

ARTICLES

PROGRESSIVITY AND POTENTIAL INCOME: MEASURING THE EFFECT OF CHANGING WORK PATTERNS ON INCOME TAX PROGRESSIVITY

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The income tax taxes the proceeds from market work, but not the “proceeds” from time otherwise allocated—whether enjoyed as self-provided goods and services or leisure time. A two earner couple that “outsources” household and child care services, for instance, pays for these services with after-tax earnings, whereas a single earner couple that self provides such services pays no tax on their provision. This Article uses data from the Panel Study of Income Dynamics to measure the redistributive impact of the implicit exclusion for nonmarket activity. Viewing the exclusion as a kind of tax benefit, it asks: How is such tax benefit distributed across the income spectrum? The Article finds that variation across income levels in “the labor income realization ratio”—the portion of potential labor income that is realized as actual labor income—has played a decisive role in shaping the real progressivity of the federal income tax. On paper, the federal income tax became more progressive during the 1990s. When average tax rates are measured in terms of potential rather than actual income, however, the income tax shows a decline in progressivity during that decade. The discrepancy arises from a change in work patterns. At the start of the decade, tax units with higher income were realizing a greater proportion of their potential earnings than were tax units with lower income. By the end of the decade, the realization ratio was greater at the lower end of the potential-income spectrum. This reversal in labor income realization patterns was substantial enough to overpower the increase in statutory progressivity.

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INTRODUCTION

In one of the most elemental economic acts, individuals apportion their time between working in the labor market, working outside the labor market (for example, in the home), and enjoying rest or recreation. The income tax taxes only the proceeds from market work. The "proceeds" from time otherwise allocated—whether enjoyed as the fruits of nonmarket labor or as leisure time—do not enter the income tax base.

This implicit exclusion for self-provided goods and services and leisure is so familiar that, at first, it seems beyond question. On reflection, however, the exclusion raises a number of normative concerns¹—concerns that, although themselves subject to controversy,² seem worthy of serious consideration.

1. These normative concerns find expression in a recent literature supporting “endowment taxation.” While an income tax taxes on the basis of actual labor market earnings (as well as other forms of income), an “endowment tax” taxes on the basis of *potential* labor market earnings (as well as other components of “endowment,” such as inheritance). Thus, unlike the income tax base, the endowment tax base does not exclude the portion of earning potential that is allocated to the self provision of goods or services or to leisure. See, e.g., David F. Bradford & U.S. Treasury Tax Policy Staff, *Blueprints for Basic Tax Reform 21–48* (2d ed. 1984) (regarding as ideal, if not practically implementable, taxation based on earning power (and inheritance), rather than actual earnings); Daniel Shaviro, *Endowment and Inequality*, in *Tax Justice: The Ongoing Debate* 123, 144 (Joseph J. Thorndike & Dennis J. Ventry Jr. eds., 2002) (arguing that endowment taxation “deserves greater prominence and acceptance”); Kirk J. Stark, *Enslaving the Beachcomber: Some Thoughts on the Liberty Objections to Endowment Taxation*, 18 *Can. J.L. & Juris.* 47, 65 (2005) (arguing that liberal egalitarian arguments against endowment taxation, see *infra* note 2, are difficult to distinguish from libertarian arguments against all taxation); Lawrence Zelenak, *Taxing Endowment*, 55 *Duke L.J.* 1145, 1149, 1181 (2006) (concluding that “although Congress will not and should not enact” a system of endowment taxation in “a full-fledged” manner, principles associated with such taxation “can usefully inform tax policy analyses”).

Also relevant is the literature on taxing human capital. See generally, in chronological order, Paul B. Stephan III, *Federal Income Taxation and Human Capital*, 70 *Va. L. Rev.* 1357 (1984) (explicating concept of human capital and applying it to evaluate reform proposals and uncover logic of current tax code); Louis Kaplow, *Human Capital Under an Ideal Income Tax*, 80 *Va. L. Rev.* 1477, 1480 (1994) (“This investigation asks what treatment of human capital would be analogous to what has come to be understood as the ideal, accrual tax treatment of physical and financial capital.”).

2. The literature supporting endowment taxation, as described *supra* note 1, is balanced by a literature opposing that form of taxation, generally on the basis of principles of liberty or autonomy. See, e.g., Mark G. Kelman, *Personal Deductions Revisited: Why They Fit Poorly in an “Ideal” Income Tax and Why They Fit Worse in a Far from Ideal World*, 31 *Stan. L. Rev.* 831 (1979). Kelman argues that taxing the value of self-provided goods and services and leisure “would violate the simple libertarian principle that the state should not require people, directly or indirectly, to engage in particular activities.” *Id.* at 842. His argument is that taxing people according to what they could potentially earn in the labor market, rather than what they actually have earned, would effectively force people to market a portion of their labor in order to convert that labor value to a form in which they could remit their tax liability. *Id.* at 841–42. In line with this position, Kelman argues that voluntary entrance into the market is the proper touchstone for taxation. *Id.* at 842; see also, in chronological order, Eric Rakowski, *Can Wealth Taxes Be Justified?*, 53 *Tax L. Rev.* 263, 267 n.10 (2000) (arguing that taxing potential rather than actual labor market earnings “enslave[s]” the talented); Liam Murphy & Thomas Nagel, *The Myth of Ownership: Taxes and Justice* 123 (2002) (arguing against taxation of potential rather than actual labor market earnings as “an extreme interference with autonomy”); David Hasen, *Liberalism and Ability Taxation*, 85 *Tex. L. Rev.* 1057, 1063, 1076 (2007) (arguing that taxing potential rather than actual labor income is neither consistent with “liberal” political theories nor “optimally efficient”); Linda Sugin, *Let the Beachcomber Drown: Why Endowment Taxation is Unjust* 17, 24 (Fordham Legal Studies, Research Paper No. 959710, 2008), available at <http://ssrn.com/abstract=1102370> (on file with the *Columbia*

There are two ways to express such concerns. The first is to argue that the implicit exclusion for nonmarket activity attenuates the connection between tax liability and “ability to pay.” By virtue of the exclusion, that is, income tax is imposed on what people actually earn, not on what they are capable of earning.

Suppose, for instance, that two individuals have the same earning capacity in the sense that they can both command the same hourly wage rate in the labor market. The first individual chooses to work from nine to five. After hours, he reads or watches television in his relatively modest apartment. The second individual works overtime so that she can afford the higher rent on a larger apartment. With longer hours and a larger apartment, the second individual pays more income tax than the first because her actual income is higher. Yet the two individuals, facing the same wage rate, arguably have the same “ability to pay”—at least insofar as “ability to pay” means more than cash on hand.³

Alternatively, suppose that each spouse in one couple is capable of earning twice the hourly wage as each spouse in another couple. Imagine, however, that the higher wage couple sends only one spouse into the labor market, while the lower wage couple sends both. If, specifically, the higher wage couple works half as many hours in the labor market as the lower wage couple, then both couples have the same labor income and, all else the same, pay the same tax. But the higher wage couple presumably *could have* worked as many hours in the labor market as the lower wage couple. If it had, its labor income would have been twice as large as that of the lower wage couple. If ability to pay is the proper basis for tax liability, the tax bill of the higher wage couple should arguably be greater than, and not equal to, the tax bill of the lower wage couple.

Thus, one form of normative objection to the implicit exclusion for nonmarket activity emphasizes that the exclusion causes ability to pay, broadly defined, to have less of a role in determining tax liability. A second form of normative objection emphasizes the arbitrary nature of what may end up determining tax liability in place of ability to pay. In the first hypothetical, for example, the only difference between the two individuals—and so necessarily the source of the difference in their tax bills—is that one individual prefers time and the other space. The second individual, to satisfy her penchant for a larger apartment, must convert additional time into money. That money is then “income.” No such conversion is required of the first individual in pursuing his preference for additional leisure: The free time comes to him as such. Does this difference in preferences justify the resulting difference in tax liability? Contrary to the discussion above, one may well be prepared to argue that tax

Law Review) (arguing that taxing potential rather than actual labor income is inconsistent with liberal egalitarian ideals and fails to account for positive social value of various forms of nonmarket work).

3. For an alternative view, see Kelman, *supra* note 2, at 842 (arguing that it is appropriate to base taxation in part on voluntary entrance into the market).

liability should not turn so tightly on broad notions of ability to pay. But could one argue that tax liability *should* turn on the manner in which individuals trade off the time they have to relax against the space they have to relax in?

Within tax scholarship, the implicit exclusion for nonmarket activity is a well recognized feature of the income tax. Many of its implications—including those concerning work incentives and economic efficiency,⁴ the gender division of labor within families,⁵ and liberal philosophical principles of self determination⁶—have been extensively and ably discussed.

The approach taken in this Article differs from the existing literature in two respects. First, it focuses on economic inequality, rather than efficiency, gender inequality, or liberal philosophical values. Relative to these other guiding principles, economic inequality has received disproportionately little attention.

Second, the Article poses and addresses a question that is primarily empirical rather than theoretical. Viewing the exclusion for nonmarket activity as a kind of tax benefit, it asks: How is this tax benefit distributed across the spectrum of economic well being? Does it accrue mainly to those who are more well off, or mainly to those who are less well off? In

4. The distortionary effect of the income tax on work incentives is often cast in terms of its failure to tax imputed labor income. See, e.g., in chronological order, Michael J. McIntyre & Oliver Oldman, Taxation of the Family in a Comprehensive and Simplified Income Tax, 90 Harv. L. Rev. 1573, 1590 (1977) (discussing imputed income in context of taxation of “equal-income couples”); Edward Yorio, Equity, Efficiency, and the Tax Reform Act of 1986, 55 Fordham L. Rev. 395, 401 n.49 (1987) (finding “plausible arguments for taxing wages at a *lower* rate than income from capital,” including the fact that “to earn wages one necessarily forgoes leisure,” and arguing that “[a] lower rate of tax on wages may be defended as an indirect means of taxing the imputed income from leisure that a taxpayer with the same amount of income from capital is able to enjoy”); Joseph Bankman, The Case Against Passive Investments: A Critical Appraisal of the Passive Loss Restrictions, 42 Stan. L. Rev. 15, 28 n.76 (1989) (“[A]n optimal income tax would almost certainly tax the imputed income from leisure.”).

5. See, e.g., in chronological order, William D. Popkin, Household Services and Child Care in the Income Tax and Social Security Laws, 50 Ind. L.J. 238, 245–46 (1975) (describing effects of implicit exclusion for nonmarket activity on gender division of labor); Edward J. McCaffery, Taxation and the Family: A Fresh Look at Behavioral Gender Biases in the Code, 40 UCLA L. Rev. 983, 1004–05 (1993) (“[W]hen the effects are examined from the perspective of the behavioral impact . . . , what is disturbing is the push towards a gender division of labor. . . . Given that the wife is apt to have less market power, and perhaps be socialized into the role of care-provider, it becomes more likely that it will be she who takes advantage of the imputed income bonus.”); Nancy Staudt, Taxing Housework, 84 Geo. L.J. 1571, 1574 (1996) (proposing that “Congress . . . broaden the tax base to include the value of women’s household labor, thereby subjecting the benefits of housework to the same tax structure as waged labor”); Allan J. Samansky, Child Care Expenses and the Income Tax, 50 Fla. L. Rev. 245, 279 (1998) (studying interaction of exclusion with tax treatment of child care expenses).

6. See literature discussed *supra* note 2. The adjective “liberal” here refers to a particular tradition in philosophy, rather than (necessarily) a region of the political spectrum.

order to answer this question, the Article applies modern statistical techniques to the best available data on earnings capacity and work patterns.⁷

To cast the analysis in familiar terms, the Article specifically considers how the implicit exclusion for nonmarket activity affects the income tax's "progressivity," suitably redefined.⁸ Conventionally, the progressiv-

7. The literature that is perhaps most closely related to the present study measures the progressivity of the child care credit. See I.R.C. § 21 (2000) (providing nonrefundable credit, phased down on adjusted gross income, for limited amount of child care expenses incurred to enable taxpayer to be gainfully employed). This literature arose in response to complaints by policymakers that the credit is regressive because it is nonrefundable. See, e.g., in chronological order, Amy Dunbar & Susan Nordhauser, *Is the Child Care Credit Progressive?*, 44 Nat'l Tax J. 519, 519, 525 (1991) (describing Senator Kennedy's 1989 claim that credit is regressive and finding, on the contrary, that for the period 1979 to 1986 credit added to tax code progressivity); Rosanne Altshuler & Amy Ellen Schwartz, *On the Progressivity of the Child Care Tax Credit: Snapshot Versus Time-Exposure Incidence*, 49 Nat'l Tax J. 55, 56–57, 64 tbl.3 (1996) (finding for 1983 that credit is seen to deliver greater benefits to lowest (actual) income group if income is measured by averaging income levels over several years). In comparing these studies to the present Article, notice that they estimate not the progressivity effect of the exclusion for nonmarket activity, but rather the progressivity impact of what might be regarded as a partial countermeasure to such exclusion. See *infra* Part V.D.2 for a discussion of the special structure and limited impact of the child care credit.

For additional discussion, see William M. Gentry & Alison P. Hagy, *The Distributional Effects of the Tax Treatment of Child Care Expenses*, in *Empirical Foundations of Household Taxation* 99, 100, 122 fig.4.2, 123 n.34 and accompanying text (Martin Feldstein & James M. Poterba eds., 1996) (finding for 1989, and among married couples with children, that credit was more progressive in terms of potential income than in terms of actual income). Like the present study, Gentry and Hagy measure progressivity in terms of potential income. *Id.* at 100. However, like the two studies mentioned above, Gentry and Hagy study only the impact of the credit and not the impact of the implicit exclusion that it only partially counteracts. Moreover, unlike both the present study and the papers mentioned above, Gentry and Hagy measure the progressivity of the credit itself, not the magnitude of the impact of the credit on overall income tax progressivity.

8. Two theoretical issues regarding progressivity—and their relation to the empirical exercise conducted in this Article—are worth noting. First, it is not clear from an optimal tax perspective that the income tax should be progressive, even if redistribution is desired. See J.A. Mirrlees, *An Exploration in the Theory of Optimum Income Taxation*, 38 *Rev. Econ. Stud.* 175, 207–08 (1971) (finding, *inter alia*, that uniform progressivity is not an implication of optimal taxation of labor earnings). For less technical accounts, see Chris William Sanchirico, *Deconstructing the New Efficiency Rationale*, 86 *Cornell L. Rev.* 1003, 1050 (2001) [hereinafter Sanchirico, *Deconstructing*]; Joel Slemrod, *Do We Know How Progressive the Income Tax System Should Be?*, 36 *Nat'l Tax J.* 361, 363 (1983). Roughly speaking, a tax schedule with uniformly increasing average tax rates may not be the most efficient means of decreasing economic inequality, given the varying distortionary effects of taxation on work incentives across the potential income scale. Note that this Article does not ask whether the current tax code redistributes *efficiently*, but rather *how much* it redistributes. This is a question of tax incidence rather than tax optimality.

Second, an even more foundational question is why redistribution should be desired in the first place. From a welfarist perspective, one of many approaches to the question, there are at least two distinct impetuses for the redistribution of resources: the assumption that marginal utility from resources is diminishing, and the axiomatic adoption of an "equity-regarding" social welfare function—that is, one that increases with mean-preserving equalizing transfers of utility. For more on this, see Matthew D. Adler & Chris

ity of the income tax is measured by the extent to which taxpayers with higher pretax incomes pay a greater percentage of such income in tax.⁹ For example, if low income taxpayers in Country A pay 10% of their income in tax, while high income taxpayers pay 20%, Country A's income tax would be regarded as progressive. Yet if, in Country B, low income taxpayers pay 10% of their income in tax, while high income taxpayers pay a full 35%, Country B's income tax code would be regarded as more progressive than Country A's.¹⁰

This paper proposes a different measure of progressivity. This new measure is based not on tax owed as a proportion of what is actually earned, but on tax owed as a proportion of what *could* be earned. The tax code is regarded as progressive under this alternative measure if those who *could* earn more pay a larger portion of such *potential* earnings in tax.

To see how this measure of progressivity differs from the conventional measure, imagine that in the above example high income Country B taxpayers work only half time. Then the tax payments of high income taxpayers in Country B, although constituting 35% of their *actual* income, are only half that much, 17.5%, of their *potential*—i.e., full time—income.¹¹ If we further suppose that all other taxpayers in Country A and in Country B work full time, then the potential income tax rates of these other taxpayers equal their actual income tax rates. (Recall that this is 10% for low income taxpayers in either country, and 20% for high income taxpayers in Country A.) Country B's income tax is still more progressive than Country A's in terms of actual income (from 10% to 35% versus from 10% to 20%). But Country B's income tax is *less* progressive than Country A's in terms of potential income (from 10% to only 17.5%, versus from 10% to 20%).

Thus, in Country B, the implicit exclusion for nonmarket activity rounds chiefly to the benefit of high income taxpayers. To be sure, the regressive incidence of this tax benefit in Country B is not enough to render its tax code regressive in terms of potential income: High potential income taxpayers in Country B still pay a greater proportion of their

William Sanchirico, *Inequality and Uncertainty: Theory and Legal Applications*, 155 U. Pa. L. Rev. 279, 291–304 (2006). This Article's attempt to more precisely measure the extent of redistribution in the current code should be of interest both to those who favor more redistribution and to those who favor less.

9. Joel Slemrod & Jon Bakija, *Taxing Ourselves: A Citizen's Guide to the Debate over Tax Reform* 52 (2d ed. 2000).

10. Under the current federal income tax, average tax rates range from roughly negative 40% (due to refundable credits) to 35%, the top rate bracket for ordinary income. I.R.C. § 1 (2000 & Supp. V 2005) (providing individual income tax rate schedules); id. § 32(b)(1)(A) (specifying earned income "credit percentage" of 40% for taxpayers with two qualifying children); id. § 6401(b)(1) (making earned income credit refundable).

11. The calculation is as follows: High income taxpayers in Country B could earn X per year. Instead, they earn $\frac{1}{2}X$. So, their tax bill is 35% of $\frac{1}{2}X$ (what they actually earn), which is only 17.5% of X (what they could earn).

potential income in tax than low income taxpayers (17.5% versus 10%). But the regressive impact of the exclusion is enough to render Country B's tax code less progressive in terms of potential earnings than Country A's, where the incidence of the tax benefit for nonmarket activity is not similarly skewed towards high income individuals.

This Article presents similar findings, not across two countries, but across two points in time for a single country. The Article shows that despite increases in actual income progressivity over the 1990s,¹² changes in work patterns over the course of that decade rendered the U.S. income taxation of labor earnings¹³ less progressive in potential income terms at the end of the decade than at the beginning.

Before describing these findings in more detail, it is important to clarify why it is worth searching for them in the first place. The tax code contains many features that impact progressivity. Within the federal income tax itself, for example, reduced rates on long-term capital gains and dividends,¹⁴ the deduction for mortgage interest,¹⁵ and the earned income credit¹⁶ come immediately to mind as bearing importantly on the tax code's progressivity. Why focus on the exclusion for nonmarket activity?

The chief reason is that the exclusion for nonmarket activity is comparatively large in magnitude not only in relation to these other tax code features, but also in relation to the scant attention that it has received in empirical tax analysis.

To illustrate, Table 1 shows the largest items¹⁷ in the 2007 "Tax Expenditure Budget."¹⁸ The Tax Expenditure Budget measures the size of exclusions, deductions, and credits by recasting them as payments to

12. See *infra* Part IV.C (explaining tax code changes that led to increase in statutory progressivity of income taxation of labor earnings over range of labor income studied in this Article).

13. As discussed *infra* text accompanying note 33, this Article focuses specifically on the progressivity of the income taxation of labor earnings.

14. I.R.C. § 1(h) (imposing maximum rate for individuals of 15% on "net capital gains," inclusive of "qualified dividend income").

15. *Id.* § 163(h) (allowing deduction for "qualified residence interest").

16. *Id.* § 32 (providing refundable credit for "earned income").

17. Despite technical problems with doing so, some items, such as those relating to owner-occupied housing, are added together for a more meaningful comparison. See Tax Expenditure Budget, *infra* note 18, at 20 (tax expenditures non additive due to interactive effects).

18. See Staff of Joint Comm. on Taxation, 110th Cong., Estimates of Federal Tax Expenditures for Fiscal Years 2007–2011, at 23–36 (Comm. Print 2007), available at <http://www.house.gov/jct/s-3-07.pdf> (on file with the *Columbia Law Review*) [hereinafter Tax Expenditure Budget] (showing estimates of federal tax expenditures); Office of Mgmt. & Budget, Analytical Perspectives: Budget of the United States Government, Fiscal Year 2009, at 287–328 (2008), available at <http://www.whitehouse.gov/omb/budget/fy2009/pdf/spec.pdf> (on file with the *Columbia Law Review*). Estimates in the OMB document are prepared by the Office of Tax Analysis in the Treasury Department. Tax Expenditure Budget, *supra*, at 1.

the taxpayer,¹⁹ rather than as subtractions from what the taxpayer would otherwise pay to the government. Two features of the table are worth noting. First, the largest items are in the neighborhood of \$125 billion. Second, the implicit exclusion for nonmarket activity does not appear on the list.

TABLE 1: LARGEST TAX EXPENDITURE ITEMS FOR INDIVIDUALS
(IN BILLIONS OF DOLLARS)

Net exclusion of pension contributions and earnings under employer plans; individual retirement plans; "Keogh plans"; and IRAs	133.8
Reduced rates of tax on dividends and long-term capital gains	127.1
The deduction for mortgage interest on owner-occupied residences; the exclusion of capital gains on sales of principal residences; and the deduction for property taxes on owner-occupied housing	119.0
Exclusion of employer contributions for health care; health insurance premiums; and long-term care insurance premiums (including those through cafeteria plans)	105.7
Exclusion of capital gains at death	51.9
Tax credit for children under seventeen	45.0
Earned income credit	44.7
Deduction for charitable contributions, including those for education and health	41.9
Exclusion of Medicare benefits for hospital insurance, supplementary medical insurance, and prescription drug insurance	39.9
Deduction of nonbusiness state and local government income taxes, sales taxes, and personal property taxes	33.9
Exclusion of investment income on life insurance and annuity contracts	26.1
Exclusion of untaxed social security benefits and railroad retirement benefits	22.4
Exclusion of interest on public purpose state and local bonds	20.0

Source: Culled from Tax Expenditure Budget, *supra* note 18, at 24 tbl.1.

The implicit exclusion for nonmarket activity fails to appear on the list not because it was calculated to be smaller than the items that do appear, but because it was not calculated at all. Determining the magnitude of that particular exclusion is not considered part of the tax expenditure exercise.²⁰ Some rough calculations suggest, however, that *had* it

19. Tax Expenditure Budget, *supra* note 18, at 2–3 (describing concept of tax expenditures). In making their calculations, the Joint Committee on Taxation assumes that individual behavior is fixed. *Id.* at 20. This assumption distinguishes the exercise of calculating tax expenditures from the exercise of calculating the revenue effect of eliminating a provision. *Id.* at 22.

20. See *id.* at 3–8 (describing what are considered tax expenditures). This report makes no mention of the omission. It does, however, mention another source of imputed income, from "the services provided by owner-occupied homes and durable goods," citing

been calculated, the exclusion for nonmarket activity would top the list. Keeping in mind that the largest reported tax expenditures are in the neighborhood of \$125 billion, note that \$5,400 billion of salary and wage income was reported in tax year 2005.²¹ How this amount translates into a tax expenditure on nonmarket activity depends on what one assumes regarding, among other factors, the fraction of workable hours that individuals spend outside the labor market and the applicable tax rate. Reasonable assumptions place the tax expenditure for nonmarket activity in the range of \$110 to \$270 billion, making it anywhere from one to two times the largest reported tax expenditures.²²

The climacteric transformation of work patterns that has taken place over the last quarter century provides another reason to investigate the economic equity effects of the exclusion for nonmarket activity. As several researchers have noted, married women entered the labor market in unprecedented numbers over this period.²³ From 1980 to 2000, for in-

administrative and measurement issues as the reasons for not including such imputed income in the tax expenditure budget. *Id.* at 5 (“The measurement of imputed income for tax purposes presents administrative problems and its exclusion from taxable income may be regarded as an administrative necessity.”).

21. Internal Revenue Serv., Individual Income Tax Returns Publication 1304, at 2 tbl.A (2005), available at <http://www.irs.gov/pub/irs-soi/05inalcr.pdf> (on file with the *Columbia Law Review*). The figure in this report is stated in 2005 dollars. I have adjusted the figure upwards for inflation (using the PCE Deflator) in order to make the figure comparable to the 2007 dollar figures presented in Table 1. For more information about the PCE Deflator, see *infra* note 61.

22. An upper bound of \$270 billion is calculated assuming that the tax rate on residual workable hours (hours not worked in the market) is on average 15%, that there is no wage discount for residual workable hours, and that the residual workable hours are one-third of market work hours. A lower bound of \$112.5 billion is calculated assuming that the tax rate on residual workable hours is 12.5% (roughly the percentage of adjusted gross income paid in tax in 2004), that the wage discount for residual workable hours is two-thirds, and that residual workable hours are one-quarter of market work hours.

23. See, e.g., in chronological order, Francine D. Blau & Laurence M. Kahn, Changes in the Labor Supply Behavior of Married Women: 1980–2000, at 1–2 (IZA Discussion Paper No. 2180, 2006), available at <http://ssrn.com/abstract=918724> (on file with the *Columbia Law Review*) (finding based on census (CPS) data that most of increase in measured economic value of labor supply by married women from 1980–2000 was due not to increased female wages, but to supply shifts; finding also that labor supply elasticity for married women decreased markedly over same period); Lawrence Mishel, Jared Bernstein & Sylvia Allegretto, The State of Working America 2006/2007, at 88–92 (2006) (examining work hour trends in summary statistics for census (CPS) data on work hours for married couple families with children, with both spouses aged twenty-five to fifty-four for peak years 1979, 1989, and 2000; measuring work hours against actual rather than potential income); Bradley T. Heim, The Incredible Shrinking Elasticities: Married Female Labor Supply, 1978–2002, 42 *J. Hum. Resources* 881 (2007) (reporting simultaneous and similar findings as Blau & Kahn, *supra*, with regard to decline in female labor supply elasticities).

In general, the changing relationship between income, wages, and work hours has been well studied within the field of labor economics. A partial list of relevant articles includes, in chronological order, John Pencavel, Labor Supply of Men: A Survey, in 1 *Handbook of Labor Economics* 3 (Orley Ashenfelter & Richard Layard eds., 1986); Chinhui Juhn, Kevin M. Murphy & Robert H. Topel, Why Has the Natural Rate of

stance, average market work hours for all married women, including those with zero market work hours, increased by approximately one full workday a week.²⁴ However, existing data seem to suggest that the movement of married women into the labor market has not been uniform across the income scale, with the most dramatic changes located at the middle and lower middle income levels.²⁵ Such tectonic shifts in socio-economic patterns call for an investigation of potential implications, not the least of which concern the progressivity of the income tax.

To measure how changing work patterns affect income tax progressivity, I turn to the Panel Study of Income Dynamics (PSID), a well known dataset with relatively rich and comprehensive information on family

Unemployment Increased over Time?, *Brookings Papers on Econ. Activity*, 1991, vol. 2, at 75 (finding positive elasticity of work hours in wages); Chinhui Juhn, *Decline of Male Labor Force Participation: The Role of Declining Market Opportunities*, 107 *Q.J. Econ.* 79 (1992); Chinhui Juhn & Kevin M. Murphy, *Wage Inequality and Family Labor Supply*, 15 *J. Labor Econ.* 72 (1997) [hereinafter Juhn & Murphy, *Wage Inequality*] (finding that employment and wage gains for married women between 1969 and 1989 were largest for those married to middle and high wage husbands); Dora Costa, *The Unequal Workday: A Long Term View*, 88 *Am. Econ. Rev. (Papers and Proc.)* 330 (1998) [hereinafter Costa, *The Unequal Workday*] (examining usual length workday by wage decile in 1890, 1973, and 1991—which were trough, rather than peak years in business cycle—and finding that although lower wage deciles worked longer hours in 1890, pattern had leveled by 1973 and reversed by 1991); Dora Costa, *The Wage and the Length of the Work Day: From the 1890s to 1991*, 18 *J. Labor Econ.* 156 (2000) (expanding on earlier work, Costa, *The Unequal Workday*, supra).

For a review and assessment of this literature, see John Pencavel, *A Cohort Analysis of the Association Between Work Hours and Wages Among Men*, 37 *J. Hum. Resources* 251 (2002). Pencavel describes the consensus in the 1980s that the elasticity of work hours in wages was near zero or negative. *Id.* at 251. He also describes the break in this consensus in the 1990s, when several papers published estimates of this elasticity that were large and positive. *Id.* at 251–52. Pencavel argues that controlling for age and age squared is what produced positive estimated elasticities in the 1990s papers. *Id.* at 271. He suggests that researchers who found positive elasticities were measuring the substitution of work hours into higher wage periods, while researchers who earlier had found zero or negative elasticities were measuring changes in permanent income and finding the classic textbook ambiguity regarding the slope of labor supply function. *Id.* This classic ambiguity derives from the possibly countervailing impacts of substitution and income effects, as described in Hal R. Varian, *Intermediate Microeconomics: A Modern Approach* 160–81 (7th ed. 2006).

24. See Blau & Kahn, supra note 23, at 13, 47 tbl.1. Specifically, average work hours of married women increased dramatically during the 1990s, the period studied in this Article. However, the most dramatic increases in work hours occurred during the 1980s. *Id.* Note in this regard that the main results in this Article are primarily driven not by changes in average work hours, but by changes in the distribution of work hours across potential income groups. These appear to be more significant during the 1990s. See infra note 25.

25. Mishel, Bernstein & Allegretto, supra note 23, at 91 tbl.1.24 (showing the following percentage increases in work hours of married women, aged 24–54, with children, over 1989–2000 (the period studied in this Article) broken down by family income quintile: for the lowest quintile, 9.3%; for the second quintile, 16%; for the middle quintile, 18.6%; for the fourth quintile, 9.6%; and for the highest quintile, 6.8%). The same left-skewed hump pattern emerges in the 1980s, though somewhat less dramatically. *Id.*

work hours and family average hourly earnings.²⁶ I examine PSID data for a particular time period, a particular demographic cohort, and a particular range of the income spectrum.

With regard to time period, I focus on the 1990s, comparing 1989 to 2000 (both peak years in the business cycle, and thus macroeconomically comparable²⁷). The 1990s are of interest not only for their recency, but also because, as it turns out, conspicuous increases in the statutory progressivity of the income taxation of labor earnings during that period were quietly countered by less obvious progressivity reducing changes in work patterns. The 1990s, therefore, present an informative case study of the relative importance of work patterns on potential income progressivity. With regard to demographic cohort, I focus on the subpopulation of mid-career married couples with two children. The focus on married couples derives from existing research indicating that the largest shifts in work patterns were among married women.²⁸ The focus on couples with a particular number of children reflects the desire to limit the sample sufficiently to be able to plausibly apply a single tax schedule. The focus on mid-career couples reflects a desire to avoid the complicating effects of schooling and retirement. Lastly, my story specifically concerns a fixed region of the potential income distribution—from roughly the tenth percentile to the ninetieth percentile of income earners in 1989.²⁹

My first set of findings concerns what happened individually within each year, 1989 and 2000. I find that in 1989, labor supply patterns worked in conjunction with statutory progressivity to produce a degree of potential income progressivity that exceeded actual income progressivity. As explained in Part IV.B, this is because couples with greater potential income “realized” a greater portion of those potential earnings as taxable labor income in 1989.

In 2000, by contrast, work patterns dampened potential income progressivity. Couples with greater potential income tended to realize a lower portion of their potential income as actual income. Nonetheless, statutory progressivity overwhelmed this effect, and the tax code in 2000 was still progressive in potential income terms.

My second set of findings derives from comparing the two years. The income taxation of labor earnings became more progressive (in actual income terms) over the course of the 1990s. For the tax cohort and potential income range that I study, the main source of additional progres-

26. The relative advantages and disadvantages of using the PSID rather than the March CPS, a popular alternative, are discussed *infra* Part II.B.

27. This is in line with other analyses of work and income trends, which often compare peak years such as 1979, 1989, and 2000, or trough years such as 1973 and 1991. See, e.g., Mishel, Bernstein & Allegretto, *supra* note 23, at 68–69 & tbl.1.13 (examining peak years); Costa, *The Unequal Workday*, *supra* note 23, at 330–32 & tbl.1 (examining trough years).

28. See sources discussed *supra* note 23.

29. For further discussion of this point, see *infra* note 82.

sivity was the enactment of the child tax credit in 1997.³⁰ Yet, differences in potential income realization across the income spectrum shifted over the course of that decade from a progressivity enhancing force to a progressivity reducing force. This reversal in the progressivity impact of labor income realization was significant enough to overwhelm increases in statutory progressivity. Consequently, although on paper the 2000 code was more progressive than the 1989 code, it was in fact less progressive in potential income terms. In short, shifting work patterns offset the child tax credit.

These empirical conclusions have a number of policy implications, which are discussed in detail in Part V of the Article. Most obviously, the Article's findings regarding the progressivity impact of labor income realization patterns point toward the propriety of taking work patterns into account in setting tax schedules. They also provide some support for expanding the currently meager credit for child care expenses (not to be confused with the child tax credit).³¹ A more substantial credit would put couples who purchase child care with market earnings on a more equal footing with those who self provide such services. The findings in this Article suggest that the former group is not evenly distributed across the spectrum of earnings capacity, which in turn suggests that the size of the child care credit is, among other things, an issue of economic inequality.

The Article's empirical analysis also has implications for evaluating proposals for structural tax reform. Most of the discussion to date has surrounded the proposal to replace the income tax with a consumption tax.³² Although a consumption tax differs in important respects from an income tax, it too provides an implicit tax benefit for nonmarket activity. The analysis in this Article suggests that the tax-favored treatment of nonmarket activity may deserve greater attention in the debate regarding wholesale tax reform. Alternatives or appendices to consumption taxation that attempt to bring tax liability more in line with earnings capacity may deserve greater practical consideration than they have thus far received.

These are the main points of the Article. The remainder of the Article describes in greater detail the empirical and policy analysis that supports these points. But before delving further into specific procedures

30. The Taxpayer Relief Act of 1997, Pub. L. No. 105-34, § 101(a), 111 Stat. 788, 796 (codified as amended at I.R.C. § 24 (2000)) (providing partially refundable per child credit that phases out for higher income taxpayers). For a discussion of changes in statutory progressivity between 1989 and 2000, see *infra* Part IV.C.

31. See I.R.C. § 21 (providing nonrefundable credit, phased down on adjusted gross income, for limited amount of child care expenses incurred to enable taxpayer to be gainfully employed).

32. The debate regarding consumption taxation is summarized in Daniel Shaviro, *Beyond the Pro-consumption Tax Consensus*, 60 *Stan. L. Rev.* 745 (2007) [hereinafter Shaviro, *Beyond*].

and findings, a few general remarks regarding the scope of the inquiry are worth mentioning.

First, the Article considers only the income taxation of labor earnings. This limitation of focus should be regarded as an attempt to begin the process of “dividing and conquering” a vast and multiplex issue. One portion of the overall picture of tax code progressivity, an important portion, is income tax progressivity with regard to labor earnings. This Article separates out for closer study this important component in a notional decomposition of overall tax code progressivity.³³

Second, in defining “potential income,” the Article—imitating the tax code itself—takes a time-slice approach. The concept of potential income analyzed here captures the potential earnings of a tax unit, given its current stock of human capital. The taxpayer’s level of education, for instance, is regarded as fixed. Perhaps an individual with only a high school diploma could have obtained a college degree in prior years. Perhaps, having done so, she could now command a higher wage. Or, perhaps, the individual could have moved geographically in prior years in order to access a more favorable labor market. In either case, there is a sense in which this individual is not realizing her “potential” in terms of current labor earnings. However, this sense of “long-run potential income” is not studied here. What is studied might be more accurately referred to as “short-run potential income.”³⁴ Just as, in the economic theory of the firm, “short-run costs” are defined to take existing investment in plant and equipment as fixed,³⁵ short-run potential income takes existing investment in human capital as fixed.

The Article’s focus on short-run potential income implies, in turn, a focus on two particular sources of divergence between earning potential and actual earnings: differences in work hours and differences in hourly earnings rates within educational, demographic, or geographic groups. Thus, if one spouse stays at home, or works part time, or works full time at the kind of job that pays less than what full-time workers in his cohort are currently earning, then, all else the same, this couple’s potential income, as measured in this Article, will be larger than its actual income.

33. It is possible that other sources of income are correlated with labor income and, as a result, these other sources differentially affect the rate paid on labor income by pushing some tax units, and not others, into higher brackets. This raises the possibility that the story told in this Article regarding labor income and progressivity is not the full story for labor income—that labor income also plays a role in overall progressivity by virtue of its correlation with other sources of income. This renders no less important a study of the terms in labor income per se, as attempted here; it merely means that some of the terms in the decomposition of overall tax code progressivity—in addition to those terms in labor income alone and those terms in income from other sources alone—would concern the covariance between labor income and other sources of income.

34. An exception to this general principle is my treatment of work experience. See *infra* note 96.

35. See Varian, *supra* note 23, at 367–77 (defining short-run and long-run costs for firms).

There is no doubt that a longer run conception of potential income is worth investigating in relation to the income tax.³⁶ For several reasons, that investigation is not conducted here. In the first place, the study of long-run potential income is seriously hampered by data limitations.³⁷ Secondly, because adopting a long-run conception of potential income would distance the analysis from the current income tax, it also risks removing it from current policy discourse. Thirdly, one could justifiably claim that many of the issues attaching to long-run (but not short-run) potential income relate to timing and realization, implicating separate features of the income tax that warrant and require separate study.³⁸

A third limitation of the Article is that it generally ignores heterogeneity in *workable* hours. It assumes that the level of workable hours is the same for all individuals, and that individuals differ only in what they can earn per hour and in how many hours they actually work. In fact, it may be the case that some individuals who are not working *could not* work, because work is simply not available. A similar possibility arises with respect to part-time workers. My analysis overstates the potential income of these individuals. Correspondingly, my analysis *understates* their potential income average tax rate (the calculation of which puts potential income in the denominator). However, because a relatively small proportion of individuals within the subpopulation of families that I study are unemployed (in the sense of wanting but being unable to work),³⁹ the magnitude of the effect of this understatement on my results is unlikely to be large.

36. See Matthew D. Adler, *Well-Being, Inequality and Time: The Time-Slice Problem and Its Policy Implications* 3–5, 50–53 (Univ. of Pa. Law Sch. Inst. for Law & Econ., Research Paper No. 07-17, 2007), available at <http://ssrn.com/abstract=1006871> (on file with the *Columbia Law Review*) (arguing welfarists should evaluate policies with respect to their impact on lifetime well-being and specifically considering implications of lifetime welfare approach for tax policy).

37. Some studies of lifetime tax incidence have been conducted. See, e.g., Don Fullerton & Diane Lim Rogers, *Who Bears the Lifetime Tax Burden?* (1993) (using calibrated simulation to estimate the lifetime impact of various taxes); Erik Caspersen & Gilbert Metcalf, *Is a Value Added Tax Regressive? Annual Versus Lifetime Incidence Measures*, 47 *Nat'l Tax J.* 731 (1994) (estimating impact of value added tax on lifetime income). Other studies measure the progressivity of annual tax or transfer payments using proxies for lifetime income as the denominator in average tax rate calculations. Most often, the stated reason for doing this is to dampen the effects of transitory changes in income. See, e.g., Altshuler & Schwartz, *supra* note 7, at 56 (measuring progressivity of child care credit using “time exposure” income, that is, average income of the tax unit over years in data set); Joel Slemrod, *Taxation and Inequality: A Time-Exposure Perspective*, in 6 *Tax Policy and the Economy* 105 (James M. Poterba ed., 1992) (using “time-exposure” income, as defined above, as a proxy for lifetime income).

38. For a discussion of these issues, see Kaplow, *supra* note 1; Stephan, *supra* note 1.

39. These relatively low unemployment figures are evident from the data itself. For a description of the data and survey design used in this paper, see *infra* Part II.

Lastly, the paper does not consider a host of what might be called “horizontal equity” issues⁴⁰ that arise specifically with respect to potential income progressivity. Two families with equal potential income, for instance, may devote differing numbers of hours to market work. They will thus have different levels of tax liability and different average tax rates. Consequently, there is no single potential income average tax rate at each level of potential income. Rather, there is a distribution of potential income average tax rates and only a tendency for this distribution to vary in the level of potential income. This Article does not analyze the dispersion of the distribution of tax liability at each level of potential income. It focuses instead on the tax liability of the average member of each potential income group.

The remainder of the Article is organized as follows. Part I provides a conceptual framework for the empirical analysis. Part II describes the data (from the PSID) and the survey design from which it derives. The main empirical findings of the paper, regarding actual and potential income progressivity in 1989 and 2000, are presented in Part III. Part IV describes in greater detail the calculations and intermediate results that lie behind the main findings presented in Part III. Part V contains a discussion of several of the issues raised by these findings.

I. CONCEPTUAL FRAMEWORK

This Part discusses various conceptual issues surrounding the measurement of tax progressivity and potential income. It also shows how the tax code’s degree of potential income progressivity can be informatively decomposed into several distinct components. This decomposition forms the conceptual basis of the empirical work reported in subsequent Parts.

A. *Measuring Progressivity*

The tax code is progressive if those⁴¹ with greater income pay a larger proportion of that income in tax. The proportion of income paid in tax is called the average tax rate. One way to measure progressivity—

40. There is much controversy surrounding whether horizontal equity is really an independent normative principle, and, if so, whether and to what extent it should be given weight in policymaking. See, e.g., in chronological order, Louis Kaplow, *Horizontal Equity: Measures in Search of a Principle*, 42 *Nat'l Tax J.* 139 (1989) (questioning justification for horizontal equity as independent welfare principle); Richard A. Musgrave, *Horizontal Equity, Once More*, 43 *Nat'l Tax J.* 113 (1990) (arguing for horizontal equity as independent welfare principle); Louis Kaplow, *Commentary on Tax Policy and Horizontal Equity*, in *Inequality and Tax Policy* 75 (Kevin A. Hassett & R. Glenn Hubbard eds., 2001) (arguing that horizontal equity is unjustified as independent principle); Alan J. Auerbach & Kevin A. Hassett, *A New Measure of Horizontal Equity*, 92 *Am. Econ. Rev.* 1116, 1116 (2002) (deriving measure of inequality that is “decomposable into components naturally interpreted as indices of horizontal and vertical equity”).

41. For ease of exposition, the following discussion will view taxpayers as individuals. As noted, however, the empirical analysis in the Article concerns married couples. The same measurement principles apply at the family level.

and the method adopted in this paper—is to compare the percentage increase in the average tax rate to the percentage increase in income. That is, one asks the question: For every one percentage point increase in actual income, by how many percentage points does the average tax rate increase?⁴² The greater the percentage point increase in the average tax rate, the more progressive the tax code. It is common to refer to this measure of relative percentage increases as an “elasticity.”⁴³

Suppose, for example, that there are only two income levels: \$50,000 and \$100,000. Suppose that the tax schedule imposes tax liability equal to 10% of the taxpayer’s first \$50,000 of income and 20% of the taxpayer’s second \$50,000 of income. Then, those with \$50,000 of income pay 10% of that income in tax. Their average tax rate is 10%. Those with \$100,000 of income pay tax of \$5,000 on the first \$50,000 and \$10,000 on the second, for a total tax of \$15,000. Their average tax rate is 15%. Therefore, when income increases from \$50,000 to \$100,000 (an increase of 100%), the average tax rate increases from 10% to 15% (an increase of 50%). Thus, the progressivity of the tax code, as measured by the elasticity of average tax rates, is .5 (50% divided by 100%).

The preceding example concerns the progressivity of the tax code in terms of actual income. The same measurement principles can be applied to *potential* income. (The method used in this Article to measure potential income itself will be discussed below.⁴⁴ For purposes of the present discussion, assume that each taxpayer’s potential income is known.) The tax code is progressive *in potential income terms* if those with greater potential income pay a greater proportion of that potential income in tax. The proportion of potential income paid in tax is the potential income average tax rate. Again, progressivity is measured in terms of an elasticity, by finding the percentage increase in the potential income average tax rate per percentage increase in potential income.

B. *The Three Components of Potential Income Progressivity*

A key theoretical finding in this Article concerns the decomposition of potential income progressivity into several components.⁴⁵ How quickly

42. This amount is the degree of actual income progressivity at each level of actual income. To measure the overall progressivity of the code in terms of actual income, one averages the level of progressivity at each level of actual income.

43. Why use measures of progressivity that measure changes in terms of elasticities? The reason is that such elasticity measures lend themselves most readily to concise decomposition. Note that other non-elasticity measures of progressivity can always be recovered from an elasticity measure.

44. See *infra* Part I.C.

45. This result is derived mathematically in the working paper version of this Article. See Chris William Sanchirico, *Progressivity and Potential Income: Measuring the Effect of Changing Work Patterns on Income Tax Progressivity* 12–21, 62–63 (Univ. of Pa. Law Sch., Pub. Law & Legal Theory Research Paper No. 07-03, 2007), available at http://www.cstone.net/~csanchir/Sanchirico_Progressivity_Technical.pdf (on file with the *Columbia Law Review*) [hereinafter Sanchirico, Working Paper].

the potential income average tax rate increases as potential income increases (that is, the elasticity of the potential income average tax rate) depends on three things: statutory progressivity, realization variance, and the general realization level. These three components and their differing effects on potential income progressivity may be summarized in a simple mathematical formula. Before presenting that formula, this section considers each component in turn.

First, potential income progressivity depends on how quickly *actual* income average tax rates increase as *actual* income increases. That is, potential income progressivity depends on the elasticity of the actual income average tax rate. The elasticity of the actual income average tax rate is the first component listed above: “statutory progressivity.” In general (though, interestingly, not always⁴⁶), the more progressive the code is in terms of actual income, the more progressive it is in terms of potential income.

The second and third components of potential income progressivity both relate to the pattern of potential income “realization.” A taxpayer “realizes” her potential income to the extent that she actually *earns* that amount. A taxpayer’s (labor income) “realization ratio” is the proportion of her potential income that she earns as actual income. For instance, a taxpayer with potential income of \$100,000 who actually earns \$75,000 realizes three quarters of her potential income. Her realization ratio is .75.

The second effect overall on potential income progressivity—and the first connected to potential income realization—concerns variation in the realization ratio across levels of potential income. If high potential income individuals realize a greater portion of their potential income than low potential income individuals—because high potential income individuals tend to work longer hours or because their hourly earnings are closer to their potential wage rate—then, all else the same, high potential income individuals will have a higher potential income average tax rate than low potential income individuals. Conversely, if high potential income individuals realize a *lower* portion of their potential income than low potential income individuals, then, all else the same, high potential income individuals will have a lower average tax rate than low potential income individuals.

Imagine, for example, that the tax table consists solely of a single rate: Every taxpayer pays one-third of her actual earnings in tax. In this case, the tax code is not progressive in terms of actual income, but rather is neutral. The actual income average tax rate is constant at one-third

46. An increase in actual income progressivity may, in fact, decrease potential income progressivity. Suppose, for example, that those with lower potential income work in the market so many more hours than those with higher potential income that those with lower potential income actually have higher actual income. In this case, when actual income average tax rates increase, potential income average tax rates in fact *decrease*. For a fuller explanation, see *id.* at 19.

across all levels of actual income. But now suppose that taxpayers with high *potential* income work twice as many hours in the labor market as those with low potential income. Then, in effect, high potential income taxpayers expose twice as much of their potential income to actual income taxation as do low potential income taxpayers. Thus, high potential income taxpayers pay twice as high a proportion of their *potential* income in tax as low income taxpayers. Thus, although the tax code in this example is neutral in terms of actual income, it is progressive in terms of potential income. Conversely, if low potential income taxpayers worked longer hours than high potential income taxpayers, a neutral tax code in actual income terms would be regressive in terms of potential income.

Consistent with the measures of actual and potential income progressivity described above, variation in the realization ratio will be measured by calculating the percentage change in the realization ratio per percentage change in potential income. That is, variation in the labor income realization ratio will be measured by that ratio's elasticity with respect to potential income. The resulting measurement constitutes the second component of potential income progressivity: "realization variance."

The third overall effect on potential income progressivity—and the second way in which the pattern of potential income realization affects potential income progressivity—concerns the general level of realization rather than variation therein. This effect arises because the actual income progressivity of the tax code varies along the actual income scale. The federal income tax is, and has been for some time, generally less actual income progressive at higher levels of actual income.⁴⁷ Thus, if every taxpayer across the board works longer hours or at a wage closer to her potential, then each level of potential income becomes associated with a greater level of actual income, and the relevant range of potential income levels shifts to a less progressive region of the actual-income tax schedule. Conversely, if every taxpayer works shorter hours or at a wage farther from her potential, then each level of potential income is associated with a lower level of actual income, and potential income progressivity increases.⁴⁸ This third component will be referred to as the "general realization level."

47. There is a sense (although it is not what is meant here) in which this must be true with a finite number of brackets. In the limit, as the actual income approaches infinity, the income tax comes more and more to resemble a single rate proportional tax at a rate equal to the rate in the highest bracket.

48. Suppose, for instance, that there are two levels of potential income: \$100,000 and \$200,000. Suppose, again, that the (actual) income tax schedule imposes tax at a rate of 10% on the first \$50,000 of (actual) income and 20% on the second \$50,000 and thereafter. If all taxpayers realize half of their potential income (notice the lack of variation in realization across taxpayers), then the actual income level corresponding to \$100,000 of potential income is \$50,000, and the actual income level corresponding to \$200,000 of potential income is \$100,000. Therefore, individuals with \$100,000 of potential income (and \$50,000 of actual income) pay \$5,000 in tax, and their potential-

The foregoing three components of potential income progressivity stand in a particular, surprisingly simple mathematical relationship to one another. That relationship centers on a simple equation relating the elasticities defined above. The elasticity of the potential income average tax rate at any given level of potential income is (approximately) the sum of the elasticity of the actual income tax rate and the elasticity of the labor income realization ratio.⁴⁹ The first addend in the sum, the elasticity of the actual income tax rate, is evaluated at the average actual income level among individuals having the given level of potential income. That is, at any given level of potential income,

FIGURE 1

$$\begin{array}{c}
 \text{Elasticity of the Potential Income Average Tax Rate} \\
 = \\
 \text{Elasticity of the Actual Income Average Tax Rate} \\
 \text{(evaluated at the average actual income level for the} \\
 \text{given level of potential income)} \\
 + \\
 \text{Elasticity of the Labor Income Realization Ratio}
 \end{array}$$

income average tax rate is 5% (\$5,000 divided by \$100,000). Individuals with \$200,000 of potential income (and \$100,000 of actual income) pay \$5,000 plus \$10,000, or \$15,000 in tax; their potential-income average tax rate is 7.5% (\$15,000 divided by \$200,000). Thus, an increase in potential income from \$100,000 to \$200,000 causes an increase in the potential income average tax rate from 5% to 7.5%.

Now suppose that all taxpayers realize not half of their potential income, but all of it. Therefore, actual income levels are the same as potential income levels: \$100,000 and \$200,000. Those with \$100,000 in potential (and actual) income now pay \$15,000 in tax (by calculations detailed above), and so face a potential income average tax rate of 15%, rather than 5%. Those with \$200,000 in potential (and actual) income pay \$5,000 in tax (10%) on the first \$50,000 and \$30,000 (20%) on the remaining \$150,000. Therefore, they pay \$35,000 in total and have an average tax rate of 17.5%, rather than 7.5%. Thus, an increase in potential income from \$100,000 to \$200,000 now causes an increase in the potential income average tax rate from 15% to 17.5%, where before it caused an increase in the potential income average tax rate from 5% to 7.5%. In both cases, the absolute increase in the potential income average tax rate is the same, namely, 2.5 percentage points. But the percentage increase in the potential income average tax rate is now lower: A 2.5 point increase is a lower percentage of 15 than of 5.

49. This finding is original and is derived in detail in Sanchirico, Working Paper, *supra* note 45, at 12–21, 62–63.

The three components of potential income progressivity described above enter this equation in various ways. Statutory progressivity—the first component of potential income progressivity—enters the equation through addition of the elasticity of the actual income average tax rate. Realization variance—the second component—enters through addition of the elasticity of the labor income realization ratio. The third component, the general realization level, enters the equation by virtue of evaluating the elasticity of the actual income average tax rate at the average level of actual income corresponding to the level of potential income in question.

As noted, the above equation describes the components of potential income progressivity at a particular potential income level. To measure the general levels of potential income progressivity and its components over a *range* of potential income levels, the simple average of each component over such range may be calculated. The equation holds as well for such averages.⁵⁰

C. *Measuring Potential Income*

One step in the analysis is to measure the potential incomes of married couples. Each spouse's potential income is her "potential wage rate" multiplied by maximum workable hours. A family's potential income is the sum of the potential income of its adult members. (As discussed, the empirical analysis in this paper concerns families with two adult members.)

Consider, for example, a couple wherein the wife actually earns on average \$10 per hour of market work⁵¹ while the husband actually earns \$8. If the wife works 2,000 hours per year in the labor market, and the husband 1,000, their family *actual* income is \$20,000 + \$8,000, or \$28,000. This may be below or above the family's potential income, as defined in this Article, for either or both of two reasons. First, each spouse may be working more or less than "full time." Second, each spouse may be engaging in market work that, for any number of reasons, pays more or less than what those with similar labor market characteristics typically earn in the marketplace. That is, each spouse may earn more or less than his or her "potential wage."

"Potential wage" can be defined in many ways. The broadest definition—one cast in terms of lifetime earning potential—might reflect an individual's lifetime endowment of natural ability, social networks, and physical and financial capital. As noted in the Introduction, given data constraints and an interest in maintaining a measure of comparability with the current income tax, the definition of "potential wage" adopted in this Article is, like the income tax, stated on an annual basis. An indi-

50. This is true because the equation is a simple summation.

51. As is explained *infra* Part IIA, "market work" is defined broadly in this Article.

vidual's "potential wage" in a given year is meant to reflect the wage that could be earned, given the individual's current stock of human capital.

Obviously, not all aspects of an individual's stock of human capital are observable and/or actually measured in the data. Furthermore, even where human capital is observable and measured, it becomes necessary to estimate the earnings potential associated with each level of human capital. For purposes of the estimation in this Article, an individual's "potential wage" is, in essence, the average wage earned by others with the same observable educational, demographic, and geographic characteristics.

It may seem odd to define an individual's potential wage by reference to an average. But this is less of a compromise than it may appear to be. The reason is that the ultimate concern here is with progressivity, and the measures of progressivity employed in this Article are unaffected by uniformly scaling up or down estimates of individuals' potential wages. Suppose, for example, that it is concluded that most people do not reach their potential—specifically, that each individual's potential wage might be better represented as 150% of the average wage in her educational-demographic-geographic cohort, rather than as the average itself. Yet if the analysis in this Article were redone using these higher potential wages, none of the results would change. In particular, all measures and components of potential income progressivity, as reflected in the above equation, would remain the same.⁵²

Given each spouse's potential wage, I derive each spouse's potential (labor) *income* by multiplying his or her potential wage by the maximum number of workable hours per year. I then add each spouse's potential income to arrive at the family's potential income. For example, were 6,000 the maximum number of workable hours per year, the wife's potential wage \$10, and the husband's \$8, then the wife's potential income would be \$60,000, the husband's \$48,000, and the couple's \$108,000.

For the same reason as discussed above in connection with defining "potential wage," the analysis in this paper is unaffected by what one chooses to call maximum workable hours. Again, the measures of progressivity employed herein are invariable to scaling. A different issue,

52. This is explained in detail in Sanchirico, Working Paper, *supra* note 45, at 25, 63–64. Essentially, the reason is that the elasticity measures I employ are ratios of percentage changes, and percentage changes are unaffected by scaling. That is, the percentage change from x to y is defined as $(y-x)/x$. Doubling x and y has no effect on the percentage change, because doing so doubles both the numerator $(y-x)$ and the denominator x . The full explanation is somewhat more complicated than this due to the presence of the third component of potential income progressivity, the general realization level.

My results *would* be affected were there systematic, across-cohort variation in the proper multiple. For example, if there tends to be less of a shortfall of average from true potential in cohorts corresponding to higher potential wages (calculated as averages), then my results will understate true progressivity in a given year. Even so, for my across-year results, this effect would have to be greater or less in 1989 than in 2000 to make a difference.

which was discussed in detail in the Introduction and is worth mentioning again here, is that the analysis in this Article is conducted under the assumption that each individual has the same number of maximum workable hours.

II. THE DATA

This Part reviews the sources of data used in producing estimates of the components of potential income progressivity. The first section discusses the data source used to estimate work patterns.⁵³ The second section describes why a popular alternative data source was not employed. The last section describes an online simulation program, TAXSIM, used to determine actual tax liability.

A. PSID

The Panel Study of Income Dynamics (PSID), conducted by the Survey Research Center in the Institute for Social Research at the University of Michigan, has been collecting extensive data on work hours, earnings, education, and demographic characteristics since 1968.⁵⁴ In that first year, several thousand U.S. “families”⁵⁵ (each consisting of any number of individuals, including one) were sampled with known but unequal probability, and all individuals in each family were interviewed. In each subsequent year, families that were still intact were reinterviewed. New families formed from divorce or by the children of original families were added to the sample and interviewed separately. Individuals that moved into a sample family in subsequent years were also included in family interviews. In the late 1990s, the number of families derived from the original sample design was reduced and a “refresher” sample of families that had immigrated into the United States since 1968 was added. Moreover, the period between interviews was lengthened from one year to two years. Most of the interviewing for the years studied in this paper was conducted over the telephone. Almost all interviews in the latest year, 2000, were conducted using computer-assisted telephone interviewing.⁵⁶

The PSID was chosen for this Article primarily for its relatively comprehensive data on labor income and work hours.⁵⁷ The PSID defines

53. For a more detailed explanation of the data, see Sanchirico, Working Paper, *supra* note 45, at 21–25. Additionally, the computer program that was used to extract all data from the PSID and create all variables (a STATA “do file”) is available at http://www.cstone.net/~csanchir/Sanchirico_Progressivity_Supp_1.pdf (last visited Sept. 23, 2008) (on file with the *Columbia Law Review*).

54. A PSID guide, PSID data, and relevant publications can be found at <http://psidonline.isr.umich.edu/> (last visited Sept. 6, 2008).

55. The number of observations is indicated in each regression table.

56. Inst. for Soc. Research, Univ. of Mich., An Overview of the Panel Study of Income Dynamics, at <http://psidonline.isr.umich.edu/Guide/Overview.html> (last visited Sept. 6, 2008) (on file with the *Columbia Law Review*).

57. Another important feature of PSID is its panel design. The cross-sectional time

total labor income suitably broadly. Total labor income includes wages,⁵⁸ salaries, bonuses, overtime, commissions, income from a professional practice or trade, the labor part of farm income, the labor part of unincorporated business income, and income from market gardening. Work hours are determined by asking individuals about their average weekly hours. Importantly, if an individual has more than one market-oriented activity, PSID asks separately about average weekly hours for each activity. PSID also includes overtime hours in its final tally of work hours. Average hourly earnings are defined as total labor income divided by annual hours.⁵⁹

For different-sex couples, PSID most often designates the male in a couple as the family “head.” Couples may be either legally married or cohabiting. The most extensive labor data in PSID is for “heads” (who may be single individuals) and their “wives.” The labor income of children is generally not recorded until they leave the family and form their own family unit.

My estimates are for two years, 1989 and 2000. These years were similar in terms of their macroeconomic conditions. Both were peak years in the business cycle.⁶⁰ I correct for inflation: All money amounts are expressed in year 2000 dollars, unless otherwise noted.⁶¹

I limit my estimation sample to families with two adult members and two children under age seventeen. (Various intermediate estimates, however, are made on an expanded sample, as discussed below.) This limited

series analysis conducted in this paper does not make use of this feature. See Martha Hill, *The Panel Study of Income Dynamics: A User’s Guide 2–4* (1992). Part of Hill’s book is reproduced online at <http://psidonline.isr.umich.edu/Guide/ug/intro.html#OVERVIEW%20OF%20THE%20PSID> (last visited Sept. 13, 2008).

For more information on the PSID, see generally Hill, *supra*; Inst. for Soc. Research, Univ. of Mich., *PSID Frequently Asked Questions*, at <http://psidonline.isr.umich.edu/Guide/FAQ.aspx> (last visited Sept. 6, 2008) (on file with the *Columbia Law Review*).

58. Somewhat confusingly, PSID asks about both current wage rate at the time of the interview (usually in early spring of the following year) and total income from wages during the calendar year—that is, the focus of the rest of the interview. The latter, not the former, is used in calculating labor income during the calendar year in question.

59. Missing values arise when no value whatsoever (zero or otherwise) is recorded for a given variable for a given observation. The reason could be the interviewee’s refusal to answer or the interviewer’s error in recording answers or asking questions. The general practice of the PSID is to impute values where they are missing, usually for a small minority of observations. I adopted these imputed values in this study.

60. See *supra* note 27 and accompanying text.

61. I correct for inflation in this Article using the chain-type price index for Personal Consumption Expenditures from the National Income and Product Accounts (“PCE Index” or “PCE Deflator”). This standard measure of inflation is supplied by the Bureau of Economic Analysis of the U.S. Department of Commerce. See Bureau of Econ. Analysis, U.S. Dep’t of Commerce, Table 2.3.4. Price Indexes for Personal Consumption Expenditures by Major Type of Product, at <http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=64&Freq=Qtr&FirstYear=2006&LastYear=2008> (last revised Aug. 28, 2008) (on file with the *Columbia Law Review*); see also *infra* note 120 (further discussing inflation adjustments).

focus allows me to use a single tax function mapping actual income onto tax liability and to avoid confounding effects due to differences in family composition. My estimation sample is further restricted to “mid-career families”—families in which both spouses are between the ages of twenty-five and fifty-five. By imposing this second sample limitation, I hope to minimize the impact of conceptual and empirical difficulties surrounding schooling and retirement.

B. *Comparison with March CPS*

Another common data source for analyzing work hours is the March Current Population Survey (CPS).⁶² It is worth explaining why this data source is not employed in this Article.

Relative to the PSID, the March CPS has the advantage of a larger sample size. In recent years, for example, the full sample size for the PSID is in the range of 7,000 families; whereas, for the March CPS, it is in the range of 70,000. However, for purposes of the present project, the March CPS has several decisive drawbacks relative to the PSID.

Firstly, annual work hour data in the March CPS are problematic. In the March CPS, annual work hours are calculated as the product of two responses: “usual hours worked per week” and “weeks worked per year.”⁶³ If “usual hours worked per week” were equal to “average hours worked over positive work hour weeks,” the product of “usual hours worked per week” and “weeks worked per year” would indeed equal annual work hours. But there is reason to doubt that respondents interpreted “usual hours worked per week” to mean “average hours worked over positive work hour weeks,” especially in cases where the respondent’s weekly hours were variable over the course of the year or the respondent held more than one job, simultaneously or in sequence. The manual provided to March CPS interviewers specifically instructs the interviewer to solicit something other than an average, and more like a mode, in these cases.⁶⁴ It is difficult to gauge the extent to which this

62. Bureau of Labor Statistics & Bureau of the Census, Data, Annual Demographic Survey: March Supplement, at <http://www.bls.census.gov/cps/ads/sdata.htm> (last revised Oct. 2003) (on file with the *Columbia Law Review*).

63. Bureau of Labor Statistics & Bureau of the Census, Questionnaire Items, Annual Demographic Survey: March Supplement, available at <http://www.bls.census.gov/cps/ads/1996/sqestair.htm> (last revised Apr. 1997) (on file with the *Columbia Law Review*).

64. The manual states:

[I]f a person: worked 35 hours per week for 6 months, worked 40 hours per week for 4 months, and did not work for the remaining 2 months, the correct answer . . . would be 35 hours per week, since he/she worked 35 hours per week for more than half the time that he/she worked in 1995.

Bureau of Labor Statistics & Bureau of the Census, Interviewers Instruction Manual—March 1996, available at <http://www.bls.census.gov/cps/ads/1996/sintrins.htm> (last revised April 16, 1997) (on file with the *Columbia Law Review*) (emphasis omitted) (explaining question forty-one). In this example, average weekly hours across positive work hour weeks is not 35, but $.6(35) + .4(40) = 37$. The manual also states: “[I]f a person: worked at his/her regular 40 hour per week job for 52 weeks during 1995, and at a

form of measurement error biases estimates or decreases their reliability. Apparently, this form of measurement error is rarely investigated or accounted for in studies of work hours that use the March CPS.

Another difficulty in the way in which the March CPS collects data on work hours is that it asks one question for all jobs held by the individual during the year.⁶⁵ The PSID, by contrast, breaks the questioning down, job by job, month by month, thereby increasing the likelihood of accurate answers.⁶⁶

Thirdly, the March CPS data on wages is subject to more serious top-coding issues than is the PSID. In the March CPS in 2000, respondents earning \$150,000 or more in their main job were recorded as earning precisely \$150,000. Respondents earning \$25,000 or more in secondary jobs were recorded as earning precisely \$25,000. Researchers typically attempt to correct for these inaccuracies by replacing top-coded entries with a multiple thereof (usually between 1.4 and 1.5).⁶⁷ By contrast, the PSID top-code for main job salary in 2000 was \$999,999. For main job hourly wage, it was \$996.99. Similar top-codes apply individually to each additional job.

C. TAXSIM

The exercise conducted in this Article requires calculating income tax liability for each year in question. This is a complicated exercise, given the complexity of the tax code. Fortunately, the National Bureau of Economic Research makes available a tax simulation program, TAXSIM, that calculates tax liability given inputted assumptions about the tax unit.⁶⁸ The program is available for each of the three years that I study.

As noted, I study a particular tax cohort: married couples filing jointly with two children under seventeen. My tax liability calculations

parttime job of 15 hours per week for 35 weeks, the entry . . . would be 55 hours." *Id.* In this second example, average weekly hours over positive work hour weeks would not be 55, but $(35/52)55 + ((52-35)/52)40 = 50$.

65. See *id.* (second example).

66. See, e.g., Inst. for Soc. Research, Univ. of Mich., Panel Study of Income Dynamics, 2001 Interview Year: Computer Assisted Interview Documentation, at http://psidonline.isr.umich.edu/Data/Documentation/cai_doc/2001_Interview_Year/2001_Interview_Year.htm (last visited Aug. 7, 2008) (on file with the *Columbia Law Review*) (inquiring about employment in Sections B, C, D, and E).

67. See, e.g., David H. Autor, Lawrence F. Katz & Melissa S. Kearney, Trends in U.S. Wage Inequality: Re-assessing the Revisionists 35 (Harvard Inst. of Econ. Research, Discussion Paper No. 2095, 2005), available at <http://ssrn.com/abstract=803649> (on file with the *Columbia Law Review*) (multiplying topcoded earnings value by 1.5); Blau & Kahn, *supra* note 23, at 42 ("The CPS topcoded value for main job earnings was \$99,999 for 1989-91 and \$150,000 for 1999-2001. We multiplied these by 1.45.").

68. For information about TAXSIM, and TAXSIM related files, see generally Daniel Richard Feenberg & Elizabeth Coutts, An Introduction to the TAXSIM Model, 12 *J. Pol'y Analysis & Mgmt.* 189, 189 (1993); Nat'l Bureau of Econ. Research, TAXSIM Related Files, at <http://www.nber.org/taxsim/> (last visited August 7, 2008) (on file with the *Columbia Law Review*).

assume that the family takes the standard deduction and that there are four exemptions. The tax calculations account for: the child tax credit,⁶⁹ the earned income credit,⁷⁰ the alternative minimum tax,⁷¹ and the “exemption surtax”⁷² in effect in 1989. Furthermore, I account for any and all applicable limitations and phaseouts in exclusions, credits, and deductions.⁷³ Although their potential effect was accounted for, not all of these provisions had an actual effect on the tax liability of the tax cohort and potential income range that I study. Part IV.C and a web appendix⁷⁴ describe the actual determinants of tax liability in detail.

In line with my focus on labor income taxation, I assume that the family has no capital income. Further, because I assume that the family takes the standard deduction, I also do not take into account the effect on tax liability of, among other things, the mortgage interest deduction,⁷⁵ the deduction for charitable contributions,⁷⁶ or the deduction for state taxes.⁷⁷

I also do not account for the child *care* credit⁷⁸ (as opposed to the child tax credit⁷⁹). The amount of the credit is keyed to the tax unit’s actual expenses for child care and household services, expenses for which I have limited data. In any event, over the period that I study, the child care credit remained relatively constant, at a modest level.⁸⁰

The structure of the child care credit and the possibility of expanding it are discussed in detail in Part V.D.2.

69. I.R.C. § 24 (2000 & Supp. V 2005) (providing partially refundable per child credit that phases out for higher income taxpayers).

70. Id. § 32 (providing refundable credit for low income workers that increases as more income is earned before phasing out for higher income taxpayers).

71. Id. §§ 53, 55–59 (effectively requiring taxpayer to pay maximum of regular tax and alternative tax calculated with lower rates but fewer tax preferences).

72. Former § 1(g) of the I.R.C. phased out the 15% rate and personal exemptions. See Tax Reform Act of 1986, Pub. L. No. 99-514, § 101(a), 100 Stat. 2085, 2097–98 (enacting § 1(g)), repealed by Omnibus Budget Reconciliation Act of 1990, Pub. L. No. 101-508, § 1101(b)(1), 104 Stat. 1388, 1388-1 (removing § 1(g)).

73. The limitations and phaseouts applicable to the analysis in this paper include I.R.C. § 151(d)(3) (phasing out deduction for personal exemptions); § 24(b) (phasing out child tax credit); § 32(a)(2) (phasing out earned income credit).

74. This web appendix is available online. Chris William Sanchirico, Appendix to “Progressivity and Potential Income” (Sept. 7, 2008) (unpublished manuscript, on file with the *Columbia Law Review*), at http://www.cstone.net/~csanchir/Sanchirico_Progressivity_Supp_3.pdf [hereinafter Sanchirico, Appendix].

75. I.R.C. § 163(h)(2)(D) (allowing deduction for “qualified residence interest”).

76. Id. § 170 (allowing deduction for charitable contributions).

77. Id. § 164 (allowing deduction for state and local property and income taxes).

78. Id. § 21 (providing nonrefundable credit, phased down on adjusted gross income, for limited amount of child care expenses incurred to enable taxpayer to be gainfully employed).

79. Id. § 24 (providing partially refundable per child credit that phases out for higher income taxpayers).

80. Preliminary results indicate that including the credit, under the assumption that all families have maximally creditable expenses, does not significantly alter my estimates.

III. MAIN FINDINGS

This Part presents the main empirical findings of the Article—those concerning the magnitude and components of potential income progressivity at the beginning and end of the 1990s and the change in these measurements over the course of that decade. Part IV, which follows, examines the intermediate results and estimation procedures that lie behind these main findings.

Part III.A separately considers the decomposition of potential income progressivity in each year, 1989 and 2000. Part III.B analyzes the change in potential income progressivity and its components across the two years.

A. *Each Year on Its Own*

In 1989, couples with greater potential income tended to realize a greater portion of those potential earnings as actual labor income. As a result, potential income progressivity exceeded actual income progressivity in that year.

In 2000, however, work patterns dampened potential income progressivity. Couples with greater potential income tended to realize a lower portion of their potential income as actual income. The income tax code was less progressive in terms of potential income than it was in terms of actual income. The code was still potential income progressive, however, due to the dominating influence of actual income progressivity.

Table 2 presents estimates for the components of potential income progressivity for the years 1989 and 2000. The table pertains to mid-career couples (both spouses between twenty-five and fifty-five years of age) with two children under age seventeen. The three rows of the table correspond to the three elasticities in the equation presented in Part I.B. Recall that the elasticity of the potential income average tax rate (potential income progressivity) is approximately the sum of the elasticity of the actual income average tax rate (actual income progressivity, a function of statutory progressivity and the general realization level) and the elasticity of the labor income realization ratio (realization variance). Recall also that such elasticities are measured at each potential income level and vary across such levels.⁸¹ The figures for the three elasticities in the table are averages across a range of family potential wage levels. The range examined in this study is from \$20 to \$50 per hour.⁸² (Assuming 2,000

81. See *supra* Part I.B.

82. For 1989, this corresponds to the range from the tenth percentile to the ninetieth percentile for the subsample under study. For 2000, this corresponds roughly to the range from the fifth percentile to the sixtieth percentile for the subsample.

Note that this difference in percentile ranges across the two years reflects a general upward shift in potential income levels in the population. This shift is distinct from the shift in the “general realization level,” the third component of potential income progressivity. See *supra* text accompanying notes 47–48. The general realization level concerns the level of actual income associated with each level of potential income. The

workable hours, this corresponds to a potential income range of \$40,000 to \$100,000.) Shown in parentheses below each estimate is its standard error. The calculation of standard errors is discussed below.

TABLE 2: DECOMPOSITION OF POTENTIAL INCOME PROGRESSIVITY

	1989	2000
Elasticity of potential income average tax rate	1.116 (.144)	.710 (.148)
Elasticity of actual income average tax rate	.839 (.014)	1.148 (.027)
Elasticity of labor income realization ratio	.162 (.087)	-.192 (.072)

(Standard errors in parentheses)

The table shows how, in 1989, work patterns augmented potential income progressivity. *Actual* income progressivity was .839, meaning that, on average across the implicated range of actual income,⁸³ the portion of a family's actual income paid in tax was 8.39% greater for each additional 10% of actual income that it earned.

difference in percentile ranges used in this study, however, concerns the level of potential income associated with each individual.

Shifts in the general level of potential income might for some purposes be considered a fourth component of potential income progressivity, akin to what is usually referred to as "real bracket creep" in discussions of actual income progressivity. The effect of this fourth component is not considered in this study (just as real bracket creep is rarely considered in studies of actual income progressivity). In fact, it is not at all obvious that how the population is distributed along the horizontal axis (whether that measures actual or potential income) should be regarded as a determinant of the progressivity of the tax code function. If, for example, two-thirds of the population were concentrated in a relatively progressive segment of the code and one-third were concentrated in a relatively less progressive segment, would this make the tax code more progressive than if the distribution were reversed? The question of progressivity is a hypothetical one that compares an individual's tax liability to what it would be if that individual's income (actual or potential) were greater. This hypothetical question is posed without regard to the proportion of the population that actually does have higher income.

Nonetheless, there are certainly analytical purposes for which it would make sense to add this fourth component to the analysis. Thus it is important to note that, were it so added, the three components herein identified would remain intact conceptually and estimates of their measurement would remain valid. The analysis in this Article would become incomplete, but not incorrect.

83. The "implicated range of actual income" is that portion of the actual income scale whose endpoints are determined by the correspondence between each potential wage endpoint, \$20 and \$50, and average actual income at such potential wage levels. Recall that this potential wage range corresponds to the tenth to ninetieth percentiles in 1989. See *supra* note 82 for a discussion of the range of potential wages. The implicated range of actual income for 1989 runs approximately from \$41,000 to \$107,000 (in 2000 dollars). For 2000, the same range is approximately \$49,000 to \$95,000. These figures are derived from the regressions reported in Table 5.

The estimate of *potential* income progressivity for 1989 is greater than the estimate for actual income progressivity: 1.116 versus .839. Across the potential wage range under study, the portion of a family's potential income paid in tax was on average 11.16% greater for each additional 10% of potential income.⁸⁴

Per the elasticity equation presented in Part I.B, the difference between actual and potential income progressivity lies in the sign and magnitude of the elasticity of the labor income realization ratio. The estimate of that ratio for 1989 is .162. Thus, the portion of a family's potential income realized as actual labor income was on average 1.62% higher for each additional 10% of potential income. As a result, in 1989, families with greater potential income paid a greater portion of that potential income in tax not only because they were in higher tax brackets, but also because they realized a greater proportion of their potential income as actual—and so taxable—income.

The estimates for 2000 tell a different story. In that year, the variation in work patterns across the potential income scale detracted from potential income progressivity. The elasticity of the labor income realization ratio was -.192. In contrast to 1989, families with greater potential income tended to realize a *smaller* fraction of that potential income in the form of actual labor market income. As a result, potential income progressivity in 2000 was less than actual income progressivity (.710 versus 1.148). Nevertheless, the code was still progressive even in potential income terms.

Following standard practice in statistical analysis, it is worth considering whether the relative sizes of potential and actual income progressivity in each of 1989 and 2000 are merely an artifact of sampling. If PSID were to resample the population, and the above analysis were to be repeated on the new data, what is the chance that the analysis would produce qualitatively different results? As noted, stated below each estimate in parentheses is its standard error—an estimate of the standard deviation of the sampling distribution of the estimate.⁸⁵ This standard deviation is a measure of how the estimate would vary if it were calculated from a different but similarly chosen sample of the population. The standard error thus gives some indication of the extent to which reported estimates are artifacts of the particular population sample that happened to be chosen by

84. The reader will recall that such statements, which are in terms of percentage changes, may be made for potential wages as well as for potential income calculated under any assumption about homogenous total workable hours.

85. Reported standard errors show variance in the estimate of actual income progressivity. Why? Is this not just a matter of the shape of the tax schedule and so invariant to choice of sample? First, actual income progressivity varies across actual income levels. Second, our measure of actual income progressivity is an average of actual income progressivity over a range of actual income levels. That range is chosen in terms of potential wage, not directly in terms of actual income levels. The corresponding endpoints in terms of actual income are the estimates. Each of these two estimates varies across samples.

PSID.⁸⁶ Following standard statistical procedures, I used these standard errors to confirm that the relative sizes of potential and actual income progressivity for each year are not, in fact, an artifact of sampling.⁸⁷ More precisely, the data are consistent with the hypothesis that potential in-

86. This note discusses how the standard errors reported in this Article were calculated.

The PSID is a not a simple random sample, but a complex survey design. Further, the estimation procedure that I apply to it is also complex. This renders unavailable conventional methods for estimating sampling variance. Fortunately, modern computing power makes it possible to obtain reliable estimates of the sampling variance of my estimates even so. In particular, I employ a technique called “balanced repeated replication.” Under balanced repeated replication, each stratum in the survey design is divided into two primary sampling units. (This division is, in fact, provided by PSID.) Following calculation of the full sample estimates, one returns to the data choosing only one of the two primary sampling units from each stratum. This produces a sample that is half the size of the full sample. One then runs the entire estimation procedure—in my case, the procedure described below in Part IV—on this half sample. Next, one compares the estimates thus obtained for the half sample to the full sample estimates. From the difference in these estimates, one derives an estimate of the sampling variance of one’s primary estimates. To reduce the variance of this estimate of sampling variance, one then repeats this half sampling procedure on different selections of primary sampling units from each stratum. (There are 2^s possible half samples from which to choose, where s is the number of strata.) This produces a distribution of half sample estimates, which, with the original estimate, allow one to generate a stable estimate of the sampling variance of one’s primary estimates.

Importantly, for each half sample replication, I ran the full estimation procedure and did so for both years before choosing another half sample. Thus, the standard error estimates that I obtain account for correlation of errors (a) across stages of the estimate procedure, (b) within families, and (c) across time due to the panel nature of the PSID.

For other applications of balanced repeated replication to PSID data, see, e.g., Gary Solon, Marianne E. Page & Greg Duncan, *Correlations Between Neighboring Children in Their Subsequent Educational Attainment*, 82 *Rev. Econ. & Stat.* 383 (2000); Gary Solon, Mary Corcoran, Roger Gordon & Deborah Laren, *A Longitudinal Analysis of Sibling Correlations in Economic Status*, 26 *J. Hum. Resources* 509, 527, 531 app. B (1991); Gary Solon, Mary Corcoran, Roger Gordon & Deborah Laren, *Sibling and Intergenerational Correlations in Welfare Program Participation*, 23 *J. Hum. Resources* 388, 391, 394 app. (1988).

An alternative and more popular replication simulation technique is the bootstrap. Bootstrap estimation has many advantages, but its proper application to complex survey designs, such as that underlying the PSID, is unsettled. See R.R. Sitter, *Comparing Three Bootstrap Methods for Survey Data*, 20 *Can. J. Stat.* 135, 135–36 (1992) (describing potential modifications of bootstrap technique to accommodate complex survey designs). Although balanced repeated replication does have several drawbacks (including the necessity of extrapolating from half samples to full samples), it does allow the researcher to be sensitive to survey design in estimating standard errors. PSID has divided its strata into equal groups and one can be reasonably confident that half sample replication is as if a new sample were taken under the same survey design that was used to create the original PSID sample.

87. For 1989, I test the one-sided hypothesis that potential income progressivity was greater than actual income progressivity, and for 2000, the one-sided hypothesis that potential income progressivity was lower. As a result of these tests, I am able to reject the hypothesis that potential income progressivity in 1989 was no greater than actual income progressivity at a 5% level. Furthermore, I am able to reject the hypothesis that potential income progressivity was at least as great as actual income progressivity in 2000 at a 1%

come progressivity was greater than statutory progressivity in 1989 as well as the hypothesis that potential income progressivity was less than statutory progressivity in 2000.

B. *The Source of Change over Time*

Table 2 above indicates that potential income progressivity decreased between 1989 and 2000. The conceptual framework introduced in Part I implies that this decrease has three potential sources: a change in actual income progressivity through a change in the statutory tax schedule (a change in statutory progressivity); a change in the pattern of labor income realization across the potential income scale (a change in realization variance); or a change in the portion of the actual income tax schedule corresponding to the range of potential income levels (a change in the general realization level).

The major cause of decreasing potential income progressivity was a substantial shift in how labor income realization varied across potential income levels. In 1989, couples with less potential income tended to realize a smaller portion of their potential income than couples with higher potential income. In 2000, the pattern reversed. Thus, potential labor income realization shifted over the course of that decade from a progressivity enhancing force to a progressivity reducing force. Indeed, this reversal in the progressivity impact of the labor income realization was significant enough to overwhelm increases in statutory progressivity.

Table 3 presents estimates for the change in potential income progressivity and its components from 1989 to 2000.⁸⁸ Like Table 2, Table 3 is based on the elasticity equation introduced in Part I.B. Table 3 presents estimates for the increase (positive or negative) in each component elasticity from 1989 to 2000. Ignoring the boxed off middle section of Table 3 for the moment, the difference estimates themselves equal the

level. For a detailed discussion of these procedures, see Sanchirico, Working Paper, *supra* note 45, at 34–36.

Two technical points are worth mentioning here:

First, these hypothesis testing procedures require calculating, for each year, the standard error of the estimate of *the difference* between actual and potential income progressivity. Although this difference itself can be gleaned by simple subtraction from Table 2, the standard error of the difference cannot, because the latter is potentially affected by sampling covariance between the subtracted components. Thus, I calculate the standard error for the difference estimate directly from its distribution under balanced half-sample replication.

Second, the two-sided null hypothesis that actual and potential income progressivity are precisely equal cannot be rejected at a 5% level. It can, however, be rejected at a 10% level. Note that with a symmetrically distributed test statistic—such as is the case of a t-statistic evaluated at the null hypothesis assuming normality—the p-value for a one-sided test is half that for a two-sided test.

88. Standard errors for each estimate appear in parentheses; one-sided p-values are in brackets.

differences between the corresponding estimates for each year individually, as presented above in Table 2.⁸⁹

With regard to the change in the elasticity of the actual income average tax rate, the positive estimate indicates that actual income progressivity increased across the two years. Note that this increase aggregates both the effect of statutory changes and the effect of changes in the general level of labor income realization. These two effects are further decomposed in the boxed section of the table, to be discussed below.

TABLE 3: DECOMPOSITION OF TIME CHANGE IN POTENTIAL INCOME PROGRESSIVITY, 1989 TO 2000

Change in elasticity of potential income average tax rate	-.406 (.213) [.033]	
Change in elasticity of actual income average tax rate	.309 (.023) [.000]	
<i>Further decomposed into change in:</i>		
	<i>t = 89</i>	<i>t = 00</i>
Statutory progressivity	.331 (.053) [.000]	.279 (.010) [.000]
General realization level	-.022 (.061) [.358]	.030 (.020) [.685]
Change in elasticity of labor income realization ratio	-.355 (.114) [.002]	

(Standard errors in parentheses)
[One-sided P-values in brackets]

In contrast, the negative estimate for the change in the elasticity of the labor income realization ratio shows that this measure *decreased* between 1989 and 2000. Moreover, this estimate (-.355) is indeed larger in absolute magnitude than the estimate for the increase in actual income progressivity (.309).

Consistent with the fact that realization variance fell more than actual income progressivity increased, potential income progressivity itself (shown in the last row of the table) decreased on net by .406.

As for the within-year estimates in Part III.A, these across-year estimates may be subjected to standard statistical procedures in order to determine whether they are idiosyncratic to the particular sample chosen by PSID or representative of the full population from which that sample was drawn. Application of such procedures establishes that neither the in-

89. The *standard errors* reported for the difference estimates in Table 3, which appear in parentheses, cannot be inferred from the standard errors for each of the difference quantities, as reported in Table 2. This is because the calculation of standard errors for the difference estimates in Table 3 accounts for sampling covariance across the two years.

crease in the elasticity of the actual income average tax rate,⁹⁰ the decrease in the elasticity of the labor income realization ratio,⁹¹ nor the decrease in the elasticity of the potential income average rate⁹² are artifacts of sampling.

The nested box in Table 3 further decomposes the change in actual income progressivity into changes in statutory progressivity and changes in the general realization level. Each decomposition appears in a column of figures in the box.⁹³ And both indicate that the change in actual income progressivity came from changes in the statute rather than shifts in implicated actual income levels. The latter are relatively small and statistically insignificant.⁹⁴

In sum, the data are consistent with declining potential income progressivity from 1989 to 2000 despite increases in statutory progressivity. The regressive change in the labor income realization ratio proved dramatic enough to offset the tax code's increasing progressivity on paper.

IV. INTERMEDIATE RESULTS AND ESTIMATION PROCEDURE

Part III presented estimates of potential income progressivity and its components for 1989 and 2000. These estimates were essentially derived

90. More precisely, because its one-sided p-value is .000, this increase is statistically significant at a 1% level—that is, the null hypothesis that actual income progressivity decreased can be rejected at a 1% level. The data are thus consistent with an increase in actual income progressivity during the 1990s. For a detailed discussion of hypothesis testing for these difference estimates, see Sanchirico, Working Paper, *supra* note 45, at 34–39.

91. Its one-sided p-value is .002, implying that the decrease in the elasticity of the realization ratio is statistically significant at the 1% level. Thus, the data are consistent with a decrease in the labor income realization ratio between 1989 and 2000. For a detailed discussion of hypothesis testing for these difference estimates, see *id.*

More specifically, given our within-year results, the data are consistent with the realization ratio falling from a positive level to a negative level over the period.

92. The one-sided p-value for our estimate of this time change is .033. Therefore, the null hypothesis that potential income progressivity increased from 1989 to 2000 can be rejected at a 5% level. For a detailed discussion of hypothesis testing for these difference estimates, see *id.*

93. In the right column, 1989 actual income levels are used to calculate the change due to the statute. Conversely, the 2000 *statute* is used to calculate the change due to shifts in actual income levels. The left column reverses the assignment of years to these two sources of change.

94. As a technical note, notice that the estimates show potential income progressivity decreasing by a larger extent than would be indicated by the additive decomposition of potential income progressivity. That is, $-.406$ is smaller than $.309 + -.355 = -.046$. This discrepancy is due to the fact that the additive decomposition is only approximate.

It is important to note that the estimates of potential income progressivity and its components are not themselves affected by the approximations just discussed. The approximation applies merely to the equality relationship between potential income progressivity on the one hand and the sum of actual income progressivity and the elasticity of the labor realization ratio on the other. An *exact* decomposition of potential income progressivity is derived in Sanchirico, Working Paper, *supra* note 45, at 12–21, 62–63.

in three steps: an estimation of family potential income; an estimation of the relationship between family potential income and family actual income; and a simulation of the tax code.⁹⁵ This Part considers these steps in more detail and describes the intermediate results generated in each.

A. *Estimating Family Potential Income*

Part I.C provided a conceptual framework for measuring potential income. As there discussed, the core procedure for estimating potential income is the estimation of average wage rates within educational, demographic, and geographic groups.

Table 4 shows the results of regressing individuals' average hourly earnings on various educational, demographic, and geographic characteristics.⁹⁶ Because I wish to avoid part-time wage discounts when estimating potential earnings, the estimation sample consists only of individuals who worked full time (at least 2,000 hours), who were either "heads" or "wives" in a PSID family in each respective year, and who were mid-career (between the ages of twenty-five and fifty-five) at the time of the interview. The estimation sample was not restricted to individuals who were members of "married" couples, nor to individuals with children.

The estimated regression equation was then applied to each head or wife in all mid-career married couples, including those individuals who

95. The working paper version of this paper contains a detailed discussion of the estimation strategy employed in this Article. See Sanchirico, Working Paper, *supra* note 45, at 25–31. Furthermore, the computer code used to make all estimates (a STATA program coded by the author) is available at http://www.cstone.net/~csanchir/Sanchirico_Progressivity_Supp_2.pdf (last visited Oct. 13, 2008) (on file with the *Columbia Law Review*). The code is interspersed with explanatory remarks.

96. I do not include work experience as a determinant of potential wage for two reasons. First, data on work experience is difficult to recover from the PSID. See, e.g., Inst. for Soc. Research, Univ. of Mich., Panel Study of Income Dynamics, Variable ER20041, at <http://simba.isr.umich.edu/cb.aspx?vList=ER20041> (last visited Sept. 23, 2008) (on file with the *Columbia Law Review*) (describing variable ER20041 "#YR WRKED FULLTIME-H" in "Noncompatibility notes"). Second, in many circumstances it is not clear that those with less work experience should be counted as having a lower potential wage. Suppose, for example, that two individuals, now both twenty-eight years old, both graduated from law school at age twenty-five. If the first has practiced law for the last three years while the second has pursued a graduate degree in classics, the second may not be able to command as high a wage in the current year as the first. Yet it is not clear that the second should be regarded as having a lower *potential* wage—certainly not if we consider the three years since law school as a unit. As discussed in the Introduction, the adjective "potential" implies a time horizon, and substantial ambiguity plagues the proper choice thereof. For the most part, I take an annual approach. However, with regard to work experience, I deviate from this general principle.

In any event, it is important to note that excluding work experience from the determinants of potential income would only affect my within-year estimates if the exclusion had a different effect on the low end of the potential income spectrum than on the high end. Moreover, the exclusion of work experience would only affect my across-year results if this difference (across the potential income spectrum) was itself different across the two years.

TABLE 4: REGRESSION ANALYSIS OF AVERAGE HOURLY EARNINGS FOR FULL-TIME MID-CAREER INDIVIDUALS

	1989	2000
Age	1.417 (.353)**	2.460 (.512)**
Age squared	-.015 (.005)**	-.027 (.007)**
Female?	-5.480 (.481)**	-7.874 (.837)**
Black?	-2.728 (.513)**	-4.727 (.743)**
Hispanic?	1.236 (1.619)	-.903 (1.752)
Completed high school?	4.260 (.471)**	3.470 (.776)**
. . .plus college?	5.850 (.762)**	11.842 (1.465)**
. . .plus advanced/professional?	8.370 (2.360)**	.049 (2.280)
Instead of Northeast, Northcentral?	-2.971 (.773)**	-4.912 (1.585)**
. . .South?	-2.746 (.763)**	-4.892 (1.761)**
. . .West?	-.579 (1.262)	-2.882 (1.700)
. . .Alaska or Hawaii?	-4.510 (3.701)	-1.781 (5.195)
. . .Foreign country?	1.626 (3.630)	-1.927 (5.974)
Urban?	2.986 (.551)**	2.486 (1.004)**
Constant	-17.829 (6.225)**	-33.747 (9.305)**
<i>Inflation multiplier</i>	129.917	100
<i>Number of observations</i>	3591	3085
<i>P-value for joint significance of nonconstant terms</i>	.000	.000
<i>R-squared</i>	.209	.129

Robust standard errors in parentheses; * significant at 5%; ** significant at 1%.

“Full-time” is 2,000 or more hours per year, the equivalent of forty hours per week for fifty weeks. “Mid-career” is aged twenty-five to fifty-five. Sample individuals are either PSID family “heads” (including singles) or “wives/‘wives” (in married or unmarried couples). “Average hourly earnings” is “total labor income” (in 2,000 dollars) divided by “total work hours.” “Total labor income” includes wages, salaries, bonuses, overtime, commissions, income from a professional practice or trade, the labor part of farm income, the labor part of unincorporated business income, and income from market gardening. Total labor income is converted to 2000 dollars using a chain-type price index for consumer expenditures from the National Income and Product Accounts. The conversion factor is shown in the fourth to last row. “Total work hours” includes all time spent producing total labor income. Neither labor hours nor labor income account for nonmarket work. Education variables were gathered when individuals were most recently new heads or wives. Education coefficients for each level of schooling represent the estimated incremental increase in average hourly earnings from completing that level of schooling versus the next lower level. High school dropouts are the excluded group. For the regional dummy variables, Northeast is excluded. The urban dummy variable is set to one if the largest urban area (“SMSA”) in the primary sampling unit (county, county group, or SMSA) has at least 100,000 people. Estimates account for unequal probability sampling.

did *not* work full time in the market. The resulting “predicted average hourly earnings” for each individual were, in turn, added together within each married couple to generate family predicted average hourly earnings, hereinafter “family potential average hourly earnings.”⁹⁷

Before moving to the next step, it is worth noting that the intermediate results shown in Table 4 conform to prior studies of wage determinants.⁹⁸ For both years, the coefficients on age and age squared imply that average hourly earnings increase at a decreasing rate over most of the age range of the estimation sample.⁹⁹ For both years, average hourly earnings are, all else the same, lower for women and lower for African Americans. Education exhibits a positive return in both years. High school dropouts (the excluded group) earn less than high school graduates, who earn less than college graduates, who, in turn (at least for 1989), earn less than those with advanced or professional training. Individuals living in the Northeast (the excluded group) tended to earn higher wages in both years than individuals in either the Northcentral region or the South. Residence in an urban area was also positively correlated with higher average hourly earnings.¹⁰⁰

Regarding the comparison between 1989 and 2000, the most dramatic shift is the increase in the return from obtaining a college degree. The regressions predict, for instance, that in 1989, an individual with a college degree could earn approximately six dollars more per hour than an individual with the same measured characteristics but only a high school diploma. By 2000, the incremental contribution from a college degree had doubled to twelve dollars per hour.¹⁰¹

More generally, comparing the (statistically significant) coefficients for 1989 to those for 2000, the general picture is a drop in the constant term coupled with increases in the impact of the measured characteris-

97. In particular, predicted wages were also used for individuals who worked full time, and whose actual wages were reported by PSID. This was done to avoid the bias in estimating the relationship between wage rates and actual income. Such bias would be caused by both measurement error and the fact that wage rates are calculated in PSID by dividing actual income by work hours. Measurement error in actual income would show up on both sides of the regression equation and bias upwards the estimate of the regression coefficient on wages. This is discussed in more detail in the working paper version of this Article. Sanchirico, Working Paper, *supra* note 45, at 28.

98. See Zvi Eckstein & Éva Nagypál, *The Evolution of U.S. Earnings Inequality: 1961–2002*, Fed. Res. Bank of Minneapolis Q. Rev., Dec. 2004, at 10 (summarizing long term trends in gender and educational wage premiums); see also Mishel, Bernstein & Allegretto, *supra* note 23, at 140–46, 148–54, 162–64 (describing demographic and educational determinants of wage rates).

99. For 1989, the quadratic in age tops off at $.5(1.417/.015) = 47$. For 2000, the quadratic in age tops off at $.5(2.460/.027) = 46$.

100. The coefficients on Hispanic status, other regions including West, and, for 2000 only, having advanced or professional training, were not significantly different from zero.

101. For instance, the regression predicts that a forty-year-old white male from the Northeast would, in 1989, earn \$28 per hour with a college degree and \$22 with a high school diploma, whereas for 2000, the corresponding figures are \$39 and \$27.

tics. The falling constant term signifies that “baseline earnings” were less in 2000. But being white, being male, residing in the Northeast, and having a college degree all had a greater positive impact on potential average hourly earnings in 2000 than in 1989. The falling baseline, coupled with compensation for certain portions of the population, corresponds to increased dispersion in the average hourly earnings of individuals.

B. *Estimating the Relationship Between Actual Income and Potential Income*

The next step was to estimate average family actual income at each level of family potential average hourly earnings in the family wage range of \$20 to \$50 per hour. (The family wage is the sum of each spouse’s wage.) To do this, I applied a flexible estimation procedure called “fractional polynomial estimation.”¹⁰²

102. See Patrick Royston & Douglas G. Altman, *Regression Using Fractional Polynomials of Continuous Covariates: Parsimonious Parametric Modeling*, 43 *Applied Stat.* 429, 432–36 (1994) (describing fractional polynomial estimation). In this procedure, estimation is conducted along two dimensions: first, over the powers applied to each of d terms in family potential average hourly earnings, where d is the “degree”; and second, over the linear coefficients on each such term. The combinations of powers are chosen from a prespecified finite set of possibilities. This set includes combinations involving negative powers, fractional powers, logarithms, and the multiplication of logarithms and power terms. (In addition, the regressor may be affinely transformed before application of the power, and, after application of the power, the power term may be translated. See the actual estimates below for examples.) For each combination of power terms in this finite set, the estimation procedure chooses the best fitting array of coefficients (through ordinary least squares regression). The procedure then chooses the linear combination of power terms with the *best* best-fit.

A few technical notes on this first step are in order. First, my object here is to estimate the relationship between family potential wages and family actual income for my ultimate estimation sample: mid-career, two adult, two children families. In this step, I use the larger sample of families with greater than or less than two children (and then control for the number of children) in order to improve my estimates.

Second, it is important to note that my object is not to explain the determinants of actual income, in the way an econometrician might be interested in explaining the determinants of labor supply. Rather, my enterprise is more statistical than econometric. I am interested in obtaining a reasonable estimate of the population mean of actual income at each level of potential wage. Although, like the econometrician, I employ a regression technique, my motivation for doing so is somewhat different. Ideally, I would conduct separate estimations of mean actual income for each subsample corresponding to each level of potential income. Each such exercise taken individually would correspond to the classic statistical exercise of estimating a statistical mean. Unfortunately, but not surprisingly, my data does not support separate level-by-level mean estimation at each level of potential wage. Thus, I use a regression technique which essentially allows neighboring levels of potential wage to influence the average calculation at each given potential wage.

Third, because my enterprise differs from the estimation of a labor supply equation, many of the problems that plague the latter exercise are not relevant here. For example, I do not need to be concerned with econometric issues that would bias estimates of the coefficients of some underlying *causal model* of labor supply. It is of no consequence to my analysis, for instance, if my estimate for the coefficient(s) on family potential wage (and its fractional polynomial transformations) pick up the influence of omitted variables, so my estimation attributes to family potential wage effects that are not in fact caused by the

This fractional polynomial regression for each year was conducted on an estimation sample that consisted of all families of mid-career married couples, no matter how many children. Because the tax cohort under study consists specifically of those mid-career married couples *with two children*, fractional polynomial regression was conducted with dummy variables added for the number of children.

Table 5 shows the result of applying this estimation procedure to each year. Presented for completeness only, the table is less informative than Figure 2, which follows it.¹⁰³

Figure 2 is a graphical presentation of the estimated relationship between family potential average hourly earnings and family actual income,¹⁰⁴ as estimated in Table 3. It shows family actual income as a function of family potential wage (for mid-career married couples with two children). Importantly, the function for 2000 is generally flatter than that for 1989, signifying that actual earnings increased more quickly than potential earnings in 1989 than in 2000.

impact of higher wages on individuals' choices regarding how much labor to supply to the market. My object is not to estimate a behavioral equation, properly attributing to each explanatory factor its influence on individual choice. My object is rather to estimate the correlation between family potential wage and actual income *from whatever source such correlation may be derived*.

Fourth, the fact that these problems surrounding the estimation of a labor supply function do not apply here does not mean that I may ignore the problems of bias and sampling variance. In particular, it would not do to use actual wages as the independent variable, rather than predicted wages, even for those individuals in my sample who do work full time. PSID calculates average hourly earnings by dividing total labor income by hours worked. For these individuals, the dependent variable would be labor income, while one of the independent variables would be labor income divided by hours worked. Any measurement error in labor income would show up on both sides of my equation simultaneously, and shift both sides in the same direction. This would bias my estimates of the coefficient on average hourly earnings upwards, as measurement error in labor income would cause actual income and average hourly earnings to vary in the same direction.

103. The contribution of each power term is not readily apparent from the table, and neither is the meaning of the coefficient assigned to each term.

Furthermore, the standard errors reported in the table do not take into account variation in family potential average hourly earnings, as generated by prediction in the first step of the estimation procedure. Rather, these standard errors are generated as if family potential average hourly earnings were an observed variable. One apparent (but not real) alternative would be to derive the standard errors for the fractional polynomial estimation from balanced repeated replication of the combined procedure of wage prediction and actual income regression. But this is also problematic. Under the balanced repeated replication procedure used to generate standard errors for the progressivity measures of ultimate concern, the power terms in the actual income regression were, appropriately, allowed to vary from replication to replication. That is, the entire fractional polynomial estimation procedure—choice of coefficients *and* choice of power terms—was rerun for each replication. Accordingly, the power terms varied from replication to replication. So, therefore, did the meaning of the coefficients. As a result, the variance of these coefficients across replications cannot be interpreted as the sampling variance of fixed coefficients in the usual manner.

104. More precisely, the expected value of family actual income is conditional on family potential average hourly earnings.

TABLE 5: ACTUAL INCOME OF MID-CAREER MARRIED COUPLES

	1989	2000
Term 1 in family potential average hourly earnings, x		
Power term	$(\frac{x}{10})^3 - 26.738$	$\ln(\frac{x}{10}) - 1.398$
Coefficient	20108.88 (8120.99)*	-2232413 (1941769)
Term 2 . . .		
Power term	$(\frac{x}{10})^3 \ln(\frac{x}{10}) - 29.288$	$(\frac{x}{10})^3 - 2.012$
Coefficient	-34348.28 (14658.82)*	1.26e+07 (1.06e+07)
Term 3 . . .		
Power term	$(\frac{x}{10})^3 \ln(\frac{x}{10})^2 - 32.082$	$(\frac{x}{10})^3 \ln(\frac{x}{10}) - 2.814$
Coefficient	20996.25 (9037.627)*	-4054054 (3340937)
Term 4 . . .		
Power term	$(\frac{x}{10})^3 \ln(\frac{x}{10})^3 - 35.141$	$(\frac{x}{10})^3 \ln(\frac{x}{10})^2 - 3.935$
Coefficient	-4407.611 (1872.188)*	457665 (354922.7)
Number of children \geq one?	-7919.425 (2856.554)**	7742.136 (4323.597)
. . .two	678.237 (2363.494)	-2368.129 (5659.448)
. . .three	1047.43 (3754.711)	-222.1696 (8014.075)
. . .four	-13218.49 (4717.667)**	-122297.08 (9861.54)
. . .five	2781.639 (6766.809)	-14909.16 (8064.179)
. . .six	4473.844 (10907.54)	296.614 (28460.26)
. . .seven	-20413.81 (9297.067)**	61627.08 (28103.47)
. . .eight	23923.07 (18697.47)	-88921.27 (26396.89)**
Constant	58932.41 (2045.104)**	68148.95 (2572.897)**
<i>Number of observations</i>	2846	2182
<i>R-squared</i>	.219	.177

See text for discussion of reported standard errors

* Significant at a 5% level; ** significant at a 1% level

"Mid-career" means age twenty-five to fifty-five. Terms one through four themselves, in addition to their coefficients, were chosen by fractional polynomial estimation. See Royston & Altman, *supra* note 102, at 434-36 (describing fractional polynomial estimation). Dummies for numbers of children are marginal. The dummy for zero children is the excluded variable.

FIGURE 2
FAMILY ACTUAL INCOME PER FAMILY POTENTIAL HOURLY EARNINGS



Source: PSID

Expected value of family actual income conditional on predicted family average hourly earnings

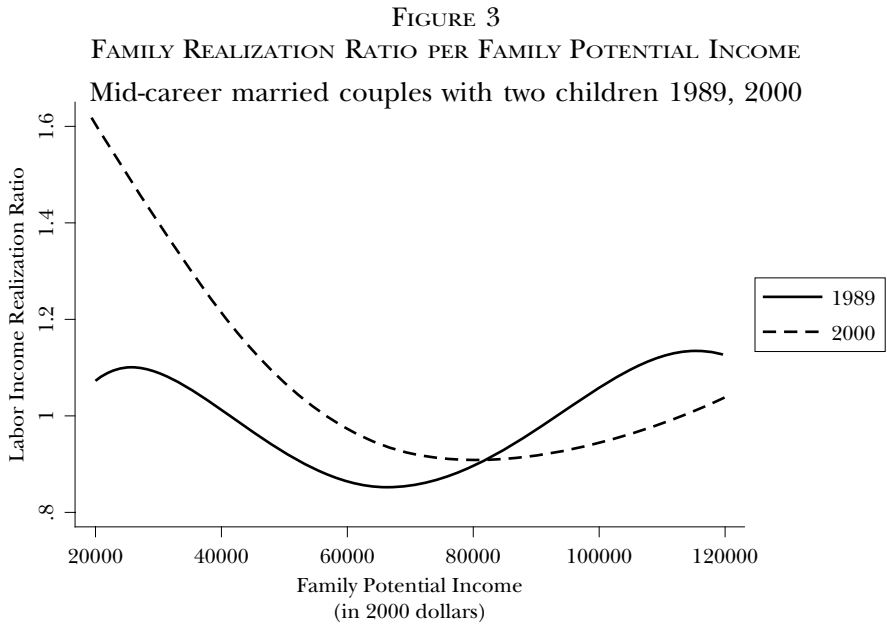
Figure 3 graphs the family level labor income realization ratio against family potential income.¹⁰⁵ In each year, the realization ratio is a U-shaped curve. Roughly speaking, in each year, those on either side of the middle realized a greater portion of their potential income as actual income. The curve for 2000 is tilted downward relative to the curve in 1989. In 2000, families with low potential income were still realizing more of that potential than families with mid-level potential income, but not much more. Moreover, families with high potential income were also still realizing more of that potential than families in the middle, but now to a lesser extent.

C. Tax Codes

The third and last step is the calculation of actual tax liability. This section describes how actual tax liability was calculated. It also describes the shape of the function mapping actual income onto tax liability for the years, tax cohort, and potential income range under study.

Average tax rates on actual labor income for the two years, 1989 and 2000, are shown in Figure 4. Actual labor income values are measured on the horizontal axis and are expressed in 2000 dollars. The horizontal axis

105. In this graph, family potential income is calculated as family potential average hourly earnings (what the wife and husband could earn in aggregate each hour) times 2,000 hours. As discussed in Part I.C, specification of the number of “workable” hours is arbitrary and of no consequence for these elasticity measures.



Expected value of family actual income conditional on family potential income, divided by family potential income
Potential income is predicted family average hourly earnings times 2000 hours

contains the range of actual income values that is implicated by the range of family potential average hourly earnings under study—namely \$20 to \$50 per hour, the tenth to the ninetieth percentile of such potential earnings in 1989.¹⁰⁶ Consistent with Figure 2 above, this implicated range of actual income values runs approximately from \$41,000 to \$107,000 for 1989 and from \$49,000 to \$95,000 for 2000.¹⁰⁷ Average tax rates were obtained by simulation using the National Bureau of Economic Research's TAXSIM program.¹⁰⁸ As described in Part II.C, this program takes into account many tax code features in addition to the rate schedule. A web appendix to this Article describes the complex correspondence between these simulation results and specific statutory provisions.¹⁰⁹

Effective marginal rates for all levels of actual income up to Figure 4's upper boundary (\$130,000) are shown in Figure 5. Rates shown here differ at certain points from those listed in the statutory rate schedule due to phaseouts and phaseins of various tax benefits.¹¹⁰ Again, the horizontal axis measures actual labor income in 2000 dollars.

106. See *supra* note 82 for a discussion of the potential income range examined in this study.

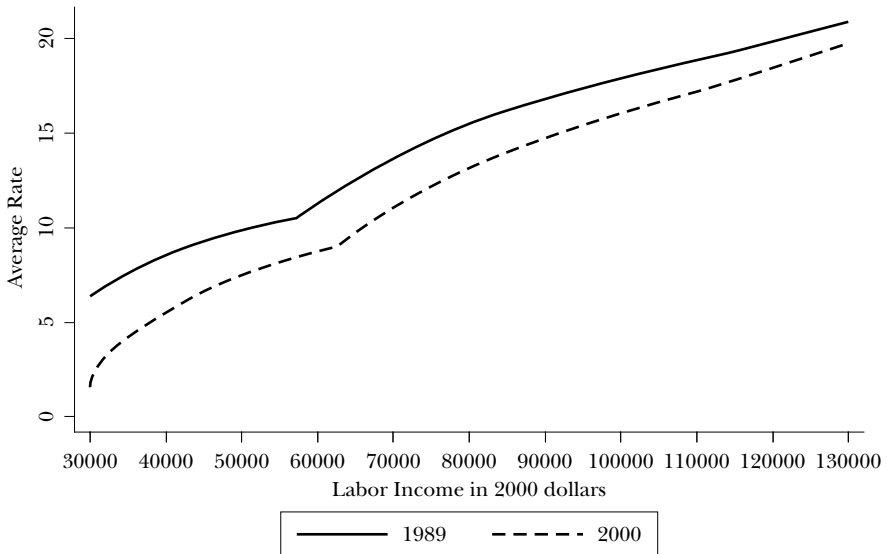
107. These figures are derived from the regression reported in Table 5.

108. For a description of TAXSIM, an online simulation program used to determine actual tax liability, see *supra* Part II.C.

109. Sanchirico, Appendix, *supra* note 74.

110. See *supra* note 73 (listing limitations and phaseouts applicable to analysis in this Article).

FIGURE 4
AVERAGE TAX RATES ON LABOR INCOME: 1989, 2000



Source: TAXSIM

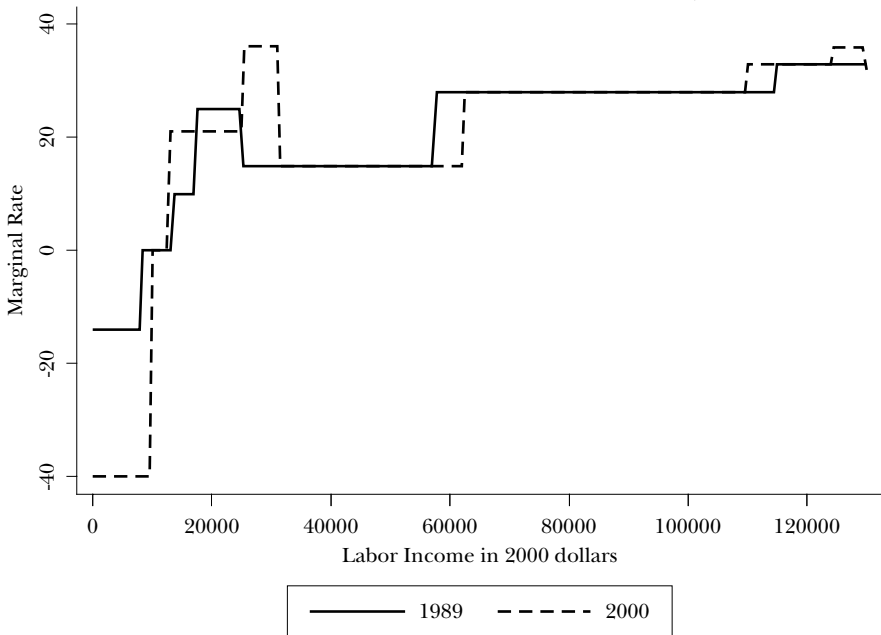
For a married couple filing jointly with equal wages, no non labor income, two children, no child support expenses, taking the standard deduction

Total tax liability for the same range of actual incomes is depicted in Figure 6. In this figure, both axes are in terms of 2000 dollars.

Returning to Figure 4, one can infer by comparing actual income average tax rate schedules that the *elasticity* of the actual income average tax rate—the measure of actual income progressivity used in this study—was generally greater across the board in 2000 than in 1989. The elasticity of the actual income average tax rate is, as noted, the percentage change in the average tax rate per percentage change in actual income. In turn, the percentage change in the average tax rate is the absolute change in the average tax rate, divided by the level of the average tax rate. In terms of absolute changes, average tax rates generally increased more steeply in 2000 than in 1989 (this is true everywhere except near the “dimple” in each average tax rate schedule around \$60,000 caused by a discontinuous step up in marginal rates). Moreover, the generally larger absolute change in average tax rates in 2000 was also always on a smaller base: Average tax rates are lower everywhere in 2000 than in 1989.

These deductions regarding the elasticities of actual income average tax rates bear out in Figure 7, which explicitly depicts such elasticities. Figure 7 shows that, but for the “dimples” in the average tax rate schedules, the elasticity of the average tax rate was greater in 2000 than in 1989. Thus, by the measure of progressivity adopted in this study, and over the

FIGURE 5
MARGINAL TAX RATES ON LABOR INCOME: 1989, 2000



Source: TAXSIM

For a married couple filing jointly with equal wages, no non labor income, two children, no child support expenses, taking the standard deduction

range of actual income levels herein examined, the code was generally more progressive in 2000 than in 1989.

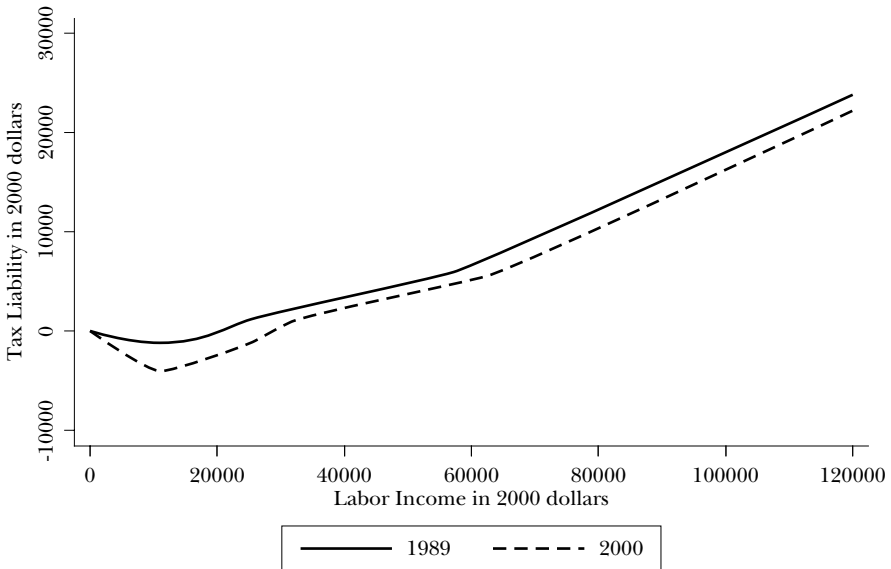
What explains this increase in statutory progressivity? Notice that the total income tax lines in Figure 6 are roughly parallel after about \$20,000 of income, with the line for 2000 lying below the line for 1989. As noted above, the range of actual incomes examined in this study falls within the range \$40,000 to \$110,000.¹¹¹ Over this range, therefore, the 2000 tax code looks a bit like the 1989 tax code shifted downward and/or rightward. This shift is the main source of the 2000 tax code's greater progressivity over the studied range of incomes.¹¹²

111. See *supra* note 107 and accompanying text.

112. The working paper version of this Article contains a detailed discussion of how the larger zero bracket amount in 2000 causes the measure of actual income progressivity used in this Article—the elasticity of the average tax rate in actual income—to be larger in 2000 than in 1989. See Sanchirico, Working Paper, *supra* note 45, at 53.

Note that the general pattern of greater progressivity in 2000 is contradicted in the small range surrounding \$60,000 of actual income. In this range, the (effective) marginal tax rates for both years shift from 28% to 33%. The shift occurs first for 1989. Over the interval, where 2000 momentarily lags, 1989's code is more progressive. This exception has little effect on my analysis for two (partially redundant) reasons. First and most importantly, I study *average* progressivity over a range of family potential average hourly earnings levels (\$20 to \$50). Second, for computational convenience, and probably with

FIGURE 6
TOTAL INCOME TAX ON LABOR INCOME: 1989, 2000



Source: TAXSIM

For a married couple filing jointly with equal wages, no non labor income, two children, no child support expenses, taking the standard deduction

The total tax liability schedule shifted between 1989 and 2000 for two main reasons. First and most importantly, a child tax credit of \$500 per qualifying child was instituted in 1998.¹¹³ This downshifted the total tax liability of all families in the cohort under study, each of which has two children, by the same dollar amount, namely \$1,000.¹¹⁴

One can get some sense of the relative magnitude of the child tax credit's impact by comparing the credit to the personal exemption and the standard deduction. For taxpayers in the 15% bracket, the child tax credit was equivalent to exempting an additional \$6,667 of year 2000 dollars from tax.¹¹⁵ The actual personal exemption amounts and standard deductions for the two years averaged roughly \$2,750 and \$7,000 respec-

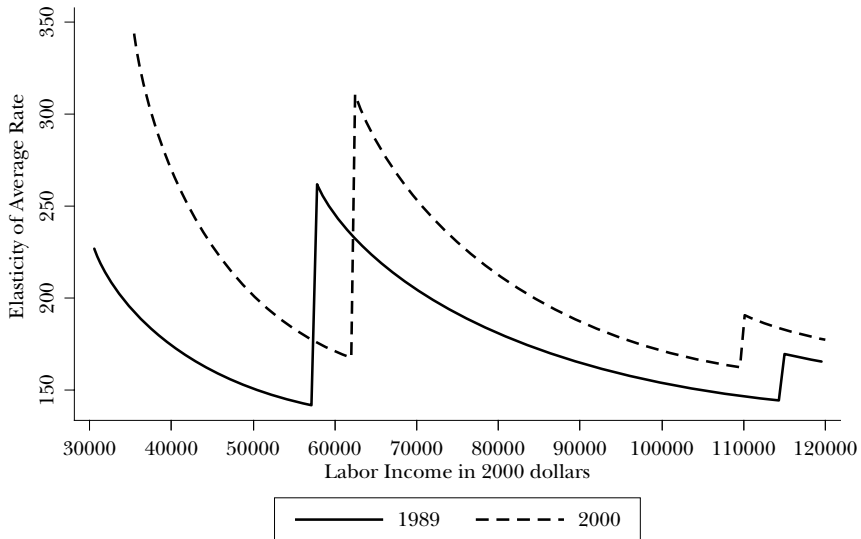
little effect, given the averaging just discussed, I measure progressivity from a degree-four fraction polynomial fit for total tax liability, rather than the tax liability schedule itself. Fractional polynomial estimation is discussed *supra* Part IV.B.

113. The Taxpayer Relief Act of 1997, Pub. L. No. 105-34, § 101(a), 11 Stat. 788, 796 (current version at I.R.C. § 24 (2000 & Supp. V 2005)) (providing partially refundable per child credit that phases out for higher income taxpayers). The child tax credit is currently \$1,000 per qualifying child. I.R.C. § 24.

114. I.R.C. § 24(a) (2000).

115. This follows in several steps. First, the child tax credit was entirely *nonrefundable* for the tax cohort under study. See *id.* § 24(d) (allowing partial refundability only for tax units with *three* or more qualifying children). Second, the lowest bracket rate in 2000 was 15%. *Id.* § 1. Third, 15% of \$6,666.66 is \$1,000. Fourth, the upper boundary of the 15% bracket was greater than \$6,666.66. *Id.*

FIGURE 7
ELASTICITY OF AVERAGE TAX RATES ON LABOR INCOME: 1989, 2000



Source: TAXSIM

For a married couple filing jointly with equal wages, no non labor income, two children, no child support expenses, taking the standard deduction

tively.¹¹⁶ Therefore, the child tax credit for those in the 15% bracket was nearly equivalent to allowing a second standard deduction, or, in the alternative, two and a half additional exemptions. Relative to the personal exemption and the standard deduction, the progressivity impact of the child tax credit was further enhanced by the fact that, unlike these other tax benefits, the dollar reduction in tax liability caused by the credit was not greater for those in higher brackets.¹¹⁷

Second, and less importantly, between 1989 and 2000, both the personal exemption amount¹¹⁸ and the standard deduction¹¹⁹ grew faster than the price index used in this study to measure inflation, which is the

Although in 2000 (as now) the child tax credit phased out on adjusted gross income, this phaseout began to take effect beyond the range studied in this Article. *Id.* § 24(b) (specifying AGI threshold amounts by filing status: \$110,000 in the case of a joint return).

Note that the child tax credit amount (\$500 per qualifying child) was not (and is not) adjusted for inflation. *Id.* § 24 (2000 & Supp. V 2005).

116. For a discussion of inflation-adjusted standard deductions and exemption amounts, see *infra* note 118.

117. Indeed, once the child tax credit began phasing it out, the reduction was smaller. But, as discussed *supra* note 115, this phaseout did not operate within the income range under study.

118. I.R.C. § 151. Although in 2000, as now, the exemption amount phased out on AGI, this phaseout began to take effect beyond the range studied in this Article. *Id.* § 151(d)(3)(C)(i), (d)(4); Rev. Proc. 99-42, 1999-2 C.B. 568 (specifying inflation-adjusted threshold amounts by filing status: \$193,400 in the case of a joint return).

119. I.R.C. § 63(c) (2000).

standard index used by labor economists.¹²⁰ This shifted the total tax

120. As explained in this note, growth in the year 2000 dollar values of the exemption amount and the standard deduction arises from a discrepancy between the measure of inflation that the code uses to adjust these amounts and the measure of inflation generally preferred by labor economists and used in this Article to convert all dollar figures to year 2000 dollars.

The exemption amount in 1989 was \$2,000. *Id.* § 151(d). In 2000, it was \$2,800. *Rev. Proc.* 99-42, 1999-2 C.B. 568. For members of the cohort under study, married couples filing jointly with two dependents, total exemptions were thus \$8,000 in 1989 and \$11,200 in 2000. I.R.C. § 151(b)–(c) (allowing four exemptions for such tax units). This statutory increase in exemption amounts was, in fact, caused by the inflation adjustment prescribed by the tax code, which uses the Consumer Price Index for urban consumers (the “CPI”). *Id.* §§ 1(f)(3), 151(d)(4). However, adjusting for inflation using the inflation measure used in this Article, the chain-type price index for Personal Consumption Expenditures from the National Income and Product Accounts (the “PCE index”), see *supra* note 61, the total exemption amount for 1989 is only \$10,393 in 2000 dollars, as compared to the year 2000 exemption amount of \$11,200. (The 1989 exemption amount in 2000 dollars is \$2,598.) That is, the code-mandated CPI inflation adjustment outpaced inflation as measured by the PCE index. Thus, according to the PCE index, the total exemption for the tax cohort under study increased by \$807 in year 2000 dollars.

A similar story applies to the standard deduction. The standard deduction applicable to the cohort under study was \$5,200 in 1989. *Id.* § 63(c); *Rev. Proc.* 88-56, 1988-2 C.B. 726. The same amount was \$7,350 in 2000. *Rev. Proc.* 99-42, 1999-2 C.B. 568. This statutory increase in the standard deduction resulted from code-mandated CPI inflation adjustments. I.R.C. §§ 1(f)(3), 63(c)(4). But, again, these adjustments outpaced the measure of inflation used in this study, the PCE index. According to the PCE index, the standard deduction in 1989 was worth only \$6,756 in year 2000 dollars, as compared to the year 2000 standard deduction of \$7,350. Therefore, per the PCE index, the standard deduction increased between 1989 and 2000, by \$594 in year 2000 dollars.

Thus, according to the measure of inflation used in this Article, the allowable exemptions plus the standard deduction (both denominated in year 2000 dollars) increased by \$1,401.

The measure of inflation used in this Article—the PCE index—is generally preferred by labor economists. See, e.g., Juhn & Murphy, *Wage Inequality*, *supra* note 23, at 77 n.3 (using PCE index); Autor, Katz & Kearney, *supra* note 67, at app. tbl.1 notes (same); Blau & Kahn, *supra* note 23, at 13 (same). One of the main reasons to prefer the PCE index is also one of the main reasons that it tends to show lower inflation: The PCE index more frequently adjusts the reference bundle of goods and services whose price trajectory is used to measure inflation. For both inflation measures, the reference bundle is meant to reflect the actual composition of purchases by consumers. The bundle is adjusted to account for changes in purchase patterns. Why does more frequent adjustment under the PCE index generally cause its inflation measurement to be lower than that of the CPI index? Prices of different items rise at different rates, and consumers shift their purchases to mitigate the steepest price increases. This shifting of expenditures partly alleviates the effect of inflation. Because the CPI adjusts the reference bundle more slowly it does not capture this effect as well. See Clinton P. McCully, Brian C. Moyer & Kenneth J. Stewart, *Comparing the Consumer Price Index and the Personal Consumption Expenditures Price Index*, *Surv. Current Bus.*, Nov. 2007, at 26, 28.

For a more detailed and comprehensive analysis of the differences between the CPI and the PCE index, see Thesia I. Garner et al., *The CE and the PCE: A Comparison*, *Monthly Lab. Rev.*, Sept. 2006, at 20; McCully, Moyer & Stewart, *supra*, at 26. With specific regard to divergence between the two measures in the mid-1990s, see Dennis Fixler & Ted Jaditz, *An Examination of the Difference Between the CPI and the PCE Deflator* (Bureau of Labor Statistics, Working Paper No. 361, 2002), available at <http://www.bls.gov/ore/pdf/ec020100.pdf> (on file with the *Columbia Law Review*).

schedule rightward by roughly \$1,400.¹²¹

Two other developments during the 1990s did not have a large impact on statutory progressivity within the range of incomes studied in this Article. First, the earned income credit was expanded in 1990 and 1993.¹²² In both years this credit phased out below the lower bound of the actual income range under study.¹²³ Second, top marginal rates were increased in 1993.¹²⁴ These marginal rates applied beyond the upper bound of income range examined in this Article.¹²⁵

V. POLICY IMPLICATIONS

The findings in this Article have several implications for tax law and policy, the most important of which are reviewed in this Part.

A. *Measuring the Redistributive Impact of the Labor Income Tax*

The income tax is generally regarded not only as a source of government revenue, but also as a means of reducing economic inequality. When commentators and policymakers consider whether the income tax accomplishes this second redistributive objective, they usually confine their analysis to the question of whether the income tax is sufficiently progressive. They ask, in particular, whether and to what extent those with greater market incomes pay a greater share of their incomes in tax.

Implicit in this inquiry is the association of market income with economic well-being. The association is an approximation of unknown precision, and certainly not an equation. The ultimate distributive issue is not whether the income tax takes more from those with higher incomes than from those with lower incomes, but whether the income tax takes more from those who are more well-off economically than from those who are less well-off economically. Market income and economic well-being are not the same.

121. For a detailed explanation, see *supra* note 120.

122. Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, § 13131(a), 107 Stat. 312, 433-35 (codified as amended at I.R.C. § 32); Omnibus Budget Reconciliation Act of 1990, Pub. L. No. 101-508, § 11111-11116, 104 Stat. 1388, 1388-408 to 1388-415 (codified as amended at I.R.C. § 32); see also Steven Holt, Brookings Inst., *The Earned Income Tax Credit at Age 30: What We Know 2-3* (2006), available at http://www.brookings.edu/~media/Files/rc/reports/2006/02childrenfamilies_holt/20060209_Holt.pdf (on file with the *Columbia Law Review*) (summarizing credit's history).

123. In 1989, the earned income credit for the tax cohort under study was completely phased out by \$19,340 in 1989 dollars, which is \$25,126 in 2000 dollars. I.R.C. § 32(b), (i) (1989); Rev. Proc. 88-56, 1988-2 C.B. 726. In 2000, the earned income credit for the tax cohort under study was completely phased out by \$31,152. I.R.C. § 32(b), (j) (2000); Rev. Proc. 99-42, 1999-2 C.B. 568.

124. Omnibus Budget Reconciliation Act of 1993 §§ 13201-13202, 107 Stat. at 457-61 (adding 36% and 39.6% brackets) (codified as amended at I.R.C. § 1).

125. *Id.* (starting 36% bracket at \$140,000 in 1993 dollars).

Careful theorizing about the income tax has always taken this distinction into account. The literature on optimal labor income taxation,¹²⁶ for example, views the labor income tax as (among other things) a means of equalizing individuals' economic well-being,¹²⁷ not individuals' labor incomes. The "first best" solution in these models would be to base individuals' tax liability directly on their economic well-being. Unable to observe individuals' economic well-being, the policymaker is forced to employ a "second best" solution whereby taxes are imposed according to individuals' labor earnings. Labor earnings differ from economic well-being in these models because labor income reflects only that portion of individuals' time endowment that they have chosen to allocate to market work, and not also the portion that they have allocated to "leisure" (by which is meant nonmarket activity).

Yet even though the difference between economic well-being and income is well recognized in theory, most commentators and policymakers continue to phrase the redistributive objective of the income tax in terms of "redistributing *income*," and continue to judge whether the income tax accomplishes its redistributive purpose by measuring its progressivity in terms of taxes per dollar of market income.¹²⁸ The question thus arises: Is this a pragmatic conceptual shortcut or a misleading oversight?

The empirical findings presented in this Article indicate that the approximation may be less proximate than previously imagined. The story that has been described herein for the 1990s renders suspect the usual practice of evaluating the redistributive impact of the income tax according to conventional measures of progressivity that fail to account for the implicit exclusion for nonmarket activity. Over that time period, the counteracting effect of variations in potential labor income realization overwhelmed changes in conventional progressivity measures. Changes in conventional measures give the misleading impression that the labor income tax became more redistributive over the course of the decade. In fact, it became less redistributive. The tax history of the 1990s, as here described, suggests a need to better align public discourse about the redistributive impact of the income tax with our understanding of its theoretical foundations.

126. The literature on optimal taxation is large. A clear discussion of its foundations can be found in Nicholas Stern, *The Theory of Optimal Commodity and Income Taxation: An Introduction*, in *The Theory of Taxation for Developing Countries* 22 (David Newbery & Nicholas Stern eds., 1987).

127. More precisely, if the social welfare function is equity-regarding, then the social planner, in choosing the optimal income tax, puts some weight on equalizing the distribution of individual well-being. If the social welfare function is utilitarian, however, then the social planner cares only about maximizing the simple sum of individual well-being.

128. Sanchirico, *Deconstructing*, supra note 8, at 1031–34 (discussing the "fuzzy rhetoric" of redistributing income).

B. *Implications for the Debate over Replacing the Income Tax with a Consumption Tax*

The most serious proposal for structural tax reform—one that enjoys broad support among scholars and commentators¹²⁹—is to replace the income tax with a consumption tax. The findings in this paper raise the question whether such reforms, however structural and comprehensive, stop too short, or are perhaps even misdirected.

It is well understood that replacing the income tax with a consumption tax would, under most proposals, leave the implicit exclusion for nonmarket activity intact.¹³⁰ This is simplest to see if one assumes for the moment that, in every tax year, all tax units spend everything they earn on the consumption of goods and services. Then the consumption tax base is the same, year by year, as the income tax base. Therefore, the two couples from our introductory example are taxed in the same way under a consumption tax as they are under an income tax. In particular, the two-earner couple still pays the same tax as the single-earner couple even though the single-earner couple has, by assumption, twice the earning power.

When individuals do not spend exactly what they earn, but rather save and dissave, the income tax and consumption tax bases differ, not just year by year, but in present discounted value. The simplest consumption tax, for instance, reaches consumption by taxing actual income with (1) a deduction for the amount of income that is saved, rather than currently consumed, and (2) an additional inclusion when and to the extent that such savings, plus any interest, are later withdrawn and consumed. As has often been noted, this tax structure is equivalent to taxing the present discounted value of labor earnings.¹³¹ The income tax, on the other hand, taxes not just the present discounted value of labor earnings, but also the return on savings. Thus, one tax unit with the same present discounted value of lifetime labor market earnings may end up paying greater lifetime taxes than another (in present discounted value) merely because it saves more early in its lifecycle, thus delaying consumption. Those who favor the consumption tax over the income tax ask: Why should a tax unit's decision about how to allocate its market earnings across time periods affect its lifetime tax liability? The consumption tax is presented as a way to remove this seemingly irrelevant factor from the tax base.

129. See, e.g. Shaviro, *Beyond*, supra note 32, at 747 (discussing widespread academic consensus “that an ideal consumption tax is unambiguously superior to an ideal income tax”).

130. See *id.* at 759–60 (explaining that “it is assumed to be unfeasible” for consumption tax to tax leisure).

131. See, e.g., David A. Weisbach, *Ironing Out the Flat Tax*, 52 *Stan. L. Rev.* 599, 603–13 (2000). This statement assumes that an individual's actual rate of return is used as the discount rate, rather than some potentially differing “market rate of return.” It also ignores gifts and bequests made or received.

But one might also ask: Why should a tax unit's decision about how to allocate its labor value across market and nonmarket activities affect its lifetime tax liability? This similarly compelling rhetorical question is a challenge to both the consumption tax and the income tax. If the two couples in our introductory example (suitably expanded to account for the passage of time) had different savings patterns, replacing the income tax with a consumption tax would align their tax bills with the present discounted values of their lifetime market earnings. But aligning tax bills with lifetime market earnings does not necessarily align tax bills with lifetime earnings potential and may well cause greater misalignment.

The findings of this Article indicate that this residual shortcoming of consumption taxation is empirically significant, and that the exclusion for nonmarket activity should perhaps be a more central part of the debate regarding structural tax reform.

C. Implications for the Heretofore Purely Theoretical Controversy over Endowment Taxation

A relatively recent literature in tax scholarship considers the possibility of taxing "endowments" rather than actual income.¹³² An individual's endowment is some amalgam—varying in detail and degree from author to author—of her genetic and material inheritance.¹³³ The present Article ties directly into that discussion. Potential income, as defined in this Article, is a giant step closer to endowment than actual income.¹³⁴

Most of the debate over endowment taxes has proceeded on a purely theoretical level.¹³⁵ In contrast, this Article gives some empirical indication of what is at stake. It suggests that the theoretical arguments populating the endowment tax literature are not, by any means, a matter of angels dancing on the head of a pin. If anything, these issues have become all the more pressing in recent years as the relationship between actual income and potential income has undergone a significant transformation.

Furthermore, most of the existing discussion of the equity impact of endowment taxation has centered on what are typically referred to as "horizontal equity" issues.¹³⁶ This is typified by the attention paid in that literature to the parable of the beachcomber.¹³⁷ A beachcomber, who

132. This literature is discussed *supra* notes 1–2.

133. See Sugin, *supra* note 2, at 21–24 (discussing difficulties of defining "endowment").

134. It does not go the whole way, to be sure, because it takes as given the individual's human capital stock in each year, and because it does not consider material inheritance.

135. The endowment tax literature previously cited, see *supra* notes 1–2, is almost entirely theoretical, as opposed to empirical.

136. This is generally true of the endowment tax sources previously cited, see *supra* notes 1–2.

137. See, e.g., Stark, *supra* note 1, at 47–48, 50 (explaining role of this parable in endowment tax debate).

could practice corporate law, instead lives a life of leisure, thus realizing none of his potential earning capacity and paying nothing in tax. The beachcomber's favorable tax treatment is compared to the high tax bill borne by a corporate lawyer with the same earning capacity, who does in fact realize that capacity. The question is whether it is fair to tax these two individuals so differently.

In contrast, the present Article focuses on *vertical* equity issues, putting horizontal equity to one side. It shows that the vertical equity implications of taxing actual rather than potential income are relatively large—relative, that is, to the vertical equity implications of more well-studied changes in the statutory rate structure. Moreover, the Article helps to clarify the nature of the vertical equity issue. As noted at several points throughout, the vertical equity implications of taxing on the basis of potential rather than actual earnings could go either way, depending on the pattern of labor income realization. Indeed, the implications have gone both ways in recent years: one way in 1989, the other in 2000.

D. *Adjusting the Tax Code to Better Reflect Variations in Work Patterns*

Suppose that policymakers wished to better align tax liability with potential earnings. How might they accomplish this? This subsection considers several alternatives.

1. *Adjusting the Actual Income Tax Schedule to Reflect Work Patterns.*

a. *Ad Hoc Adjustments and Indexing.* — During the 1990s, policymakers set out to make the tax code more progressive.¹³⁸ In point of fact, the code became less progressive in terms of potential income. If policymakers had been thinking in terms of potential rather than actual income, they might have chosen different policies. Perhaps they would have adjusted actual income tax schedules to account for the shifts in work patterns that occurred during that decade. They might have done this on an ad hoc basis, or perhaps even through some form of statutory indexing (as is currently used to adjust tax schedules for the effect of inflation on, among other things, progressivity¹³⁹).

Given the complicated politics of tax rates, indexing for work patterns was unlikely in the 1990s, and probably remains so today. But occasional extraordinary adjustments might well have been feasible and may be feasible going forward. If it were determined that the regressive impact of work patterns has continued or intensified since 2000, for instance, another expansion of the 10% rate bracket—this time without simultaneous reductions in top rates¹⁴⁰—might be made politically palatable by presenting the change not as a “giveaway,” but as “a break for

138. For a discussion of tax changes in the 1990s, see *supra* notes 113–122 and accompanying text.

139. See, e.g., I.R.C. § 1(f) (2000) (prescribing that tax tables be adjusted for inflation). Thanks to Alex Raskolnikov for suggesting the analogy to inflation indexing.

140. The Economic Growth and Tax Relief Reconciliation Act of 2001 created the 10% bracket where the 15% bracket used to be. Pub. L. No. 107-16, § 101(a)(i)(1), 115

working families,” a means of compensating for the fact that lower income families are devoting more of their earning power than intended to paying taxes because they are working relatively longer hours.

It is crucial to note, however, that adjusting rates to bring tax liability more into line with potential income will not necessarily make the tax code more progressive in terms of actual income.¹⁴¹ In 1989, for instance, an increasing labor income realization ratio raised the degree of potential income progressivity over the degree of statutory progressivity that lawmakers might have imagined they were implementing. Bringing tax liability more in line with potential income might well have meant decreasing statutory progressivity of the code.

b. *Caveat: The Influence of Taxes on Work Patterns.* — The policy response of adjusting rates is complicated—though not defeated—by the fact that work patterns are themselves in part determined by the shape of the tax schedule. In fact, the endogeneity of work patterns, as well as behavior generally, is a complication that affects all policy changes. If ignored, such endogeneity could potentially cause perverse outcomes.

Suppose, for instance, that higher marginal rates cause individuals to work less.¹⁴² In that case, increasing the progressivity of the tax code by increasing top rates may cause those to whom these higher rates apply to work shorter hours. This would, in turn, lower the correlation between potential income and the labor income realization ratio (perhaps by making such correlation more negative). One possible and ironic result would be that an increase in statutory progressivity brings about a *decrease* in potential income progressivity.¹⁴³ Conversely, it is conceivable that lowering marginal rates might increase the potential income progressivity of the code, if doing so sufficiently strengthens the positive correlation between work hours and potential income.

Stat. 38, 41 (codified as amended at I.R.C. § 1(i)(1) (Supp. V 2005)). It also lowered rates across the board. Id. § 101(a)(i)(2).

141. Cf. Stark, *supra* note 1, at 66. As Stark wrote:

Less widely recognized, or at least written about, is the fact that excluding non-market activity from the tax base severely limits the scope and effectiveness of egalitarian tax policies. In effect, by ruling personal endowment off limits, the liberal egalitarian has embraced the mother of all tax loopholes: specifically, that the high endowment individual need only opt for leisure in order to shed any obligation he might have otherwise had to ensure a just distribution of resources in society.

Id.

142. As is well known, whether individuals work more or less in response to an increase in tax rates depends on the relative strength of income and substitution effects. See Varian, *supra* note 23, at 173–77 (describing income and substitution effects in labor supply).

143. The adjustment would reduce inequality of economic well-being since it would lower the economic well-being of only those subject to the top rate. Even though these individuals would pay a smaller portion of their potential income in tax (because by hypothesis, they work so much less in response to the higher rate), they would still be less well off for having to face higher tax rates.

Could the former phenomenon have been at work in the 1990s? That is, could the decrease in potential income progressivity during that decade have been *caused by* the increase in statutory progressivity? This seems unlikely given the source of increased statutory progressivity over that time period. As shown in Figure 6 and discussed in Part IV.C, the increase in statutory progressivity from 1989 to 2000 was due primarily to a downward/rightward shift in the tax schedule during that period, and not to increases in upper bracket marginal rates.

To be sure, a shift in the tax schedule will generally affect behavior (via income effects). And it is *possible* that such effects would vary across the income spectrum in such a way as to cause high potential income individuals to realize relatively less of their income. But this is a harder story to tell than that involving increases in upper bracket marginal rates. It is, therefore, likely that the progressivity dampening changes in work patterns evident during the 1990s were not perversely caused by simultaneous increases in statutory progressivity.

2. *Expanding the "Child Care Credit."* — Another approach to making tax liability more a function of potential rather than actual income would be to expand the deductibility (or excludability, or creditability) of expenses for goods and services, such as child care and household services, that are often self provided.¹⁴⁴ Such policies would not reach the imputed income from leisure per se, but they would be a significant step toward taxing potential rather than actual income.

One might respond that the code already contains such provisions. The first order of business in discussing this form of policy response is to note that, despite the statutory presence of such credits and exclusions, current law does not accomplish this to any significant degree.¹⁴⁵

a. *Current Law.* — Expenses for child care and household services continue to be regarded as nondeductible personal expenses.¹⁴⁶ Section 21 does allow a credit against income tax liability for a varying percentage of certain "expenses for household and dependent care services necessary for gainful employment."¹⁴⁷ Taking into account ceilings, percent-

144. The progressivity of such provisions is addressed in the literature cited *supra* note 7, and has on several occasions been the subject of congressional debate or action. See Amy E. Dunbar, *Child Care Credit*, in *Encyclopedia of Taxation and Tax Policy* 53 (Joseph J. Cordes et al. eds., 2d ed. 2005) (discussing history and empirical research into progressivity of child care credit).

145. But see Stark, *supra* note 1, at 67 (arguing that earned income credit's initial subsidy is one way in which code partially aligns actual and potential income).

146. See I.R.C. § 262(a) (2000) ("[N]o deduction shall be allowed for personal, living, or family expenses."); *Smith v. Comm'r*, 40 B.T.A. 1038, 1038-39 (1939) (regarding "sums spent by the wife in employing nursemaids to care for petitioners' young child, the wife, as well as the husband being employed" as "'personal' expenses the deductibility of which is expressly denied"), *aff'd*, 113 F.2d 114 (2d Cir. 1940) (*per curiam*).

147. I.R.C. § 21 (2000 & Supp. V 2005). As noted above, crediting child care and household services expenses does not counteract the exclusion for nonmarket activity to the extent that such nonmarket activity constitutes leisure rather than the self-provision of such services. A related issue is whether such a credit does or should apply to those who

ages, and phaseouts, however, the child care credit is narrow in scope and small in magnitude despite its moderate expansion in 2001.¹⁴⁸

In the first place, if the tax unit has no dependents—more precisely no “qualifying individuals”—it receives no credit.¹⁴⁹ This is so even if the dependentless tax unit still has “expenses for household services.” (Indeed, this is so even though such household services expenses do become creditable along with child care expenses for tax units that have qualifying individuals.¹⁵⁰) Second, the credit is applicable to a maximum of \$3,000 of expenses per dependent, up to two dependents.¹⁵¹ Thus, for a married couple with two children, the credit is applicable to \$3,000 of expenses per child. For a married couple with four children, the credit is applicable to \$1,500 per child. Third, creditable expenses may not exceed, for an individual, her earned income, and for a married couple the minimum earned income as between the spouses.¹⁵² Fourth, the credited amount is not the full amount of such expenses but only a percentage thereof.¹⁵³ The percentage phases down from 35% to 20% as adjusted gross income (AGI) increases.¹⁵⁴ Thus, the amount of the credit per dependent, up to two dependents, phases down from \$1,050 to \$600. The phase down starts at \$15,000 of adjusted gross income and is

purchase (rather than self provide) child care and household services not because they are engaged in the labor market, but because they are enjoying leisure. Section 21 does not allow a credit in such a case. The child care credit is only for “employment-related expenses.” I.R.C. § 21(a) (2000). Expenses are “employment-related” “only if such expenses are incurred to enable the taxpayer to be gainfully employed.” *Id.* § 21(b)(2). The Treasury Regulations clarify that “[v]olunteer work for a nominal salary does not constitute gainful employment.” *Treas. Reg.* § 1.44A-1(c)(1)(i) (2007). (Note that 44A was the old section number for what is now I.R.C. § 21.) Furthermore, the employment-related expenses to which the credit applies are limited to the secondary earner’s “earned income.” I.R.C. § 21(d). This in turn is defined to be “[w]ages, salaries, tips, other employee compensation, and . . . [n]et earnings from self-employment.” *Treas. Reg.* § 1.44A-2(b)(2).

148. Economic Growth and Tax Relief Reconciliation Act of 2001, Pub. L. No. 107-16, § 204, 115 Stat. 38, 49–50 (codified as amended at I.R.C. § 21 (Supp. V 2005)). These expansions, detailed in the following notes, sunset on December 31, 2010. *Id.* § 901, 115 Stat. at 150.

149. I.R.C. § 21(a)(1) (2000 & Supp. V 2005) (allowing credit only for “an individual for which there are 1 or more qualifying individuals (as defined in subsection (b)(1)) with respect to such individual”); *id.* § 21(b)(1) (defining “qualifying individual” to include, among other things, “dependents” under age 13); *id.* § 152(a) (defining “dependents”).

150. *Id.* § 21(a)(1), (b)(2)(A) (crediting such household services expenses along with child care expenses for tax units that have qualifying individuals).

151. *Id.* § 21(c). This limit was increased from its previous level of \$2,400 per dependent, up to two dependents, by the Economic Growth and Tax Relief Reconciliation Act of 2001 § 204(a), 115 Stat. at 49. The increase sunsets on December 31, 2010. *Id.* § 901, 115 Stat. at 150.

152. I.R.C. § 21(d)(1).

153. *Id.* § 21(a)(2).

154. *Id.* The maximum percentage, 35%, was increased from 30% by the Economic Growth and Tax Relief Reconciliation Act of 2001 § 204(b)(1), 115 Stat. at 49. The increase sunsets on December 31, 2010. *Id.* § 901, 115 Stat. at 150.

complete by \$43,000,¹⁵⁵ which is approximately the median AGI among taxable returns.¹⁵⁶ Fifth, unlike the earned income credit,¹⁵⁷ and (to some extent) the similarly named child tax credit,¹⁵⁸ the child care credit is nonrefundable, meaning that a tax unit benefits from the credit only to the extent that it would otherwise owe tax.

What does all this amount to? Based on simulations conducted using TAXSIM,¹⁵⁹ Figure 8 shows the amount of child care credit allowed (the solid line) and the amount by which the credit actually reduces tax liability—that is, the effective credit amount. The difference between these lines arises from the credit's nonrefundability, as explained below. The diagram is for 2006, and for married couples with equal wage incomes, no nonlabor income, two children, maximal child care expenses, and taking the standard deduction.

For couples below roughly \$25,000 of AGI, the effective credit amount is zero: These couples otherwise owe no tax from which to subtract the credit. In the range from about \$25,000 to about \$38,000, the effective credit climbs as the amount of tax liability against which the credit may be subtracted increases. This increase in the effective credit occurs even though, as also shown in the figure, the statutory credit declines over this range as the percentage of expenses that may be credited falls from 35% to 20%. After a small peak at about \$40,000 the effective credit levels off at \$1,200 per year, or \$600 per child. This amounts to \$50 per month per child. For this tax cohort, therefore, the credit is in essence a \$50 payment per child per month that is phased *in* (not out) as AGI increases.

In addition to § 21, there is also an exclusion under § 129 for the value of child care provided by employers to employees.¹⁶⁰ For several reasons, § 129 does not substantially increase the magnitude of the tax benefit under § 21. Firstly, the type of expenses in question is explicitly made the same across the two provisions.¹⁶¹ Secondly, any amount excluded from income in § 129 must be subtracted from expenses used to

155. I.R.C. § 21(a)(2). The lower bound on the phaseout range, \$15,000, was increased from \$10,000 by the Economic Growth and Tax Relief Reconciliation Act of 2001 § 204(b)(2), 115 Stat. at 49. The increase sunsets on December 31, 2010. *Id.* § 901, 115 Stat. at 150.

156. Internal Revenue Serv., Individual Income Tax Returns 2004, at 29 tbl.1.1 (2006), available at <http://www.irs.gov/pub/irs-soi/04in11si.xls> (on file with the *Columbia Law Review*). The approximate median for “adjusted gross income less deficit” for 2006, the latest year for which such statistics are available, was \$58,029. See Internal Revenue Serv., Individual Income Tax Returns 2006, at 31 tbl.1.1 (2008), available at <http://www.irs.gov/pub/irs-soi/06inalcr.pdf> (on file with the *Columbia Law Review*).

157. I.R.C. § 32.

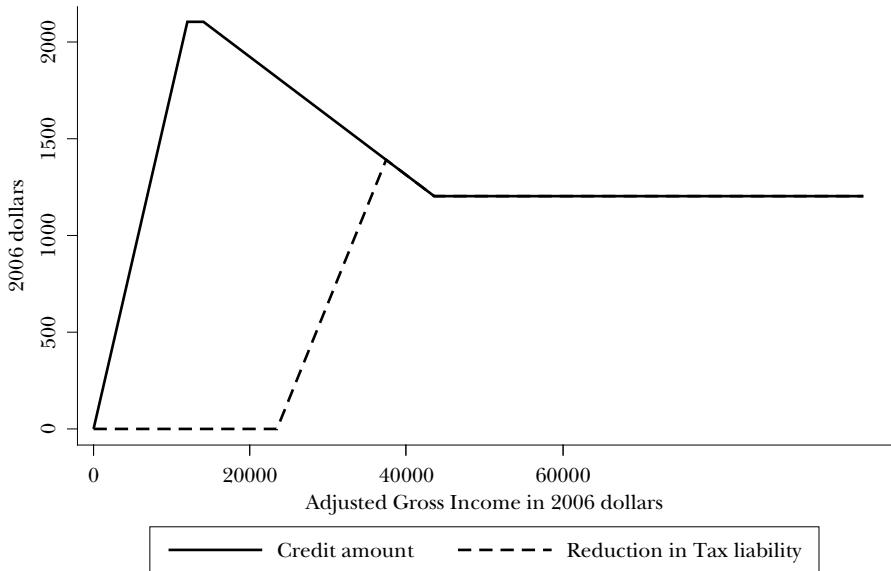
158. *Id.* § 24.

159. For information about TAXSIM, and TAXSIM related files, see *supra* note 68.

160. These expenses would be deductible by the employer under I.R.C. § 162 as a trade or business expense, just like cash salary.

161. I.R.C. § 129(e)(1) (2000).

FIGURE 8
CHILD CARE CREDIT: 2006



Source: TAXSIM

For a married couple filing jointly with equal wages, no non labor income, two children, taking the standard deduction

calculate the credit under § 21.¹⁶² Thirdly, the exclusion under § 129 is limited to \$5,000 for a two-earner married couple (and \$2,500 for married individuals filing singly).¹⁶³ When a tax unit has only one qualifying individual, this is, to be sure, more than the \$3,000 in expenses to which it can apply the credit under § 21. It is, however, less than the \$6,000 amount under § 21 that applies when a tax unit has two or more qualifying individuals.¹⁶⁴

As mentioned above, there is also a child tax credit under § 24. The credit amount is currently \$1,000 per child, but it starts to phase out when (modified) AGI reaches approximately \$100,000. However, this credit applies, for the most part, without regard to whether either or both spouses work, and so has no direct impact on the difference between actual and potential income progressivity.

b. *Potential Expansion of Tax Benefits for Child Care and Household Services.* — As currently drafted, the code provisions just described are unlikely to have a significant impact on potential income progressivity. Expanded versions of such provisions would, however, be capable of

162. I.R.C. §§ 21(c), 129(e)(7) (2000 & Supp. V 2005).

163. I.R.C. § 129(a)(2) (2000).

164. Note that the percentage of these amounts by which tax liability is reduced is different across the two provisions. For the exclusion, the percentage depends, roughly speaking, on the tax unit's marginal tax rate. For the credit, the percentage depends on the phased out statutory percentage (between 35% and 20%).

dampening the impact of the current exclusion for nonmarket activity.¹⁶⁵ In turn, the impact of removing the exclusion on progressivity would depend on work patterns.

Consider, for example, the two couples described in the Introduction.¹⁶⁶ Recall that the couple with twice the hourly wage worked half as many hours in the labor market, so that both couples paid the same in income tax. For concreteness, assume that the market-laboring spouse in the high wage couple earns \$100,000 in full-time work, and her stay-at-home counterpart could earn the same. Assume further that each spouse in the low wage couple earns \$50,000 in the labor market in full-time work. Lastly, assume that the high wage couple purchases no household or child care services, while the low wage couple purchases \$X of such services. If a deduction were allowed for these purchases, the taxable income of the low wage couple would fall from \$100,000 to \$100,000-X, whereas the taxable income of the high wage couple would remain \$100,000. This would lower the tax liability of the low wage couple relative to the high wage couple and dampen the negative impact of work patterns on potential income progressivity.¹⁶⁷

In this example, an allowance for child care expenses partially erases the difference between taxing actual and potential income. It also increases progressivity. But note that in this example, the couple with high potential income had a lower labor income realization ratio. Were the high wage couple the one sending both spouses into the market, a deduction would decrease progressivity by lowering the tax base of the high wage couple relative to that of the low wage couple. Thus, it is again crucial to note that reorienting the labor income tax toward potential rather than actual income does not necessarily mean making the code more progressive, however progressivity is measured.

3. *A Combined Approach.* — Assuming the goal is to bring the tax base as nearly as possible in line with potential income, the best approach is probably a combination of rate adjustments and expanded benefits. Actual income, on the one hand, and expenses for household/child care services, on the other, are separately correlated with potential income; neither “signal” of potential income is redundant. Both signals should, therefore, be utilized to improve the precision with which the tax code reaches potential income. As a practical matter, this would mean both adjusting tax rate schedules on the basis of variation in labor income real-

165. Past policy discourse on the child care credit seems to have focused on whether the credit itself was progressive, taking the credit to be justified on grounds not related to its impact on overall tax code progressivity. See *supra* note 144.

166. See *supra* text accompanying and following note 3.

167. Could the deduction (or equivalent credit) precisely mimic the effect of using potential income as a tax base? This depends precisely on whether actual income less deductible expenses—call this “net actual income”—may be expressed as a function of potential income. For a more detailed discussion of this issue, see Sanchirico, Working Paper, *supra* note 45, at 59 n.91 (offering technical analysis of using deductions as proxy for using potential income as tax base).

ization, and allowing deductions or credits for documented purchases of services that are often self provided.

CONCLUSION

We usually think of progressivity as a way of aligning tax burden with ability to pay. At the same time, we measure progressivity without regard to the extent to which the actual market incomes of taxpayers reflect their ability to earn. Does this make sense? If one defines “ability to pay” with reference to earning potential, the juxtaposition seems troubling—at least conceptually.

But, perhaps as a practical matter, this theoretical inconsistency makes no real difference. Perhaps taxpayers realize a similar proportion of their earning potential across the income spectrum.

This Article establishes that—as a practical matter—this inconsistency between motivation and measurement does indeed make a difference. Taxpayers at different levels of income do not, in fact, realize a similar proportion of their earning potential. Indeed, such differences may be substantial enough to be a decisive factor in assessing the effectiveness and adequacy of tax reforms. Such was the case during the 1990s, the period studied in this Article, when the taxation of labor income became more progressive on paper, but less progressive in effect due to counteracting changes in the pattern of labor income realization.