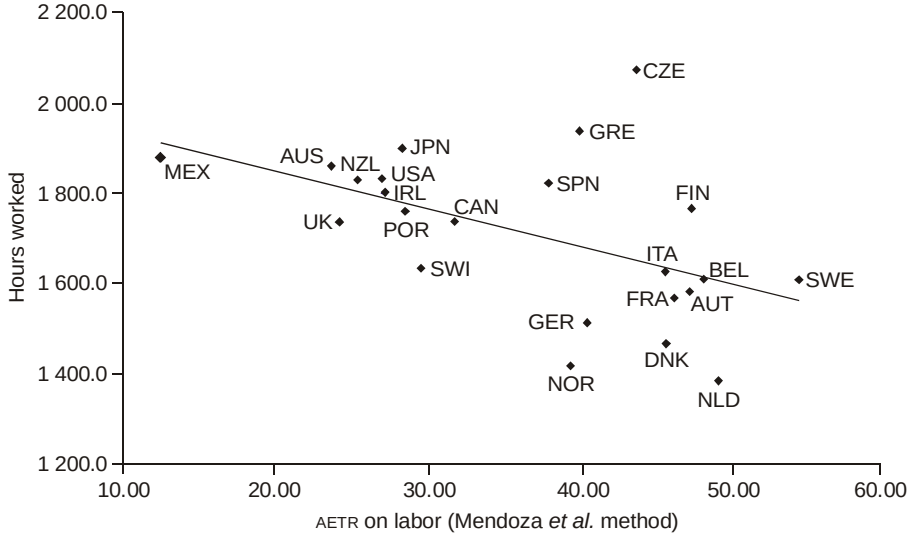
The positive correlation between hours worked and the labor income tax (with or without consumption taxes) in Mexico stands in sharp contrast with empirical results found in Mendoza *et al*. (1994). For each of the G–7 countries except Italy, the authors report a negative and large correlation between these two variables for the period 1965-88 (the correlation ranges from –0.49 to –0.92). In this regard, two comments are pertinent. First, the size of the informal labor market in Mexico is large. According to OECD (2004a) and Dalsgaard (2002), this share is between a quarter and one-half of total urban employment. Since information on average worked hours does not differentiate between formal and informal workers, the evidence shown here should be interpreted with caution. Second, tax estimates may be particularly sensitive to cyclical factors and unexpected shocks affecting tax revenues and tax bases, as pointed out by Mendoza *et al*. (1994). Thus, keeping in mind the particularities of the Mexican labor market, the (possible large) business cycle effects and the fact that preference and technology parameters may also affect labor supply, it remains an open question to check whether these factors altogether could account for the positive correlation observed in the data for Mexico.

The following step is to explore the implications from theory for a set of countries. Recently, the literature has tried to find out what factors could explain differences in average worked hours among economies. For example, Prescott (2004) reports that Americans today work 50% more than do the Germans, French, and Italians. This difference is remarkable given that in the early 1970s Western Europeans worked more than Americans. According to Prescott (2004), most of these large differences in labor supply may be explained by differences in tax rates on labor income for the G–7 countries.[14] The natural implication of this result is that countries with similar technologies and preferences but lower labor income taxes should exhibit higher worked hours on average. Following with this argument, it might be expected that Mexican workers would supply more labor than (say) French or Ger-

[13] Similar results to those reported in Table 7 are found if labor tax estimates from Table 5B are used instead.

[14] Mendoza *et al*. (1994) find that labor income taxes are substantially higher in France, Germany and Italy as compared to those in the United States, Canada, Japan and the UK.

Figure 6. Hours Worked versus Taxes on Labor Income, 1990-2000



man workers, given the low estimates for labor income taxes in Mexico reported earlier.

To find out if this conjecture is observed in practice, data on both average worked hours and effective tax rates on labor income are needed for several countries. Due to limitations on data, the sample is restricted to 23 OECD countries for which information is readily available. Since estimates on labor income taxes for Mexico start in 1993 as reported above, the period under analysis is restricted to 1990-2000. Data for average worked hours per year is taken from the OECD Labour Force Statistics Database. Estimates for tax rates on labor income for all the OECD countries in the sample except Mexico are taken from Carey and Rabesona (2002b) using the Mendoza *et al*. methodology, since taxes reported by Mendoza *et al*. (1994) only cover up to 1988.

The average of worked hours and labor income taxes for each country is presented in Figure 6 for the period 1990-2000 (1993-2000 for the Czech Republic and Mexico). Remarkably, a negative relationship between these two variables is found in the sample. In particular, high labor-tax countries such as Denmark, Netherlands and Sweden exhibit less worked hours on average than countries with lower labor income taxes such as the US, Japan and Mexico. Even though Mexico has substantially lower taxes than Japan, Greece and the Czech Republic, average worked hours in Mexico are below worked hours in

those countries. Presumably preferences, technology or even institutional factors (for example, the nature of the unemployment benefit system in each country) might account for these differences.[15]

As additional evidence of the negative relationship found in Figure 6, a simple OLS regression using the above data yields the following results:

$$H_i = \underset{(116.9)}{2015} - \underset{(3.1)}{8.36}\,\tau_{n,i} + \varepsilon_i, \qquad R^2 = 0.26, \qquad R^2 \text{ adjusted} = 0.23$$

where H_i denotes average worked hours in country i, $\tau_{n,i}$ is the average effective tax rate on labor income in country i, and ε_i is the error term (numbers below in parenthesis denote the standard error). Thus, the coefficient on labor income taxes is negative and significant at standard confidence levels (5%), as expected.[16] Remarkably, this negative and significant relationship is also found in Mendoza and Tesar (2005) for a panel of G–7 countries over the period 1971-95.

IV.2. Private Investment / GDP Ratio and Capital Income Taxes

From a theoretical point of view, it is well-known that capital income taxes have a negative effect on private investment/GDP ratio at the steady state in a neoclassical setting (cf. Mendoza and Tesar, 2005). Estimates on capital income taxes presented above may be thus used to check if this prediction is observed in the data, both at the individual level for Mexico and for a sample of countries.

Table 8 shows the contemporaneous correlation between total investment as a fraction of GDP and the alternative estimates on the capital income tax for the period 1993 to 2001 in Mexico, using the information provided in Table 6A. As expected, the correlation between these two variables is unambiguously negative for each of the methods considered. If only private investment over GDP is taken into account, the contemporaneous correlation coefficient is even larger in absolute value, regardless of the approach used.[17]

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[15] These numbers should also be interpreted with caution given the differences in methodology to report hours worked in each country. See the OECD Labour Force Statistics Database and OECD (2004b), *Employment Outlook* for details.

[16] The coefficient on $t_{n,i}$ remains negative and significant if labor income taxes using the Carey and Rabesona method are considered instead. Furthermore, this result is also robust to a linear combination of consumption and labor income taxes.

[17] Results in Table 8 only change slightly if estimates from Table 6B are used instead.

Table 8. Contemporaneous Correlation between Investment/GDP and Capital Income Taxes in Mexico, 1993-2001

Method	*Total investment / GDP* *Corr.* (τ_k)	*Private investment / GDP* *Corr.* (τ_k)
Mendoza *et al.*	–0.37	–0.49
C&R	–0.43	–0.55
Gollin1	–0.47	–0.58
Gollin2	–0.43	–0.54

C&R: Carey and Rabesona (2002a) method.
Gollin1 and Gollin2: Alternative estimation methods following Gollin (2002).

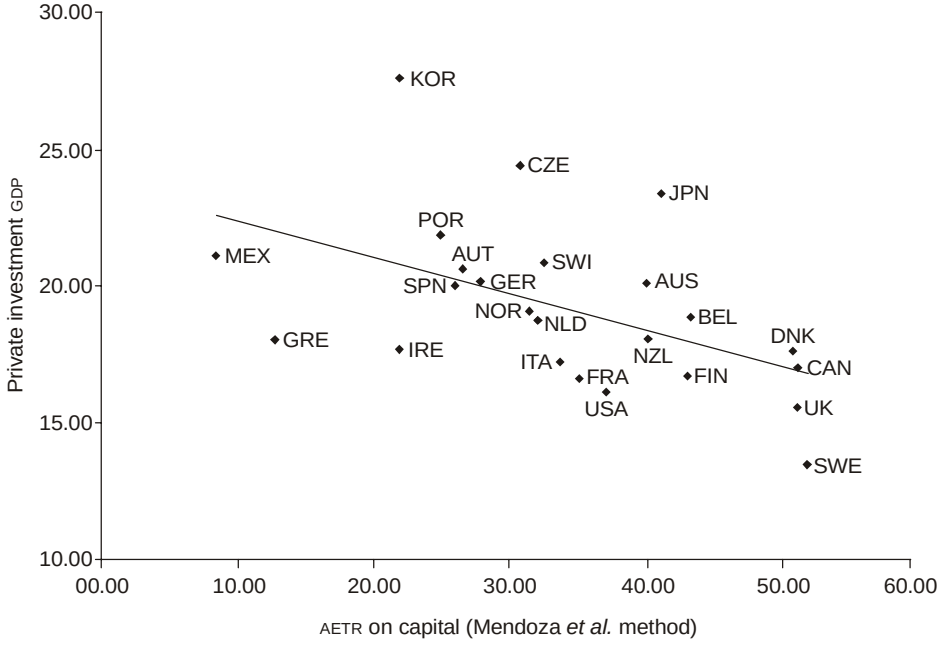
Now consider the implications of neoclassical theory for a sample of countries. If economies have similar technologies and preferences, there should be a negative relationship between investment ratios and capital income taxes in the data. Using a sample for 18 OECD countries (not including Mexico) over the period 1965-91, Mendoza *et al.* (1997) find that the coefficient on capital income tax is negative and significant. In particular, the results imply that a reduction of 10 percentage points in capital income increases the private investment rate between 0.9 and 1.4%. Similar quantitative results are also reported in Mendoza and Tesar (2005) for a panel of G–7 countries over the period 1971-95.

Given the low taxes on capital income in Mexico reported above, it might be expected that Mexico (abstracting from technology and preferences) should exhibit a higher investment rate than countries such as the United States, Sweden and the UK on average, given that taxes on capital income in these countries are generally above 35%. To check if this prediction is consistent with the data, a sample of 24 OECD countries is considered for which information on capital tax ratios is readily available. As before, data on capital income taxes is taken from Carey and Rabesona (2002b) using the Mendoza *et al.* approach. The period of analysis is restricted to the years 1990-2000, given the limitations on data for Mexico.[18]

Average investment rates and taxes on capital income for each country are presented in Figure 7. As expected from theory, higher taxes on capital income yield lower investment/GDP ratios in the sam-

[18] Data for the Czech Republic and Mexico covers the period 1993-2000. Data for Portugal is for 1990-98 only.

Figure 7. Private Investment/GDP Ratio versus Taxes on Capital Income, 1990-2000



ple. In particular, low-tax countries such as Mexico, Greece and Korea exhibit higher investment ratios than high-tax countries such as the UK and Sweden. In fact, the most dramatic case in the sample is Sweden: it is the country with the highest tax on capital income and at the same time the country with the lowest investment ratio. Despite the low average tax rate in Mexico, there are four countries (Portugal, Japan, the Czech Republic and Korea) where the investment ratio is higher than Mexico's. As for the case of labor supply analyzed earlier, differences in technology and/or preferences might account for this result.

To complete the analysis, a simple OLS regression using the above data yields the following results:

$$(I/Y)_i = \underset{(1.74)}{23.68} - \underset{(0.05)}{0.13}\,\tau_{k,i} + \varepsilon_i, \qquad R^2 = 0.25,\ R^2 \text{ adjusted} = 0.22$$

where $(I/Y)_i$ is the private investment/GDP ratio for country i, and $\tau_{k,i}$ is the tax on capital income in country i. The coefficient on $\tau_{k,i}$ is nega-

tive and significant at the 5% confidence level, as it might be expected.[19] Remarkably, this number is very similar to those reported in Mendoza *et al*. (1997) and Mendoza and Tesar (2005) under different samples and periods of analysis. Therefore, the estimates for capital income taxes presented in this paper yield results consistent with theory and empirical evidence elsewhere.[20]

V. Conclusion

This paper has presented alternative methods to calculate average effective tax rates on income and consumption in Mexico following the general approach by Mendoza *et al*. (1994) and later extended by Carey and Rabesona (2002a). Because of lack of detailed data, the Mendoza *et al*. approach assumes that all income of the self-employed is assigned to capital. A major problem with this assumption is that estimates for labor (capital) income taxes are biased upward (downward). Of course, this concern is avoided to the extent that data for self-employed income from national accounts is disentangled between its labor and capital components. Since this is not typically the case even for data on industrialized countries, this paper provides two novel methods in an attempt to compute tax ratios more precisely, following the suggestions by Gollin (2002) to calculate factor incomes at the aggregate level.

Results for the Mexican case show that there may be relatively large differences in tax estimates on income among the four methods under consideration. These differences may be as large as 5.5 percentage points on average. In particular, it is found that labor income taxes are between 8 and 12.5%, whereas capital income taxes average between 8.5 and 15%. Nevertheless, results are qualitatively similar among methods. For example, each of the four approaches exhibit a steadily increase in income taxes for Mexico since 1996. In contrast, estimates for consumption taxes may differ qualitatively depending

[19] Despite the simplicity of this regression, this negative coefficient is presumably robust and significant to alternative specifications. For example, Mendoza *et al*. (1997) perform a similar regression analysis in a smaller sample of OECD countries but additionally controlling for variables such as the GDP level, changes in terms of trade, the GDP share of government purchases and secondary education enrollment in each country. The coefficient on capital income tax changes only slightly and remains significant at standard confidence levels.

[20] A regression analysis was also performed for the same sample but using tax estimates according to the Carey and Rabesona method. In such a case, the coefficient on the capital income tax reduces to –0.10 but is still significant at the 5% confidence level.

on the method used. The reason is that the Mendoza *et al*. approach mostly includes VAT and excise taxes, but data for Mexico show that these taxes only explain slightly more than 54% of all consumption tax revenue. As a result, substantial differences in tax ratios arise as consumption taxes may average between 7 and 14% depending on the approach used. Overall, each method yields income and consumption tax estimates for Mexico that are still too low as compared with tax ratios in other OECD countries. This result might not be surprising given the low ratio of tax revenues over GDP in Mexico, as discussed in the text.

Average effective tax rates in Mexico are then used to check if they are consistent with macroeconomic implications from theory, both at the individual level and for a sample of countries. In particular, two sets of exercises are considered: the relationship between hours worked and the labor income tax, and the effect of taxes on capital income over the investment ratio. It is found that, with the exception of labor supply and labor taxes in Mexico, tax estimates deliver results consistent with theory and empirical findings elsewhere. For example, annual hours worked are higher in Mexico than Sweden on average, given that taxes on labor income are four times larger in Sweden. These empirical relationships are also supported by a simple regression analysis.

Remarkably, estimates presented in this paper compare relatively well with those provided elsewhere for Mexico under similar and alternative approaches. Easterly and Rebelo (1993) calculate marginal individual income tax rates prevailing in 1984 for a series of countries including Mexico. In this particular case, the authors find that the marginal income tax rate in 1984 is somewhere between 4 and 6%. Using the Mendoza *et al*. approach (1994), Rico (1996) reports effective tax rates on consumption, labor and capital income taxes of 7, 9.7 and 6%, respectively for the period 1960-93 on average. Dalsgaard (2000) estimates what he calls a theoretical effective tax rate for each income category of wage earners in the formal sector by combining statutory rates, tax credits and tax subsidies applying under the individual income tax system at place in 1997. A nonweighted average yields an individual income tax rate of 9.5% for that particular year.

The approach originally proposed by Mendoza *et al*. (1994) is extremely convenient in the sense that information required for estimation is relatively easy to obtain. Furthermore, their method is quantitatively consistent with alternative approaches in the literature. Thus,

one may calculate tax ratios in a reliable way at a fraction of the cost in terms of information. Of course, the estimation methods used in this paper are far from perfect. As discussed by Carey and Rabesona (2002a), issues as tax shifting are not taken into account because the initial impact of taxes is assumed to be the final incidence. Thus, in the presence of tax shifting, tax burdens using this methodology do not correspond to the actual burdens impacting on economic incentives. In addition, the tax treatment of losses, cross-border flows and tax planning are also ignored, which might have an important effect, especially on capital income tax estimates. On the other hand, one might question the results since the approach presented here do not use information on statutory tax rates, income distribution per tax bracket or several particularities of the tax law. In fact, it may be argued that average levels of taxation are not necessarily good approximations of the distortions created by the tax system, which are primarily determined by marginal rates facing the taxpayer. Keeping in mind all these possible caveats, it remains true that tax estimates under this method may be a useful input for analysis, both in terms of testing macroeconomic implications from theory as well as for policy recommendations typically derived from well-specified, general equilibrium models.

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