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EXECUTIVE SUMMARY

In this paper, we estimate the economic effects of the wealth tax proposed by Senator Warren using a computable general equilibrium model of the U.S. economy under the assumption that all revenues are used to increase income transfers (excluding Social Security payments) that accrue primarily to lower income groups. Our simulation of the Warren wealth tax estimates in the long run GDP falls by roughly 2.7 percent, as a result of decline in the capital stock of roughly 3.7 percent and in total hours worked of 1.5 percent, and aggregate consumption falls by 1.4 percent. Initially hours worked decline by 1.1 percent in a full employment economy; if instead labor hours worked per individual were held constant, this would be roughly equivalent to a loss of approximately 1.8 million jobs. Real wages decrease initially by 1.4 percent, but increase by 0.2 percent five years after enactment and by 1.3 percent in the long run. Together, the changes in real wages and the decline in hours worked imply that annual household real wage income on average across all wealth cohorts fall by $2,491 initially and by $1,129 five years after the reform. Five years after the reform, household real wage income falls by $4,487 for the lowest lifetime income group, by roughly $561 for the median household, and is unchanged for the top decile. In the long run, transfers relative to GDP increase by 70.1 percent, with most of the increase in transfers going to the bottom third of lifetime earners, whose average per-household transfer increases by $6,905. Per-household wealth held by the top lifetime income group (the top 0.25 percent) falls by 6.3 percent ($3.7 million), and per-household wealth of the fourth through ninth income deciles declines by 0.9 percent (roughly $440) to 4.2 percent (roughly $49,660), while the per-household wealth of the bottom three income deciles increases by roughly 19.0 percent ($100) for the lowest income decile, 10.7 percent (roughly $500) for the second lowest decile, and 1.8 percent (roughly $350) for the third lowest decile.

I. INTRODUCTION

A wealth tax is an individual level tax imposed on all or most forms of net wealth (assets less liabilities) typically above a fairly large exemption amount. Although the United States currently does not have a broad-based wealth tax, Senator Bernie Sanders and Senator Elizabeth Warren each proposed a version of a wealth tax in the recent Democratic presidential campaign. In this paper, we begin by discussing the basic features of wealth taxation, the administrative concerns raised by the implementation of a new wealth tax, and its economic effects.[1] We then turn to a description of the computable general equilibrium model we use to analyze the economic effects of a wealth tax in this study, followed by a description of our simulation results. A final section summarizes the results and suggests directions for future research.

II. THE STRUCTURE OF A WEALTH TAX

A wealth tax is imposed on an annual basis and its base is net wealth, that is, the taxpayer's total assets less total liabilities, including assets and liabilities held abroad.[2] In principle, all assets should be included in the wealth tax base at market values, such as stocks and bonds including those held in mutual funds, privately held businesses, housing and other real estate, liquid assets such as money market funds and savings deposits, and consumer durables. In practice, many assets are exempted from taxation on either administrative grounds (e.g., consumer durables) or on political grounds. Loans should be subtracted from the base,

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[1] In this paper, we draw on numerous recent articles that have examined the issues surrounding wealth taxation, including especially Viard (2019), as well as Holtzblatt (2019), and Li and Smith (2020).

[2] An annual wealth tax should thus be distinguished from the estate and gift tax, which is a one-time tax imposed on the transfer of assets.

but limits on the deductibility of loans are appropriate to the extent that some assets are not included in the wealth tax base. Wealth taxes are typically assessed only on wealth in excess of a significant exemption amount, both to simplify administration and compliance and to limit taxation to high-wealth taxpayers on equity grounds. The base is then subject to taxation under the wealth tax rate schedule, which may specify a single or "flat" rate or may involve a progressive tax rate structure.

The wealth tax proposed by Senator Warren is an example of a tax with a relatively simple progressive rate structure, as her plan would impose a 2 percent annual tax on household wealth in excess of $50 million and a 6 percent tax (up from a 3 percent tax rate in her initial proposal) on household wealth in excess of $1 billion. The Sanders wealth tax proposal is more complex. For married couples, it would impose a tax of 1 percent on households with wealth in excess of $32 million and increase in seven one percentage point increments to a top rate of 8 percent for households with net wealth in excess of $10 billion.[3] Both proposals assume a broad wealth tax base. In this paper, we model the economic effects of the Warren proposal; however, some preliminary results suggest that the economic effects of the two plans would be roughly similar.

Interestingly, the proposed top rates under these two proposals (6 percent and 8 percent) are quite high in comparison to other wealth taxes around the world – at least in the relatively few countries that utilize such taxes. Bunn (2019) notes that of the 36 countries in the OECD, only three (Switzerland, Spain, and Norway) currently have relatively broad-based

[3] The tax thresholds for married couples under the Sanders plan are $32 million (1 percent), $50 million (2 percent), $250 million (3 percent), $500 million (4 percent), $1 billion (5 percent), $2.5 billion (6 percent), $5 billion (7 percent), and $10 billion (8 percent). These thresholds would be halved for single taxpayers.

wealth taxes, down from a high of 12 countries in 1996.[4] Specifically, Norway imposes a wealth tax at 0.15 percent at the national level plus 0.70 percent at the municipality level for a total tax rate of 0.85 percent, Spain imposes a progressive wealth tax with rates that vary from 0.2 percent to 2.5 percent but that can be adjusted by its autonomous regions (with Madrid eliminating the tax entirely), and Switzerland has wealth tax rates that vary across its 26 cantons, ranging from 0.3 percent to 1.0 percent. Brülhart et al. (2017) note that the Swiss wealth tax is imposed on the upper middle class as well as the wealthiest households, given its relatively low exemption that was roughly equivalent to $107,000 in U.S. dollars in 2011.

As discussed by the Organisation for Economic Co-operation and Development (OECD) (2018), the countries that have eliminated their wealth taxes have done so for a variety of reasons. One overarching trend cited by OECD is a general movement toward lowering tax rates on high-income earners and on capital income; for example, the average top personal income tax rate in OECD countries declined from 65.7 percent to 43.3 percent in 2016, and the average statutory corporate income tax rate declined from 47 percent in 1981 to 24 percent in 2017. More specifically, OECD notes three primary reasons cited by countries for eliminating their wealth taxes. First, governments in these countries were concerned about the efficiency costs associated with wealth taxes, especially those related to capital flight in an era of increased capital mobility and increased access of wealthy taxpayers to tax havens.[5] Second, in

[4] In addition, Belgium imposes a tax on financial securities at a flat rate of 0.15 percent, Italy imposes a tax on foreign wealth, and the Netherlands imposes a presumptive income tax on wealth in lieu of taxing capital gains under its income tax. These taxes differ considerably from the broad-based wealth taxes under discussion in the United States.

[5] For example, in 2018 France replaced its wealth tax with a property tax on high-value real estate as part of a set of measures designed to reduce the taxation of relatively mobile capital income, with the government citing the need to attract foreign investment as a primary rationale; see "Speech by Bruno LeMaire, French Ministry of the Economy and Finance," https://eaccny.com/news/chapternews/speech-by-bruno-la-maire-french-minister-of-the-economy-and-finance/.

practice net wealth taxes often failed to achieve their redistributive goals, primarily due to narrowly-defined tax bases coupled with pervasive tax avoidance and evasion which resulted in relatively low revenues, on the order of 0.2 to 1.0 percent of GDP.[6] Third, these countries were concerned about high administrative and compliance costs, especially when compared to these relatively low revenues.[7] In addition, wealth tax revenues in OECD countries have declined over time or at best remained constant, despite increasing levels of wealth since the 1970s. Kopczuk (2013) notes that the relatively low revenues obtained from wealth taxes has made their elimination less problematic from a political perspective. Finally, as discussed below, the fact that relatively low wealth tax rates are equivalent to relatively high capital income tax rates has dissuaded some countries from using wealth taxes. For example, Boadway and Pestieau (2019) note that German courts held that the combined tax burden under the German income and wealth taxes could be no more than 50 percent of taxable income, and the wealth tax was ultimately held to be unconstitutional due to its confiscatory nature.

Another critical issue is the breadth of the base of a wealth tax. A broad base is desirable on both efficiency grounds so that the tax does not bias investment toward assets that receive preferential wealth tax treatment, and on equity grounds so that the tax does not provide differential treatment of individuals who have the same amount of wealth but choose to hold it in different forms. However, as under the income tax, a broad base may be difficult

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[6] For example, Sweden repealed its wealth tax in 2007 due to concerns about widespread evasion (Henrekson and Du Rietz, 2014) and emigration of high-wealth individuals (Edwards, 2019).

[7] Rosalsky (2019) notes that the wealth tax in Austria was eliminated in large part due to the high cost of administering and enforcing the tax (https://www.npr.org/sections/money/2019/02/26/698057356/if-a-wealth-tax-is-such-a-good-idea-why-did-europe-kill-theirs).

to achieve under a U.S. wealth tax, as political factors could easily result in exemptions or preferential treatment for wealth held in the forms of closely held businesses, farm assets, housing (partly on the grounds that housing is already subject to wealth taxation in the form of local property taxes), pension assets, collectibles such as fine art and antiques, and myriad other assets.

The experience with wealth taxation in Europe is not encouraging, with many exemptions such as those listed above, coupled with full deductibility of all loans in calculating net wealth which further reduces the tax base (Brumby and Keen, 2018; OECD, 2018). Saez and Zucman (2019) provide a counter argument: because the U.S. wealth tax would apply only to net wealth in excess of $50 million, preferential treatment of assets would be politically unpopular as it would benefit only highly wealthy individuals. This argument, however, clearly discounts the political power of such wealthy individuals – which, at least in some circles, provides one of the main arguments in support of a tax on large accumulations of wealth. Moreover, as noted above, creating a wealth tax bias favoring certain assets implies differential effective tax rates across assets which in turn creates resource misallocation and causes economic inefficiencies, a problem that has arisen in the context of European wealth taxes (OECD, 2018).

III. ADMINISTRATIVE CONCERNS WITH A WEALTH TAX

Much of the debate regarding the feasibility of a wealth tax centers on whether it can be administered effectively. Perhaps the most critical issue is valuation – under a wealth tax the market value of all assets subject to tax would have to be determined annually. Assets traded on national exchanges would be easy to value, as would holdings of cash. But experience with the estate and gift tax suggests that other assets, especially closely-held businesses, intangible

assets, and collectibles such as fine art and antiques, are difficult to value and tend to be significantly under-valued; in addition, experience with the property tax suggests that accurate valuation may be problematical with real estate, including both residential and non-residential properties. Valuation problems would not be trivial – Batchelder and Kamin (2019) estimate that publicly traded assets account for only one-fifth of the taxable holdings of the top one percent of wealth holders. Valuing assets held abroad is also likely to be quite difficult. A second issue is evasion – taxpayers would have an incentive to hide assets, both domestic and foreign, and locating these assets would in many cases be quite difficult. Note that poor enforcement of a wealth tax creates its own economic distortions, as taxpayers are inefficiently encouraged to invest in assets that tend to be undervalued or hidden from the tax authorities. Finally, rules would have to be devised for the taxation of wealth held in trusts and family foundations.

The effectiveness of a wealth tax in the United States would depend on successful enforcement. Saez and Zucman (2019c) recommend increased reporting requirements for financial assets, valuing businesses using simple rules of thumb based on income or the book value of assets, and valuing artwork at its insured value. Additional resources for the aggressive enforcement by the IRS would be required, although such expenditures could be financed with some of the revenue from the wealth tax. The incremental increase in enforcement resources could be significant, as auditing the financial affairs of the very wealthy is highly complex; currently, the IRS processes about 4,000 estate and gift tax returns annually while collecting relatively little revenue. By comparison, roughly 75,000 returns would have to be processed under the Warren plan, and the analogous figure under the more sweeping Sanders plan would be 180,000 households. Moreover, these returns would have to be

processed in an environment in which the taxpayers would have sizable resources to contest valuations, challenge legal interpretations, dispute other IRS claims, etc.

Finally, a wealth tax could encourage emigration and the renouncing of U.S. citizenship by the wealthy in order to avoid the wealth tax, which would be facilitated by the fact that most other OECD countries currently do not tax wealth. Although emigration has been problematical under several European wealth taxes, it seems less likely to be an issue in the much larger and more geographically isolated United States. In addition, both the Sanders and Warren proposals recommend an exit tax to discourage such tax-induced migration, which in principle could be applied retroactively to individuals who migrated while the tax was being discussed and enacted. Enforcement of these provisions, however, might also be difficult.

Ultimately, the key issue is the fraction of the wealth tax base that would be lost to undervaluation, other forms of tax avoidance, and tax evasion. Saez and Zucman (2019b) argue that the empirical evidence suggests that a 1 percent wealth tax would reduce reported wealth by 8 percent and then assume that a 2 percent tax would result in 15 percent reduction in reported wealth. Summers and Sarin (2019) suggest that this estimate is highly optimistic, seriously underestimating tax avoidance, evasion, and the exemptions that are likely to characterize a realistic wealth tax in the United States.[8] By comparison, the authors of the Penn-Wharton Budget Model (PWBM) (2019) analysis of the Warren wealth tax proposal review the empirical evidence and conclude that it implies a tax semi-elasticity of reported

[8] Summers and Sarin (2019) argue that experience with the estate and gift tax suggests that far more wealth – on the order of 60 percent – would escape taxation; their revenue estimate for the Warren proposal is roughly $25 billion, in comparison to the Saez-Zucman (2019b) estimate of $212 billion. Saez and Zucman (2019d) argue that the Summers-Sarin estimate is far too low because it assumes that the exemptions and weak enforcement under the estate and gift tax would apply to the wealth tax. Note that the Saez-Zucman estimate implies that revenues would be roughly 1 percent of GDP – only the Swiss tax raises revenue on this scale although it imposes the tax on a much broader base including many upper middle class households, while wealth taxes raise much less in Norway (0.4 percent) and in Spain (0.2 percent) (Viard, 2019).

wealth of -13, that is, a one percent increase in the wealth tax rate is associated with a reduction in reported wealth of 13 percent, so that a flat rate 2 percent tax would reduce taxable wealth by 26 percent. In our analysis, we generally rely on the PWBM estimated wealth tax semi-elasticity. Note, however, that all of the existing empirical estimates are for relatively low rate taxes, and may not apply for taxes at rates as high as 2 and 3 percent — not to mention the 6 percent top rate envisioned under the Warren proposal or the 8 percent top rate under the Sanders plan. Indeed, the taxable income elasticity literature suggests that the sensitivity of taxpayers increases as tax rates increase, and also with income which provides the resources and often the flexibility to more effectively avoid or evade the tax. Moreover, Brülhart et al. (2017) find that the taxable wealth elasticity substantially exceeds the taxable income elasticity. Thus, avoidance and evasion are likely to create serious problems under a wealth tax, the magnitudes of which are difficult to estimate, especially for high wealth tax rates that are outside the boundaries of existing experience with the tax.

IV. ECONOMIC EFFECTS OF A WEALTH TAX

A. Effects on Saving and Investment

A primary concern about a wealth tax is its effect on saving and investment. The most direct effect operates through the reduction in wealth of the affected taxpayers, including the reduction in accumulated wealth over time. Although such a reduction in wealth is, for at least some proponents of the wealth tax, a desirable result, the associated reduction in investment and thus in the capital stock over time will have deleterious effects, reducing labor productivity and thus wage income as well as economic output. This effect would to some extent be ameliorated by increased foreign investment in the United States (which would be accompanied by an increase in the trade deficit through the balance of payments); for example,

Viard (2019) notes that the central estimate utilized by the Congressional Budget Office that 43 percent of reductions in domestic saving are offset by increased investment flows from abroad, with the range of estimates varying from 29 percent to 61 percent. The analogous figure in our model is 43 percent, very similar to the 40 percent figure used by PVBM (2019). A second offsetting effect would arise if wealth tax revenues were used for public saving or investment, e.g., in the form of reductions in the deficit and national debt, investment in public infrastructure, or investment in human capital accumulation. By comparison, this offsetting effect would not arise with expenditures on public consumption. Viard (2019, p.8) suggests that "very little of the revenue might be devoted to those purposes [public saving or investment]" and might instead be used to finance transfer programs; indeed, both the Warren and Sanders plans indicate that one of the primary ways their wealth tax revenues would be used would be to finance a new "Medicare for All" program. Our analysis follows the latter approach in assuming that wealth tax revenues are used solely to finance increases in transfer payments. Note, however, that the simulated macroeconomic effects of the wealth tax would be less negative if the revenues were instead used to finance reductions in the national debt or other public investments.

A wealth tax would also affect saving by changing the relative prices of current and future consumption. In the standard life-cycle model of household saving, a wealth tax effectively increases the price of future consumption by lowering the after-tax return to saving, creating a tax bias favoring current consumption and thus reducing saving. The magnitude of this response would depend on the sensitivity of the consumption of high-wealth individuals to such changes in relative prices, as well as the effective tax rate on saving, taking into account the potential for tax avoidance and evasion, which would reduce the effective tax rate and thus

dampen the saving response. An offsetting effect arises, however, if some saving of high-wealth individuals is motivated by a desire to leave a bequest, defined broadly to include bequests to children and other relatives as well as charitable contributions. Such motives are sometimes modeled as implying a "target bequest," that is, a bequest or a gift of a fixed magnitude determined by the taxable household.[9] In this case, by both reducing wealth and reducing the after-tax return to remaining wealth, a wealth tax actually forces additional saving, since additional wealth accumulation is required to achieve the target bequest.

Our model includes both saving motives, as households are life-cycle savers but also have a fixed target bequest. The latter ensures that savings responses to changes in after-tax returns are muted, and thus addresses the long-standing criticism that savings responses in life-cycle models are unreasonably large (for example, see Ballard (2002) and Gravelle (2002)).

However, in our view, the standard life-cycle model with a target bequest does not capture well the likely responses of high-wealth households at the very top of the lifetime income distribution to the imposition of a wealth tax for two reasons. The first is that it seems unlikely that these households would dramatically curtail their consumption in order to finance a fixed target bequest. Indeed, the opposite result seems more likely: very high-wealth households might instead roughly maintain their pre-tax levels of consumption and thus their existing standards of living and instead reduce the target bequest by the amount of wealth tax paid. Such a result would be broadly consistent with empirical evidence suggesting that the wealth elasticity of consumption is relatively low, and that the consumption spending of high-

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[9] For example, see Fullerton and Rogers (1993). Other bequest motives may also be operative, including altruism toward one's heirs, a "joy of giving" motive typically modeled by treating the bequest simply as another consumption good, or a "strategic bequest" motive, under which parents attempt to alter the behavior of their children by altering the promised bequest.

wealth households is much less sensitive to changes in income and wealth than that of low-wealth households (see, for example, Carroll, et al., 2017). Accordingly, in our analysis, we assume that in the aggregate, the target bequest is reduced by the amount of wealth tax revenue raised, so that the effects of the wealth tax on saving are limited to changes in after-tax rates of return and other general equilibrium effects.

Second, in the standard life-cycle model, a reduction in wealth will result in a reduction in demand for leisure (assuming that leisure is a normal good) and result in an increase in labor supply. Again, such a result seems unlikely for the very wealthy, whose labor supply is likely to be largely independent of the variations in wealth due to the wealth tax. Accordingly, we assume that the labor supply of the very wealthy households subject to the wealth tax is not affected by the tax, an assumption that is generally consistent with empirical evidence suggesting that income effects on labor supply are relatively small (McClelland and Mok, 2012). This is only true for the top 0.25 percent of households and relaxing this assumption has virtually no effect on aggregate estimates.

As noted above, another issue is that a wealth tax may distort the allocation of investment into assets for which enforcement is relatively poor or avoidance and evasion are relatively easy, which is likely to have a negative economic impact. For example, if tax avoidance, including under-valuation or tax evasion, is easier for collectibles or foreign investments, investments in such assets may increase at the expense of investments in the domestic private capital stock, reducing labor productivity and wages. Note that our model does not capture these differential effects as all assets are taxed uniformly – although the effective tax rate is reduced by avoidance and evasion – and thus may understate the negative effects of a wealth tax on the domestic private capital stock and wages.

Finally, we should note that the apparently low tax rates under the typical wealth tax are misleading if they are compared to income tax rates imposed on capital income, and the capital income tax rates that are analogous to wealth tax rates are often in excess of 100 percent. To see this, note that a wealth tax is imposed each year on the stock of wealth (at some specific date), rather than on the flow of the income from that stock of wealth. As a result, a relatively low wealth tax rate is equivalent to a much higher capital income tax rate. For example, with a 1 percent wealth tax and a Treasury bond earning 2 percent, the effective income tax rate associated with the wealth tax is 50 percent; with a 2 percent tax rate, the effective income tax rate increases to 100 percent. In addition, as stressed by Mitchell (2019), these calculations do not take into account the taxation of interest income under the federal income tax, which adds a second level of taxation at a top individual rate of 37 percent plus a net investment income tax of 3.8 percent, or taxation at the state level in those states that tax capital income under their personal income taxes.[10]

Moreover, Melly and Viard (2020) stress that the relatively high effective income tax rates obtained using the risk-free return on an asset such as a U.S. Treasury bill are also the relevant effective income tax rates for riskier investments that include a risk premium. The rationale underlying this argument is that in equilibrium the ex ante after-tax returns to safe investments should be equal to the ex ante after-tax returns to risky investments, and this can occur only if the tax applies solely to the safe return component of the total risky return.[11]

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[10] Recognizing this relatively high tax burden, Spain limits the combined income and wealth tax burden to 60 percent of taxable income.

[11] Our model does not consider risk and uncertainty explicitly, although it does include an equity premium. On a related point, Kopczuk (2019) notes that a wealth tax may encourage risk-taking more than the alternative of capital income taxation because the taxation of wealth effectively allows full deductibility of losses, which is often difficult to achieve under capital income taxation. On the other hand, he also argues that wealth taxation tends to shift the tax burden from economic rents to safe returns, which is undesirable on efficiency grounds.

B. Distributional Effects of the Wealth Tax

A wealth tax with a large exemption would necessarily be highly progressive as it would directly affect only households with wealth in excess of the exemption – $50 million in the case of the Warren proposal – and thus apply only to very wealthy households.[12] Saez and Zucman (2019b) estimated that the Warren proposal, which would apply tax to households with wealth in excess of $50 million, would apply to 75,000 households or approximately 0.06 percent of all households, who hold approximately 10 percent of the total net wealth held by U.S. households, which they estimate to be $94 trillion in 2019. This estimate falls squarely in the middle of the range of four estimates of total net wealth of $86 trillion to $101 trillion (in 2016) cited by Holtzblatt (2019). Saez and Zucman estimate that a $50 million exemption would exempt slightly over 90 percent of this wealth, leaving a tax base of $9.3 trillion. A flat rate 2 percent wealth tax, ignoring any tax avoidance or evasion, would thus raise about $187 billion. They also estimate that a 1 percent surtax on wealth in excess of $1 billion – which characterized Senator Warren's initial proposal – would raise an additional $25 billion from the 900 families at the top of the wealth distribution.

By comparison, Saez and Zucman (2019a) estimate that the Sanders proposal, which applies tax to households with wealth in excess of $32 million (for couples) would apply to 180,000 households or 0.15 percent of all households. They estimate the Sanders plan would raise $335 billion in 2019 under the assumption of a tax avoidance and evasion rate of 16 percent. However, the assumption that the avoidance and evasion rate would be the same under a wealth tax with rates as high as 8 percent as it would be under rates of 2 and 3 percent under

[12] Note, however, that shifting of the wealth tax might reduce wages as described above, thus reducing somewhat the progressivity of the tax.

the original Warren plan is implausible. On the other hand, with the tax semi-elasticity of -13 used by the PWBM authors, the wealth tax base of the highest wealth households would vanish entirely at a rate of 8 percent, an equally implausible result. The general point is that it is impossible to predict how much avoidance and evasion would occur under such wealth tax rates, given the lack of empirical evidence on these high-rate elasticities, attributable to the fact that no country has ever tried to impose a wealth tax at anything approaching such rates.

Since under either proposal these households would bear most of the burden of a wealth tax, it would be highly progressive. A final assessment, however, would of course depend on the general equilibrium effects of the tax, including an analysis of how the revenues were spent.

V. THE DIAMOND-ZODROW MODEL

This section provides a brief description of the model used in this analysis; for more details, see Zodrow and Diamond (2013) and Diamond and Zodrow (2015), and for the most recent parameter values used in the model, see Diamond and Zodrow (2020). The Diamond-Zodrow (DZ) model is a dynamic, overlapping generations, computable general equilibrium (CGE) model of the U.S. economy that focuses on the macroeconomic, distributional, and transitional effects of tax reforms. The model is thus well suited to simulating in considerable detail the economic effects of the implementation of the wealth taxes described above.

The DZ model is a micro-based general equilibrium model in which households act to maximize utility over their lifetimes, and firms act to maximize profits or firm value, with behavioral responses dictated by parameter values taken from the literature; these responses include changes in consumption, labor supply, and bequest behavior by households, as well as changes in the time path of investment by firms that take into account the costs of adjusting

their capital stocks. Households and firms are characterized by perfect foresight. By construction, the model tracks the responses to a tax policy change every year after its enactment and converges to a steady-state long-run equilibrium characterized by a constant growth rate. As a result, the model tracks both the short-run and long-run responses to a tax policy change.

The overlapping generations structure of the model enables us to track the effects of policy reforms across generations and across income groups within each generation, rather than simply tracking the effects of reforms in terms of broad aggregate variables, and to analyze reforms like a wealth tax that affect only specific income groups. Specifically, each generation alive at any point in time includes 12 income groups that have differing but fixed lifetime wage profiles (we do not model human capital accumulation). Households are grouped by lifetime income deciles in each generation, with the tenth decile split into the top 0.25 percent (group 12) the next 0.75 percent (group 11), and the remaining 9 percent (group 10). In the case of the Warren wealth tax plan analyzed in this paper, the $50 million exemption implies that the tax affects only a small subset of the population, specifically, households with lifetime income in approximately the top 0.12 percent, all of whom are in the top lifetime income group.

Implementation of the reform implies that these households are subject to the two-rate progressive wealth tax that characterizes the Warren plan; the reform is not anticipated. As noted above, a key factor in the analysis is the fraction of the wealth tax base that goes unreported due to tax avoidance and evasion. The PWBM (2019) approach in assuming a wealth tax semi-elasticity of -13 implies a 26 percent avoidance/evasion rate with a 2 percent wealth tax, and a 78 percent avoidance/evasion rate with a 6 percent wealth tax. However,

since the 6 percent rate is far outside the range observed empirically and is thus quite uncertain, and a 78 percent avoidance/evasion rate is extremely high, we simply assume that the average avoidance/evasion rate is 30 percent. It is also worth noting that our model does not capture the efficiency costs associated with tax avoidance/evasion behavior.

The model includes considerable detail on business taxation, including separate tax treatment of corporate and pass-through entities, separate tax treatment of owner-occupied and rental housing, and separate tax treatment of new and old capital. The model includes explicit calculation of asset values before and after the enactment of a reform, which enter into the base of the wealth tax. We also model the progressive taxation of labor income for households at different income levels, capture differential taxation of different types of capital income (although we do not model differential capital income taxes across income groups), and model government expenditures, including government transfers and a pay-as-you-go Social Security system.

The model includes four consumer/producer sectors, characterized by profit-maximizing firms and competitive markets. The goods produced by these four sectors are: (1) a composite good *C* produced by the "corporate" sector, which includes all business subject to the corporate income tax; (2) a second composite good *N* produced by the "noncorporate" sector that encompasses all pass-through entities including S corporations, partnerships, LLCs, LLPs, and sole proprietorships; (3) an owner-occupied housing good *H*; and (4) a rental housing good *R*.

The model includes a simplified treatment of international capital flows and international trade. The allocation of mobile capital is determined by relative interest rates at home and abroad, and the reduction in investment due to the introduction of a wealth tax in the

United States leads to capital inflows from abroad. Trade is assumed to satisfy a standard balance-of-payments constraint.

On the consumption side, each household has an "economic life" of 55 years, with 45 post-education working years and a fixed 10-year retirement, and makes its consumption and labor supply choices to maximize lifetime welfare subject to a lifetime budget constraint that includes personal income and other taxes as well as a fixed "target" bequest. As discussed above, households in the top lifetime income group are assumed to have fixed labor supply and to reduce their target bequest by the amount of the wealth tax. Given this model structure, there are 55 overlapping generations at each point in time in the model, and each generation includes the 12 lifetime income groups described above.

The government purchases fixed amounts of the composite goods at market prices, makes transfer payments, and pays interest on the national debt. It finances these expenditures with revenues from the corporate income tax, a progressive labor income tax, and flat-rate taxes on capital income. The model does not include public infrastructure.

All markets are assumed to be in equilibrium in all periods. The economy must begin and end in a steady-state equilibrium, with all of the key macroeconomic variables growing at the exogenous growth rate, which equals the sum of the exogenous population and productivity growth rates. Note that this is a critical assumption in that it implies that the imposition of a wealth tax cannot change the rate of economic growth in the model, which is exogenously specified. Hansson (2010) examines wealth taxes in 20 OECD countries between 1980 and 1999 and estimates that a 1 percentage point increase in the wealth tax rate reduces the economic growth rate by between 0.02 and 0.04 percentage points. Thus, a wealth tax rate in

the range of 2 to 6 percent as proposed under the Warren plan could potentially have significantly more negative medium and long terms effects than those simulated in this paper.

VI. WEALTH TAX SIMULATION RESULTS

In this section we describe the results of simulating the effects of the Warren wealth tax within the context of our computable general equilibrium model. As discussed above, the tax is imposed at a 2 percent tax on wealth in excess of $50 million, coupled with a 4 percent surtax on wealth in excess of $1 billion. We compare the macroeconomic effects of the policy change to the values that would have occurred in the absence of any changes — that is, under a current law long run scenario, which includes the permanent features of the Tax Cuts and Jobs Act enacted in 2017, including the corporate income tax rate cut to 21 percent, but does not include provisions like expensing and the personal income tax rate cuts that are currently scheduled to be phased out.

The wealth tax raises revenue equal to 1.1 percent of GDP in the first year of enactment and 1.35 percent of GDP in the long run, and is collected from households who are in the top 0.1 percent of the lifetime income distribution. The macroeconomic effects of the wealth tax are shown in Table 1. Because the wealth tax reduces the after-tax return to saving and investment and increases the cost of capital to firms, it reduces saving and investment and, over time, reduces the capital stock. Investment declines initially by 13.6 percent, then rebounds quickly, and declines by 4.7 percent in the long run. The total capital stock declines gradually to a level 3.5 percent lower ten years after enactment and 3.7 percent lower in the long run; the capital stock declines less than domestic investment because of an inflow of foreign capital in response to an increase in relative returns to capital, as described above. The smaller capital stock results in decreased labor productivity and an eventual decline in nominal

wages, although price changes imply that real wages, which decrease initially by 1.4 percent, increase by 0.2 percent after ten years, fluctuate around that level, and ultimately increase by 1.3 percent in the long run. The demand for labor falls as the capital stock declines, and the supply of labor falls as households receive larger transfer payments financed by the wealth tax revenues which result in income effects that increase the demand for leisure and thus reduce labor supply. Hours worked decrease initially by 1.1 percent and decline by 1.5 percent in the long run. Recall that our model assumes full employment so that this decline reflects a voluntary reduction in hours worked, holding the labor force constant, in response to wealth-tax-induced changes in prices and incomes. However, if instead labor hours worked per individual were held constant, the initial decline in hours worked of 1.1 percent would be equivalent to a decline in employment of approximately 1.8 million jobs initially. The declines in the capital stock and labor supply imply that GDP declines as well, by 2.2 percent 5 years after enactment and by 2.7 percent in the long run. Consumption also declines, but by less than GDP since the declines in investment are disproportionately large and the declines in the capital stock occur gradually over time. Indeed, consumption increases initially by 4.4 percent, but then declines gradually, to a decrease of 0.7 percent ten years after reform and 1.4 percent in the long run. Similar declines in consumption are observed in the four sectors, although there is also a shift from owner-occupied housing to rental housing due to the increase in relative housing demands by lower-income individuals, who consume a disproportionate share of rental housing.

Transfers increase as the revenues from the wealth tax are used to increase government transfers (other than Social Security) in proportion to existing government transfers. Transfers relative to GDP increase by 54.8 percent initially (from a ratio of 4.1 to 6.3), by 60.1 percent

ten years after reform, and by 70.8 percent in the long run. These increases are concentrated in the lower lifetime income groups, as 20 percent of the increase in transfers relative to GDP goes to the lowest income group (the bottom decile), 15 percent to the second lowest lifetime income group (the second lowest decile), and 13 percent to the third lowest lifetime income group (the third decile). This of course reflects a reduction in the wealth of the top lifetime income group, which experiences a reduction in net wealth of roughly 6.3 percent. The wealth of the fourth through ninth income deciles falls by 0.9 percent to 4.2 percent, while the wealth of the lowest three income deciles increases by roughly 19.0 percent for the lowest decile, 10.7 percent for the second lowest decile, and 1.8 percent for the third lowest decile. Based on data from the Survey of Current Finances for 2016 and the long run change in wealth from the simulation, the changes in wealth in terms of today's dollars and wealth holdings implies that the wealth per household of the highest income decile falls by roughly $3.7 million, and per household wealth of the fourth through ninth income deciles declines by roughly $440 to $49,660, while the per household wealth of the bottom three income deciles increases by roughly $100 for the lowest income decile, $500 for the second lowest decile, and $350 for the third lowest decile.

Table 1

Macroeconomic Effects of the Warren Wealth Tax

(Tax Rates of 2% and 6%, Revenue Finances Increased Transfers)

(Percentage changes in variables, relative to steady state with no wealth tax)

Variable % Change in Year:	**2020**	**2024**	**2029**	**2039**	**2069**	**LR**
GDP	0.4	-2.2	-2.5	-2.7	-2.6	-2.7
Total Consumption	4.4	0.2	-0.7	-1.3	-1.3	-1.4
Corporate Good	4.2	0.3	-0.6	-1.3	-1.2	-1.4
Noncorporate Good	4.2	0.3	-0.6	-1.3	-1.2	-1.4
Rental Housing	6.2	2.0	1.9	2.1	2.6	3.2
Owner–Occupied Housing	4.6	-0.6	-1.6	-2.3	-2.5	-2.8
Total Investment	-13.6	-8.7	-6.8	-5.4	-4.8	-4.7
Total Capital Stock	0.0	-2.3	-3.5	-4.2	-3.7	-3.7
Real Wage	-1.5	0.2	0.6	1.1	0.8	1.3
Total Employment (hours worked)	-1.1	-1.3	-1.3	-1.3	-1.4	-1.5
Transfers (non-SS) / GDP	54.8	65.1	60.1	59.1	66.5	70.8

VII. CONCLUSION

Recent proposals for the introduction of a wealth tax, especially those put forth by U.S. Senators Elizabeth Warren and Bernie Sanders, have garnered considerable attention. Proponents of a wealth tax stress that in addition to raising revenue, the wealth tax has the advantage of reducing income and wealth disparities. Opponents stress that implementing a wealth tax would face formidable administrative and compliance problems and would have

negative effects on saving and investment – problems that have resulted in many OECD countries dropping the tax, although three nations still utilize the tax. Of special concern are the relatively high tax rates under the two proposals – with top rates of 6-8 percent – which are significantly above those utilized in other countries.

In this paper, we focus on estimating the economic effects of the wealth tax proposed by Senator Warren using a computable general equilibrium model of the U.S. economy under the assumption that all revenues are used to finance increase in income transfer that accrue primarily to lower income groups. In particular, we provide an estimate of the trade-offs involved in imposing such a plan. For example, in the long run, transfers relative to GDP increase by roughly 70.1 percent (from a ratio of 4.1 to 6.9), with 48 percent of the increase in transfers going to the bottom 3 income groups, while GDP falls by roughly 2.7 percent, as a result of declines in the capital stock of roughly 3.7 percent and in hours worked of 1.5 percent, and aggregate consumption falls by 1.4 percent. Wealth held by the top lifetime income group falls by 6.3 percent. Different observers will of course have very different views as to the desirability of making these tradeoffs, but our analysis hopefully sheds some light on the debate by providing an estimate of their magnitudes.

We conclude with a few caveats. In our view, dynamic, overlapping generations computable general equilibrium models of the type used in this analysis are one of the best tools available to analyze the economic effects of tax policy changes such as the wealth tax analyzed in this study; in particular, they provide a rich structure based on fundamental economic theory that captures many of the complex and interacting effects of potential tax reforms. Nevertheless, it is clear that the estimated effects of the wealth tax presented in this report reflect the results of a particular simulation within the context of a specific computable

general equilibrium dynamic economic model. For example, as noted above, the model used in this analysis does not allow for the imposition of the wealth tax to change the rate of economic growth (although it does allow for changes in GDP relative to the steady state level). If a wealth tax reduced the long run rate of economic growth, as suggested in the empirical analysis by Hansson (2010) cited above, a wealth tax rate in the range of 2 to 6 percent as proposed under the Warren plan could potentially have significantly more negative medium and long terms effects than described in this paper. On the other hand, our analysis assumes that wealth tax revenues are used solely to finance increases in transfer payments and assumes the very wealthy reduce their bequests in response to the wealth tax; the simulated macroeconomic effects of the wealth tax would be less negative if the revenues were instead used to finance reductions in the national debt or other public investments or if we assumed the very wealthy reduced consumption rather than their bequests. More generally, the results of any study that attempts to model the effects of significant tax reforms in today's highly complex and internationally integrated economy are at best suggestive, and this report is no exception. Such results depend on the details of the reform proposed and its model representation as well as a wide variety of structural assumptions in the model and the specific model parameters utilized in simulating the model. An analysis of the sensitivity of our results to variations in model structure, model assumptions, and parameter values as well as alternative wealth taxes is the subject of ongoing research.

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This study used the Diamond-Zodrow model, a dynamic computable general equilibrium model copyrighted by Tax Policy Advisers, LLC, in which the authors have an ownership interest. The terms of this arrangement have been reviewed and approved by Rice University in accordance with its conflict of interest policies.

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