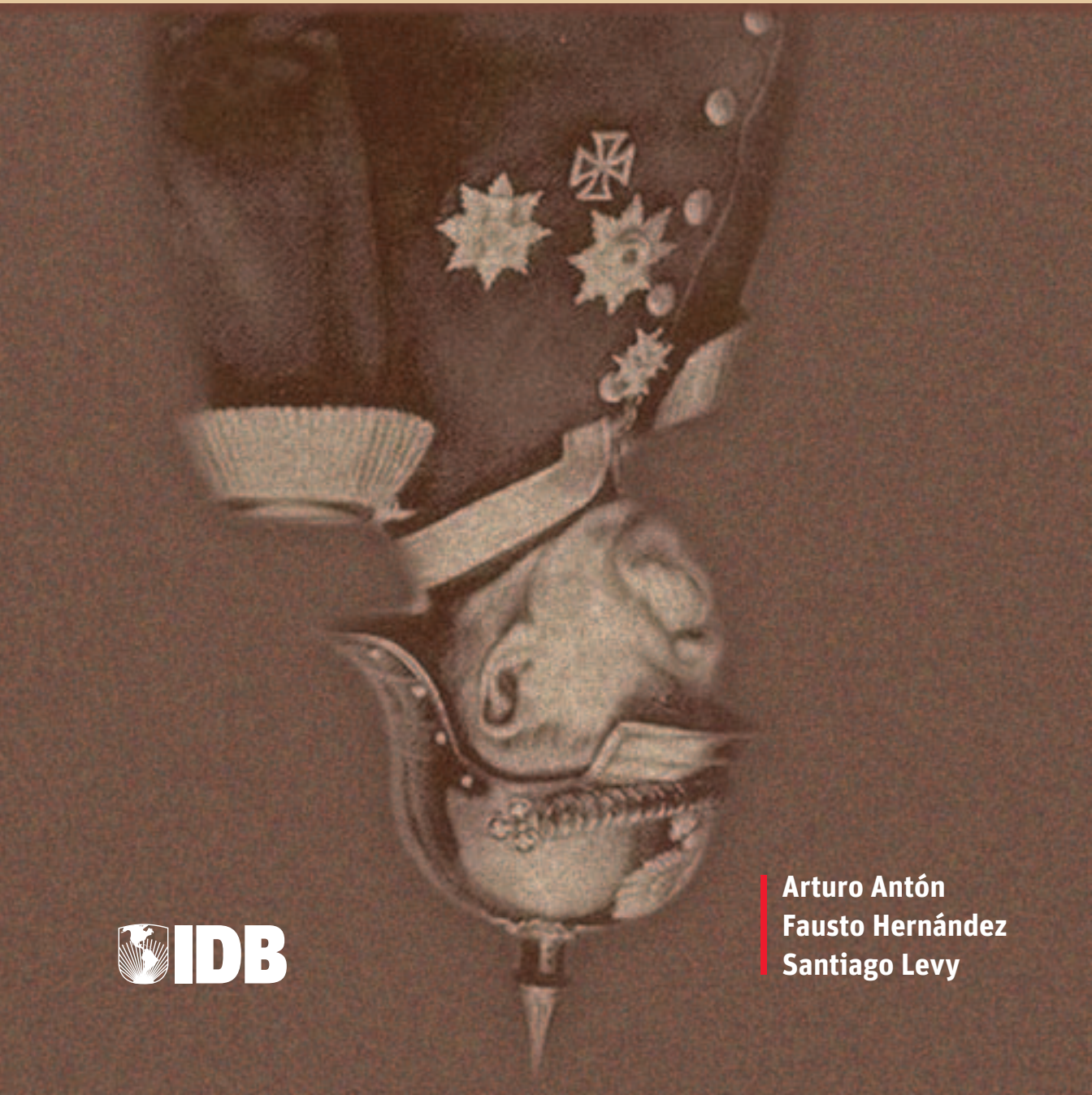
The End of Informality in Mexico?

Fiscal Reform for Universal Social Insurance



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Abstract

Mexico is characterized by a dual social insurance architecture. Firms and workers in salaried contractual relations are obligated to pay for a bundled set of health, pension and related programs. Nonsalaried workers benefit from an unbundled set of parallel programs paid by the government. We develop a model to study the implications of this architecture in a context of informality and imperfect tax enforcement. We argue that this architecture: (i) provides workers with erratic and incomplete coverage against risks, (ii) fosters evasion and narrows the tax base, (iii) delinks contributions from benefits undermining fiscal sustainability, and (iv) distorts the labor market lowering real wages and total factor productivity.

We propose a reform to shift taxation for social insurance from labor to consumption. We show that by setting a uniform value added tax rate of 16 percent it is possible to provide all workers with the same health and pension benefits and Hicks-compensate poor households for the VAT increase at a net fiscal cost of 0.34 percent of GDP. We argue that our proposal: (i) effectively protects all workers against risks, (ii) reduces distortions in the labor market stemming from social insurance tax-cum-subsidies allowing for an increase in the real wage despite the higher VAT, (iii) raises total factor productivity, (iv) helps to reduce poverty and income inequality, (v) links contributions with benefits ensuring fiscal sustainability, (vi) increases aggregate savings for retirement, and (vii) reduces evasion and widens the tax base. While the focus of the paper is on Mexico, the issues discussed have broader relevance to other countries in Latin America, which are also characterized by high informality and high tax evasion.

JEL Classification: J38; H26; O17.

Keywords: labor market informality; contributory and noncontributory social insurance; tax evasion; fiscal and social reform; pensions, health care, poverty.

CHAPTER 1

Introduction

On November 17, 1881, Germany's Emperor William the First delivered an Imperial Message to the National Parliament (Reichstag), expressing his conviction that "the healing of social wrongs must be sought not solely through the repression of social democratic excesses but just as much by positively advancing the well-being of workers". Soon after this announcement, under the leadership of his Chancellor Otto von Bismarck, the Reichstag approved the Law Concerning Health Insurance for Workers (1883), the Accident Insurance Act (1884) and the Law on Invalidity and Old Age Insurance for Workers, Journeymen and Apprentices (1889). Thus was social insurance born, the cornerstone of the modern Welfare State.

On December 1, 1940, Mexico's President Avila Camacho delivered his Inaugural Address to Congress, expressing his conviction that "we should all pursue the goal, to which I shall devote all my energies, that soon social security laws protect all Mexicans in times of adversity, when children are orphaned, when women are widowed, in sickness, unemployment and old age, to replace these hardships that we have all lived with as a result of the poverty of the nation". Soon after this announcement, in January 1943, Congress approved the country's first Social Security Law. Thus was social insurance born in Mexico.

Bismarck's social insurance model was based on a key idea: benefits for workers would be paid by the firms hiring them through an ear-marked tax (or contribution) proportional to workers' wages (initially set at 6 per cent!). As a result, the adjective contributory has been added to this model of social insurance (henceforth CSI). Why was this method of financing chosen? Two motivations stand out. The first, which we call the administrative convenience motive, is that wages can be measured more easily by the fiscal authorities than other sources of income; as a result, compliance can be exercised by auditing firms' payrolls

and by the fact that firms have a fixed location where assets can be impounded. The obligatory nature of CSI—critical from the point of view of risk pooling—can thus be enforced. The second, which we call the redistributive motive, is that it can be argued that through CSI a share of firm's profits is re-distributed to workers. These are clearly important motivations. But Bismarck's idea has a fatal flaw: by design, the coverage of social insurance is limited by the method of financing. While all workers are exposed to the risks being insured, even under full compliance only workers hired by firms and receiving payments in the form of wages are actually insured; self-employed workers and those who work with firms with nonsalaried contracts are excluded.

Administrative convenience and redistribution motivations loom large in Mexico's case because of its high income inequality and because the Mexican state has historically been characterized by its weak capacity to tax. In this context, a tax that could be collected easily and also served to reduce inequality was attractive indeed. Thus, the fatal flaw in Bismarck's social insurance model was replicated in Mexico's model. Despite President's Avila Camacho goal that "... *soon* social security laws protect *all* Mexicans...", coverage was limited to salaried workers (and their families). As a result, almost 70 years after the country's social security law was enacted, more than half of Mexican workers are still excluded. Mexico's Welfare State was born truncated, has remained so since then, and, following its current path, will remain so forever.

Nonsalaried workers represent a major challenge for social insurance (henceforth, SI). Under CSI there is no possibility of extending coverage to them precisely because they are nonsalaried.[1] But they need insurance nonetheless: they can get sick, suffer from disability, fail to save for retirement, or die suddenly as much as salaried workers can. As a result, over the last seven decades, the Mexican government has gradually created programs to provide nonsalaried workers with at least a subset of the benefits that salaried workers receive through CSI.

[1] Mexico has designed schemes to promote the affiliation of nonsalaried workers to CSI, but they have failed. In 2006 only 0.5 million out of a potential universe of 25 million of workers were enrolled in such a scheme called Voluntary Affiliation into the Obligatory Regime (Levy, 2008). They key difficulty, of course, is its voluntary nature. But even if the law obligated nonsalaried workers to enroll, there would be no enforcement mechanism since observing their earnings is difficult, and even if such earnings could be observed, collection and enforcement costs would make this prohibitive. One can tax the wage bill of a firm with 100 workers in a fixed location with relative ease, and credibly impound the firm's assets if it does not comply; it is a different matter to individually tax the earnings (out of wages? capital?) of 100 self-employed workers dispersed through many locations, and to impound assets that may be worth less than the taxes due, or the costs of collection.

These efforts began with low quality health programs (relative to those provided by CSI). However, as years have gone by, and particularly since the mid 1990s, these health programs, and new ones in pensions, day care and housing, have expanded markedly in scope, quality, budget and coverage.[2] In 2008, the government spent at least 1.25 percent of GDP subsidizing health, housing, pension and day care programs for those excluded from CSI; this contrasts with subsidies of 0.5 percent of GDP for CSI. Willy nilly, a parallel system of SI is being created in Mexico, financed from revenues other than wage taxes.[3] Following standard practice, we label this parallel system noncontributory social insurance, NCSI.[4]

Elsewhere, one of us has argued that the CSI+NCSI configuration is bad social policy and bad economic policy (Levy, 2008). It is bad social policy because, first, during their working lives workers switch between salaried and nonsalaried status. Thus, sometimes they receive SI through CSI and sometimes through NCSI: sometimes they are protected against some risks, and sometimes not; sometimes coverage is obligatory and sometimes it is voluntary.[5] And second, because CSI taxes are an ineffective redistributive tool as their incidence falls mainly on workers (the letter and intention of the social security law notwithstanding). As a result, neither the insurance nor the redistributive objectives are reached effectively. It is also bad economic policy because the CSI+NCSI configuration translates into a tax on salaried labor and a subsidy to nonsalaried labor. Firms and workers naturally react to this tax-cum-subsidy by shifting into activities that

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[2] See Levy (2008).

[3] From 1998 to 2007 subsidies for NCSI programs grew by 110 percent. In February 2006 President Fox issued a decree creating the National Council for Social Protection to "...ensure the functional integration of benefits in health, housing and savings for retirement, among others, that the federal government offers to the population lacking social security coverage"; see Levy (2008).

[4] Of course, there is no such thing as noncontributory social insurance, as benefits need to be paid by someone. More precise expressions are "social insurance contributory from wages" and "social insurance contributory from general sources of revenues". However, to avoid confusion we follow standard practice and use the contributory and noncontributory labels. Importantly, NCSI programs should not be confused with targeted programs for the poor that transfer income through various means including conditional cash transfer programs like Progresa-Oportunidades (sometimes labeled social assistance programs); NCSI programs target beneficiaries on the basis of their labor status, not income levels. Also, to avoid even more confusion we eschew the expressions "social protection" or "social safety nets".

[5] This is an inappropriate design from an insurance perspective as it reduces the scope for risk pooling, creates adverse selection problems and induces moral hazard behavior. It also seriously limits the effectiveness of retirement pensions (regardless of whether they are defined benefit or defined contribution), as workers accumulate for their pensions only during the fraction of their working lives that they have a salaried job with a firm that complies with the law.

are intensive in nonsalaried labor, and when the production technology limits this, by evading the tax on salaried labor adjusting the size of the firm, the duration of contracts, and other variables, resulting in factor misallocations that are costly from the point of view of productivity and growth (Busso, Fazio and Levy, 2012).

In this context, Levy (2008) has argued that there is a better alternative to the CSI+NCSI configuration: providing all workers with the same SI, regardless of their salaried or nonsalaried status. This can be accomplished by changing the mix of financing from the current blend of wage taxes and other sources of revenues, to a single source based on an ear-marked consumption tax. The proposal rests on a simple idea: by changing the point where SI contributions are collected from "the door of the factory" to "the door of the store", the fatal flaw of Bismarck's idea can be overcome since the second door, as opposed to the first, does not discriminate between salaried and nonsalaried workers; contributions "at the door of the store" cannot be evaded by modifying the nature of the labor contract or its duration, or the legal status of the firm.

More particularly, the proposal recognizes that because CSI taxes reduce salaried workers' wages, they basically change the composition of their consumption: workers have less free disposable income in exchange for SI benefits. Put differently, CSI taxes are equivalent to a consumption tax on salaried workers that is ear-marked for SI benefits. Two questions are relevant in this context. Why are salaried workers obligated to pay directly for their SI through lower wages, while nonsalaried workers get it from other sources of revenue? Would it not be more efficient to lower all workers' disposable income through the same mechanism—a consumption tax—, and pursue redistribution objectives through another mechanism? And while a consumption tax creates its own distortions (and can also be evaded), these are substantially less costly than those created by the combination of taxes on salaried labor and subsidies to nonsalaried labor implicit in Mexico's current CSI+NCSI model. A new SI architecture based on an ear-marked consumption tax allows the government to minimize distortions in the market for the most important nontraded input: labor. At the same time, critically, it allows the government to provide the same SI to all workers.

This paper studies a fiscal reform that changes wage-based contributions to consumption-based contributions to achieve universal social insurance, USI. In particular, we provide a quantitative evaluation of the four main aspects of Levy's proposal: to unify the differentiated structure of value added tax (VAT) rates at the level of the highest existing rate; ear-mark the additional revenues together with existing subsidies for CSI and NCSI to fund the same SI benefits for all workers; drastically reduce CSI taxes so that they only finance risks specific to salaried

status and complementary pension benefits; and compensate low-income households for the negative income effects of the VAT increase.[6]

Mexico, like other countries with a dual model of SI, is characterized by the co-existence of formal and informal economic activity, a phenomenon directly related to this dualism. Mexico is also characterized by high tax evasion. Because the interplay between formality and informality, on one hand, and legality and illegality, on the other, is of the essence to the problem at hand, we develop a model where these features are prominent (see Appendix 1). To capture the core distinction created by Bismarckian SI, we assume there are two sectors with alternative contractual relations: one where firms and workers have salaried contractual relations and the other where workers are self-employed or where firms and workers have nonsalaried contractual relations.[7] Workers are formal when they are covered by CSI and informal when they are covered by NCSI. In parallel, we assume enforcement is imperfect and focus on firm's incentives to engage in illegal behavior by evading CSI or value added taxes. In this context, firms may not enroll all their salaried workers in CSI; informal employment is thus made up of nonsalaried and illegally hired salaried workers.

A central feature of our model is that the division of employment between salaried and nonsalaried, on one hand, and between formal and informal, on the other, is endogenous to the taxes and subsidies implicit in the CSI+NCSI configuration and to the VAT. The same holds for the degree of firm compliance with value added and CSI taxes. Firms are price takers and maximize profits in the usual fashion, and as part of their maximizing strategies they may evade CSI or value added taxes. If firms evade these levies, they face an endogenous probability of being detected and fined by the relevant authority, with such probability depending positively on the firm's size in the case of VAT, and on the firm's size and level of illegal salaried employment in the case of CSI taxes. These assumptions, which reflect the institutional context of Mexico where VAT is collected by the Finance Ministry and CSI taxes by the Social Security Institute, imply that the rates of tax compliance (and thus the rates of tax evasion) are specific to each tax and firm. For example, firms may optimally choose not to pay CSI taxes on some

[6] Narro, Moctezuma and Orozco (2011) also call for a major revision of the functioning of Mexico's social security system, but do not dwell on its fiscal implications.

[7] This includes production in small family firms, production by farmers in sharecropping agreements, or agreements by firms to remunerate workers on the basis of units sold. The key point is that there are no salaried contractual relations—no subordination of a worker to a boss/firm in exchange for a wage—and therefore, according to Mexico's labor and social security laws, no obligation that workers be enrolled in CSI.

workers if the probability of detection is relatively low. In that case, firms hire some salaried workers legally and some illegally. At the same time, also depending on the probabilities of detection and on being fined, firms may also partly or fully evade the VAT, and this behavior may also affect their compliance with CSI taxes. Put differently, the VAT itself may augment informal employment. As a result, the tax base and actual revenues depend on the array of CSI+NCSI and value added taxes and subsidies, and on the extent of informality in the economy.

Our model incorporates intermediate inputs, an important feature given our focus on the VAT. Firms producing intermediate inputs can also evade taxes. Because the VAT is assumed to work via the credit method, where firms that pay VAT on an intermediate input can receive a credit only if they pay VAT on their own output, the model allows for a mechanism where informality is transmitted across the production chain, as in de Paula and Scheinkman (2010).

To capture how the economy responds to the fiscal-cum-social reform that we propose, we first focus on how evasion of CSI and value added taxes changes under different policy combinations, given the government's enforcement efforts. In doing this we stress a very important point, often missed in discussions of SI: the composition of public spending on SI is as important as the level. Higher subsidies to NCSI enlarge the size of the informal sector directly, induce more evasion, and lower total tax revenues; higher CSI taxes also induce more evasion and enlarge the informal sector, but increase total revenues. On the other hand, subsidies to CSI reduce the incentives to evade, increase formal employment and expand the tax base and total tax revenues. Differently put, in an economy characterized by the CSI+NCSI duality, the method of increasing public spending to expand the coverage of SI has large fiscal implications. Thus, our model captures the sharp trade-offs between social and economic objectives present in a dual system of SI: on one hand, attempts to complete Mexico's truncated Welfare State by expanding NCSI will have negative implications for fiscal sustainability (and for productivity); on the other, not attempting to do so would leave millions of workers with no or limited coverage of SI.

The key result of our paper is to show that these trades-offs can be avoided by moving to a model of universal social insurance. The proposed fiscal-cum-social reform yields important gains in workers' real wages and welfare, without placing an undue burden on the government's fiscal balance. In our central estimate we find that after fully compensating various groups, the fiscal deficit under USI would be 0.34 percent of GDP higher vis-à-vis the status quo. The effort needed to accommodate this figure by raising revenues or reducing expenditures elsewhere would need to be balanced against what the proposal implies: namely, by

far the most ambitious social reform in Mexico since the birth of SI in 1943, a drastic reduction of productivity-reducing distortions in the labor market, and the medium term fiscal sustainability of SI policy.

To illustrate this key result, we calibrate our model to replicate key features of Mexican data observed in 2008, including the distribution of employment by firm size and formality status, the observed levels of CSI and VAT evasion and, critically, the government's fiscal balance. We next proceed to evaluate our proposal in two stages. First, we model a fiscal reform that *simultaneously* imposes a 16 percent VAT on all goods *and* completely eliminates all CSI taxes and NCSI subsidies; second, we examine the same reform reintroducing taxes on salaried labor—but at drastically lower rates than under CSI—, to ensure that pension benefits for salaried workers are at least as generous as under CSI.

In the first stage we find that, after taking tax evasion by firms into account, a complete shift from labor to consumption taxes increases the VAT revenue/GDP ratio from 0.038 to 0.071. This large increase in revenues results from eliminating distortions in both labor and goods markets at the same time.[8] These resources more than compensate for the revenues lost by eliminating CSI taxes, and at the same time finance the extra expenditure required to sustain USI. We estimate that after the VAT increase, real wages would be 15 percent higher, as labor is allocated more efficiently when the tax on salaried labor and the subsidy to nonsalaried labor are eliminated. In parallel, the associated contraction in nonsalaried employment helps expand the tax base and therefore helps increase VAT revenues (since both tax rates and tax compliance are lower for the self-employed and for family firms). Finally, we estimate that the transition from the current CSI+NCSI to the USI model implies an increase in public spending in social insurance of 2.8 percent of GDP, as all workers receive the same health and pension benefits. Critically, this large increase in social spending can occur while labor market distortions are substantially diminished and fiscal sustainability strengthened, as opposed to what would occur if the same expansion in SI occurred by raising the benefits provided by NCSI to the level of CSI (as has been gradually happening over the last few decades).

In the second stage, to ensure that salaried workers receive at least the same pension benefits as they do under CSI, we extend our proposal

[8] The *simultaneity* of the changes in CSI and value added taxes is central to our results, in particular to the reduction of informality. As shown below, a pure increase in value added taxes, while increasing revenues, raises as well the level of informality, a result consistent with the literature; see Emran and Stiglitz (2005) and Keen (2008).

complementing the VAT-financed USI benefits for all workers with additional benefits for salaried workers paid from wage-based taxes. As a result, these latter taxes would not be completely eliminated; nevertheless, we estimate that they would fall from 32 percent of the wage under CSI to an average of 5.5 percent under our proposal. This drastic reduction in the wedge between what firms pay for salaried labor and what salaried workers earn allows for both lower labor costs and higher real wages (despite the VAT increase, as noted). This reduction in firms' labor costs is *de facto* equivalent to a real depreciation of approximately 10 percent (a result at times labeled as "fiscal devaluation").

To avoid any regressive effect of the VAT increase on the poor, we calculate the resources needed to Hicks-compensate households in the first two deciles of the distribution. When these compensations are considered, the proposal has a large and unambiguously positive effect on reducing poverty: under USI poor Mexican workers would earn a higher real wage, would be covered by the same SI as other workers, would pay no net additional taxes, and would experience the largest reduction in wage-based taxes (from 32 percent 1.5 percent). Equally importantly, our proposal would complement current efforts to combat poverty through direct income transfers, particularly those effected through the Progresa-Oportunidades program, with significant improvements in the functioning of the labor market and in poor workers' possibilities of finding more stable jobs with better prospects for productivity gains through their working lives.

Although we think these results are interesting in their own right, the focus of the paper is on the policy implications. As a result, the robustness of our numerical estimates is critical, particularly those centered on the additional revenues produced by the VAT reform. To assess this issue, we note that the core transmission mechanism in our model is the re-allocation of labor, which shifts between nonsalaried and legal and illegal salaried employment in response to changes in the VAT and CSI+NCSI taxes and subsidies.[9] In this context, we estimate the same VAT reform but maintain CSI+NCSI taxes and subsidies. As expected, in this case informal employment increases in response to the higher VAT (as firms evade more and self-employment and family firms expand), so the revenue to GDP ratio increases only from 0.038 to 0.068, as opposed to the increase to 0.071 when

[9] Throughout the paper we assume an inelastic labor supply. There is a large literature on the impact of taxes on participation rates (see, for example, OECD, 2011); on the other hand, the impact on the formal/informal and salaried/nonsalaried composition of the labor force is relatively less studied and, for Mexico, central.

CSI+NCSI taxes and subsidies are eliminated. This result highlights the importance of the simultaneous reduction in CSI+NCSI taxes and subsidies to reduce informality in the face of the VAT reform. But, more importantly for our purposes, it provides reassurance to policymakers that even if, after eliminating CSI taxes and subsidies, labor is re-allocated in the opposite direction as that predicted by our model—an overly pessimistic result contrary to theory and evidence—, the associated loss in VAT revenues is in the order of 0.3 percent of GDP.

Our proposal has implications for productivity. A growing literature focuses on policies that generate productivity losses by inducing resource misallocations.[10] In our case, misallocations arise from differences in VAT rates between sectors, differences in the price of labor depending on whether the contractual relation is salaried or nonsalaried, and differences in the expected price of salaried labor across firms of different size given that the expected costs of evasion increase with firm size. The proposal eliminates these differences, and results in better factor allocation and, in principle, productivity gains. We do not quantify these gains, but note only that our proposal would result in higher productivity. This is also a critical result because, first, lagging productivity growth is the main reason why Mexico's growth performance has been lackluster over the last decades (Levy, 2010); and second, because in Mexico the distortions implicit in the formal-informal dichotomy are associated with large total factor productivity losses (Busso, Fazio and Levy, 2012).

Bismarckian SI is the norm rather than the exception in Latin America. Many countries in the region are also characterized by large informality and high tax evasion. In parallel, in some of these countries NCSI programs are also present. One can reasonably expect such programs to expand in the years ahead as the region's governments respond to the desire for increased coverage of SI and, more generally, greater social equity. Under the current CSI+NCSI architecture, many of these countries may be expanding the coverage of SI at the cost of higher fiscal vulnerability and larger productivity-reducing distortions. Thus, while the focus of the paper is on Mexico, we believe the issues discussed here have broader relevance.

The rest of the paper is organized as follows. Section 2 contains a brief discussion of Mexican SI policies and informality. Section 3 presents relevant stylized facts on tax evasion, informality and labor mobility. Section 4 builds a simple

[10] See Gollin, 2006; Restuccia and Rogerson, 2008; Guner, Ventura and Xu, 2008; Hsieh and Klenow, 2009a, 2009b; and Leal, 2010.

model to capture the behavior described above, while data and calibration are discussed in section 5. Section 6 studies the distortionary effects of CSI+NCSI taxes and subsidies. Sections 7 and 8 present our proposal. Section 7 describes the impact of a fiscal reform to finance USI on the government's fiscal balance and worker's welfare. Section 8 addresses coverage of risks that are specific to salaried workers and complementary pension benefits. Section 9 briefly touches on the implications of our proposal for poverty and productivity. Section 10 discusses implementation issues. Section 11 concludes.

CHAPTER 2

Informality, Illegality and Social Insurance

"*Informality is a term that has the dubious distinction of combining maximum policy importance and political salience with minimal conceptual clarity and coherence in the analytical literature*" (Kanbur, 2009). In this context, we follow Kanbur and define informality with respect to the inobservance of a particular regulation. Given our focus on SI, the relevant regulation is coverage of CSI.

Our definition of informality allows us to clearly identify formal and informal workers, since at any point in time an individual worker is either enrolled in CSI or not. The same does not hold for firms, however, since at the same point of time an individual firm may enroll only a subset of its workers with CSI; thus, in this case it is better to think of a formality-informality continuum, with individual firms located in this continuum as a function of their degree of evasion of CSI taxes. The impossibility of defining firms as unambiguously formal or informal implies in turn that the formal and informal sectors cannot be measured with precision. In some general sense, however, it is clear that as the number of informal workers increases (salaried or nonsalaried), and firm evasion of CSI taxes grows, the size of the informal sector expands.

Informality and illegality are not equivalent. Even if value added and CSI taxes were perfectly enforced, there would be self-employment and family firms, and thus an informal sector as some workers would not be covered by CSI. Put differently, there would be no illegality but there would be informality. On the other hand, illegality can occur with respect to either CSI or value added taxes. Because for the reasons explained below firm's evasion of both taxes is correlated, informality and illegality will overlap. That said, firms may comply with VAT but evade CSI taxes; this is relevant in a context like Mexico's, where firms face different VAT rates depending on the good they produce and, more particularly,

because some goods are exempt from VAT. In this case, firms exhibit legality with regard to the VAT and illegality with regard to CSI taxes.

Informality is not defined by the size of firms. This is because depending on the probabilities of detection, some firms may enroll all of their workers in CSI while others may not. Of course, to the extent that these probabilities are correlated with the size of the firm, the tendency will be to find proportionately more small firms in the informal end of the formal-informal continuum, and proportionately more large firms on the other end. But note that the distribution of firms in this continuum is endogenous to the incentives they face. Put differently, the same firm may be more or less formal depending on the configuration of CSI, NCSI and value added taxes and subsidies, given enforcement.

Informality is also not equal to self-employment and or employment in family firms, precisely because some salaried workers may not be covered by CSI. Nor is informality, finally, equivalent to poverty because, on one hand, the evidence shows that some poor salaried workers are enrolled in CSI, and because, on the other, many non-poor workers are either nonsalaried or not registered by the firms that hire them with CSI. In fact, there are almost twice as many informal workers in Mexico as there are poor workers (although most poor workers are informal; see Levy, 2008).

The distinction between informality and illegality is important from the perspective of SI because in Mexico CSI and NCSI programs are not the same. Workers enrolled in CSI are obligated to purchase a bundle of benefits that cannot be separated; workers covered by NCSI can voluntarily access any of the benefits that are freely offered. As a result, only in the first case is the government assured that workers are protected against the risks that it considers relevant.[1] Indeed, if the scope and obligatory nature of CSI and NCSI programs were the same, the distinction between formality and informality would not be relevant; workers would always be covered against the same risks regardless of their salaried or nonsalaried status, and regardless of firm's behavior. On the other hand, even if this was the case, it would still be relevant if firms evaded their tax obligations. Put differently, informality is a concern from the perspective of the government's social objectives; illegality from the perspective of its fiscal objectives.

[1] Thus, only under CSI are workers forced to save for their retirement pension and forced to purchase life and disability insurance. See Levy (2008) for a fuller discussion.

CHAPTER 3

Four Relevant Stylized Facts about Mexico

3.1 Low Tax Revenues and High VAT Evasion

Mexico's tax system is strongly centralized, as approximately 96 percent of total revenues are levied and collected by the federal government (including income, value added, foreign trade and most excise taxes). In addition, the tax code is characterized by many exemptions and special regimes which, combined with imperfect enforcement, translates into a low tax to GDP ratio (Antón and Hernández, 2010; Elizondo-Mayer, 2010). In 2008 this ratio equaled 0.098 compared to a Latin American average of 0.173.

Special regimes are particularly relevant with respect to VAT. The general rate is 16 per cent (15 percent in 2008), but food and medicine are zero-taxed while other services are tax-exempted (education, cultural activities, private medical expenses, some financial services, books and magazines). Furthermore, rates at Mexico's border zones are 11 per cent (10 percent in 2008). These features, combined with high levels of evasion, resulted in a VAT to GDP ratio of 0.037 in 2008. Importantly, Antón and Hernández (2010) estimate that with the current exemptions but without evasion this ratio would equal 0.061, suggesting that in 2008 VAT evasion resulted in losses of revenue of 2.4 percent of GDP.

Special tax regimes go beyond sectors. Self-employed workers and family firms may be exempt from the VAT and income tax regime. Instead, these two taxes can be substituted by one on gross sales as long as sales are below an exogenous threshold. This regime is known as Repeco, the Spanish acronym for Régimen de Pequeños Contribuyentes (roughly, Minor Taxpayer Regime). Three features of this regime are relevant. First, it prohibits firms from issuing invoices to firms that pay taxes under the normal VAT regime. Second, firms whose sales increase beyond the exogenous threshold and thus pay taxes under the normal

value added and income tax regime cannot re-enter as Repecos even if their sales fall below the same threshold. These two features serve to, *de facto*, permanently segment firms between those that contribute as Repecos and those that contribute under the normal regime.[1] The third feature is evasion. While there are no estimates of the potential revenues that under full compliance would be collected from Repecos, it is nonetheless surprising that in 2008 total collections were only 0.0004 percent of GDP.

3.2 High Firm Informality and Skewed Size Distribution

Workers in Mexico can be enrolled in CSI only if the firm that hires them is registered with the Mexican Institute of Social Security (henceforth IMSS, for its Spanish acronym). As a result, the number of firms registered with IMSS can be used as a proxy of firm formality, even if firms do not fully pay CSI taxes. On the other hand, the Economic Census captures firms in Mexico regardless of whether they are registered with IMSS or not. That said, we note that despite its name, the Census captures only economic activity taking place in fixed establishments in urban areas; urban employment in the streets and other non-fixed locations is excluded, as is rural employment. Table 1 compares the number of establishments captured in the 2008 Census with those registered with IMSS in the same year. According to the Census, there were 3,724,019 establishments in 2008; IMSS, however, recorded only 795,466 establishments in that year.[2]

As can be seen, the discrepancy between IMSS and Census data is inversely associated with firm size (measured by the number of workers). Firm compliance with IMSS registration increases with size. On the other hand, note that 89

[1] Valero and Sánchez-Vela (2010) show that the co-existence of the Repeco and normal value added and income tax regimes introduces a discontinuity in the profit function of tax compliant firms, implying that if both regimes were fully observed there would be a range of sales volumes for which profit maximizing firms would not exist. Also note that the prohibition for firms under the Repeco regime to issue invoices to firms under the normal VAT regime implies the breakdown of the value added chain for purposes of accrediting the VAT. In particular, tax-compliant firms under the normal VAT regime will be dissuaded from purchasing intermediate inputs from firms under the Repeco regime.

[2] The correspondence between Census and IMSS data is imperfect. The unit of observation in the Census is the establishment; for IMSS it is the firm. Some firms may have more than one establishment, so the comparison may overestimate the number of unregistered firms. This problem affects mostly very large firms, as most small firms have only one establishment. On the other hand, some firms may have more than one registry in IMSS. Again, this occurs mostly for very large firms, who for accounting or tax purposes report as two or more legally separate firms (this explains why there are 2 percent more firms with 50 or more workers in the IMSS than in the Census data).

Table 1: Registries of Firms, 2008

Firm size (number of workers)	Census (number of firms)	IMSS (number of firms)	IMSS/Census (percent)	Share in Census total (percent)
1–5	3,312,092	542,064	0.16	0.89
6–10	224,086	101,231	0.45	0.06
11–50	149,968	113,458	0.76	0.04
51+	37,873	38,713	1.02	0.01
Total	3,724,019	795,466	0.21	1.00

Source: Economic Census and IMSS data.

percent of firms captured by the Census have fewer than five workers, 95 percent less than ten, and only 1 percent more than fifty. The picture that emerges from Table 1 is that of an economy characterized by a skewed size distribution of firms. On one end, there is a large number of mostly small informal firms evading or eluding CSI taxes (and by-and-large paying no VAT with perhaps a few contributing under the Repeco regime). On the other end, there is a very small number of mostly formal large establishments that comply with their CSI and value added and income taxes. In the middle, there are relatively small number of semi-formal firms partly complying with both CSI and value added and income taxes.[3]

3.3 High Informal Employment

Table 2 presents the distribution of employment by firm size and formality status in 2008. Panel A presents data on urban employment in firms included in the Economic Census. Panels B and C show, respectively, urban employment not associated with firms included in the Census and rural employment (see Appendix 2 for details of data and methodology).[4]

Various aspects are of interest. First, the Census underestimates economic activity in Mexico; in fact, it accounts for only 51 percent of all private workers (19.6 million/38.4 million). Second, even within employment captured by the

[3] Leal (2010) compares the distribution of employment by firm size in Mexico with the United States. When only employment in formal firms is compared, the two distributions overlap considerably; when employment in informal firms in Mexico is added, however, the distributions differ importantly as a result of large left tail of employment in mostly small and informal firms.
[4] The occupied labor force includes also 4.6 million public sector workers who, however, have their separate SI regime. In the reminder of the paper we focus only in non-public employment.

Table 2: Total Private Occupied Labor Force, 2008
(thousands of workers)

Firm size	Formal	Informal	Total
Panel A: Urban employment captured in Census			
1–5	596	8,174	8,770
6–10	733	981	1,714
11–50	2,731	1,060	3,791
50+	4,665	687	5,352
Total	8,725	10,902	19,629
Panel B: Urban employment not captured in Census			
Self-employment	9	4,064	4,073
2–5	213	6,015	6,228
6 +	1,517	1,403	2,920
Total	1,739	11,482	13,223
Panel C: Rural employment not captured in Census			
Distribution by size not available	283	5,354	5,638
Total	10,747	27,738	38,485

Source: Authors' calculations with Economic Census and Employment Survey data.

Census, informal employment is larger than formal (10.9 million vs. 8.7 million); in addition, note that informality is inversely related to firm size, a fact that is consistent with firm evasion of CSI taxes noted in Table 1. Third, the majority of workers not captured by the Census are informal (16.8 million out of 18.8 million in Panels B and C). All in all, 72 percent of private employment is informal, with a large share accounted by self-employed workers, or by firms with up to five workers (47 percent of all private employment). Thus, Table 2 complements Table 1 and indicates that informal employment in Mexico occurs both in firms (presumably illegal) or in establishments without a fixed location (street markets and stands), or by self-employed individuals (street vendors and the like, and rural workers).

3.4 High Mobility between Formal and Informal Employment

Lastly, Mexico's labor market is characterized by high mobility of individual workers between formal and informal status. Table 3 exploits the panel structure of

Table 3: Workers Job and Status Change, 2007–2008
(shares)

		Status in 2008				
		No job or status change	Status change, no job change	Job change, no status change	Job and status change	Total
Status in 2007	Formal	80.1	8.6	7.1	4.2	100.0
	Informal	77.3	6.0	13.5	3.2	100.0

Source: Authors' calculations based on Employment Survey data.

Mexico's employment survey to separate job and status changes between 2007 and 2008. The data are presented as a transition matrix, with the rows referring to the status of workers in 2007, and the columns to the status of the same workers one year later.

As can be seen, 80 percent of workers who were formal in 2007 kept the same job and their formal status one year later, while 20 percent changed either job or status or both. Of the latter, 8.6 percent had the same job one year later, but transited to informal status. This change, which at first sight may sound contradictory, is a reflection of firm's evasion strategies, as they register only a subset of their workers with CSI and rotate who they register.[5] An additional 7.1 percent changed jobs, but kept their formal status. This change is what is normally considered as churning, as a worker changes jobs from one formal firm to another, but with no implications for the coverage of SI. Finally, 4.2 percent changed both jobs and formality status, meaning that they changed from a job with a firm that registered them with CSI to another job with a firm that failed to register them with CSI, or to self-employment or a family firm. Similarly, 77 percent of workers who were informal in 2007 kept that status one year later; 6 percent kept the same job, but transited to formality (presumably because their firm registered them with CSI); 13 percent changed into another informal job; and 3 percent into a formal job.

[5] Levy (2008) reports that IMSS experiences about 15 million changes in worker registration a year, with a total stock of formal workers of around 13 million. Some of these registration changes reflect true hiring and firing as firms adjust employment to various shocks, but some also reflect registration rotation without any changes in the individuals working in the firm.

On average, 11 percent of all workers changed status in one year, with or without a job change. This phenomenon, which needs to be distinguished from the normal churning of a labor market, implies that 11 percent of workers transited in one year between coverage of CSI and coverage of NCSI. More generally, and over longer time spans, Mexican workers experience various episodes of CSI and NCSI coverage during their working life, with the associated implications for the coverage of risks at the individual level, risk pooling at the aggregate level, and the accumulation of savings for retirement at both individual and aggregate levels.[6]

[6] Levy (2008) uses the IMSS records to construct a panel data of all workers registered in IMSS in 1997 and follows them over the 1997–2006 period, dividing workers between those earning high and low wages (more or less than three times the minimum wages). He finds that high wage workers spent 77 percent of that decade in formal jobs, compared to 49 percent for low wage workers. He also finds greater frequency of entry and exit from formality for low wage workers than for high wage workers. These results are consistent with data of contribution densities to individual retirement accounts, which in the same period averaged about 45 percent, and which were lower for low wage workers.

CHAPTER 4

The Model

We model an economy with special tax regimes, imperfect enforcement and a dual system of SI. Here we only describe the features needed to interpret our empirical results; Appendix 1 gives further details and derivations. The economy produces two intermediate and two final goods. Intermediate goods I_1 and I_2 are produced with capital and labor by firms and workers in salaried contractual relations. Workers receive CSI benefits when firms comply with the law; they receive NCSI benefits if firms do not. I_1 and I_2 are aggregated into a final consumption good A, which for simplicity is produced only with intermediate inputs. The second consumption good, B, is produced without intermediate inputs by self-employed workers, or by workers in family firms with nonsalaried contractual relations, receiving NCSI. Value added from A, B and intermediate goods I_1 and I_2 makes up total GDP. We focus attention on the labor market and assume the economy is small and open to world markets, so producer prices p_1, p_2 and p_B are given by the world market.[1]

Firms producing I_1, I_2 and A are legally required to pay income and value added taxes under the regular regime, though they may partly evade these obligations.[2] VAT rates for I_1 and I_2 differ. I_1 is assumed to be exempt (as is currently

[1] Prices are normalized such that $p_1 + p_2 + p_B = 1$, and the model satisfies the usual condition of homogeneity of degree zero (one) of all real (nominal) variables. The price of A follows from p_1 and p_2; see equation (20). One could also treat good B as nontraded. This considerably complicates the model without much additional insight. As discussed in Appendix 1, a negatively-sloped demand curve for B would partly offset the labor re-allocations produced by changes in taxes and subsidies as p_B responds to changes in employment in this sector.

[2] Income taxes are included here to capture the fact that as the tax base changes revenues from corporate income taxes change as well. But the corporate income tax does not affect behavior, and we ignore personal income taxes.

Table 4: Taxes and Subsidies on Goods and Factors

Goods	Income tax	VAT	Labor	
			Formal	Informal
I_1	τ^{IT}	τ_1^{VAT}	τ^{CSI}	$(-)\tau^{NCSI}$
I_2	τ^{IT}	τ_2^{VAT}	τ^{CSI}	$(-)\tau^{NCSI}$
A	τ^{IT}	$\tau_A^{VAT} = \gamma\tau_1^{VAT} + (1-\gamma)\tau_2^{VAT}$	n.a.	n.a.
B	0	0	0	$(-)\tau^{NCSI}$

Source: Authors.

Notes: All taxes and subsidies expressed as rates, except for τ^{NCSI} which is expressed per worker (see discussion below). γ is the share of VAT exempt goods in good A; n.a. = not applicable.

the case with food, medicine and the like). I_2 (all other goods) pays VAT at the rate of 15 percent. Firms producing I_1 and I_2 pay CSI taxes when they hire workers legally (and implicitly receive a subsidy from NCSI when they hire workers illegally; see below). Workers producing good B are nonsalaried and thus pay no CSI taxes (and receive the same implicit subsidy from NCSI as illegally hired salaried workers). Production of B is assumed to be subject to the Repeco regime. However, since this regime is practically unenforceable, we assume for simplicity that sector B faces no tax.[3] In what follows we refer to sectors (I_1, I_2, A) as the taxed sector of the economy (although evasion can occur), and B as the non-taxed sector. Table 4 summarizes this information and introduces notation on taxes and subsidies.

4.1 The Intermediate Goods Sector

Intermediate goods, indexed by z = 1,2, are produced by a large number of firms in each sector. Firms behave in a competitive fashion selling their output to sector A at the price p_z, and produce it with constant returns to scale technology:

$$I_z = I_z(K_z, L_z) \tag{1}$$

[3] Enforcement of the Repeco is left to state governments, as opposed to enforcement of the regular income and VAT regime for the rest of the economy (in our model, firms producing I_1, I_2 and A), which falls on the federal government. States have few incentives to collect given high enforcement costs, non-credible sanction mechanisms and the fact that revenue-sharing formulas provide them with large transfers from the federal government. Thus, to simplify we treat sector B as non-taxed. We would get basically the same results if we treated it as taxed but with lower probabilities of detection than in sectors (I_1, I_2, A), but with little additional insight.

Capital per firm K_z is given, so the representative firm makes positive profits in equilibrium.[4] K_z is continuous and distributed among firms according to a distribution function $F(K_z)$, with support $k_z = [\underline{K}_z, \overline{K}_z]$. The corresponding density is denoted by $f(K_z)$. Capital endowment in the economy is given by $\overline{K}$. Since good B is only produced with labor, the economy's capital resource constraint is:

$$\int_{\underline{K}_1}^{\overline{K}_1} K_1 f(K_1) dK_1 + \int_{\underline{K}_2}^{\overline{K}_2} K_2 f(K_2) dK_2 = \overline{K} \tag{2}$$

Firms make two critical decisions: how many salaried workers to hire, and the optimal combination of legal and illegal workers. The firm's total labor input, L_z, is:

$$L_z = L_{fz} + L_{iz} \tag{3}$$

where L_{fz} and L_{iz} refer to legally and illegally hired workers, respectively. In this case this corresponds to formal and informal workers. If firms hire workers formally, they pay the formal wage, w_f, and CSI taxes (expressed as a proportion of the wage). Note, however, that in Mexico a share of CSI taxes is paid by the government, denoted $\theta \in [0,1]$.[5] Thus:

$$\text{Unit cost of legally hired salaried workers} = w_f[1+(1-\theta)\tau^{CSI}]. \tag{4}$$

On the other hand, informal labor occurs precisely because CSI taxes are evaded, so labor costs are simply given by the informal wage rate w_i. However, if a firm evades CSI taxes, there is an endogenous probability $\lambda_z^{CSI}(L_{iz}, K_z)$ that it will be discovered by the authority (Levy, 2008). This probability is proportional to firm's size as measured by both the amount of informal labor employed and the firm's capital. For example, if relatively little labor is required to conduct business, the probability that such firm is discovered evading CSI taxes is near zero, and the firm will hire mostly informal workers. In contrast, if conducting business requires hiring many workers, the firm will have an incentive to hire mostly formal workers as the probability of being discovered evading by the authority

[4] Alternatively, K_z may be interpreted as entrepreneurial ability as in Lucas (1978).

[5] This reflects the "tripartite" nature of CSI (with contributions from firms, workers and the government). In particular, the government subsidizes the health, life and disability insurance and retirement pension components of CSI. All in all, 16 percent of CSI taxes are paid by the government; see Appendix 2.

is high. The probability of detection $\lambda_z^{CSI}(L_{iz}, K_z)$ is assumed to increase in both arguments. In general, firms will demand both formal and informal workers, but larger firms will demand relatively more formal workers.

Following Mexico's social security law, firms caught cheating must pay CSI taxes due on illegally hired workers, times a penalty $\sigma^{CSI} > 1$ to dissuade them from evading. Thus:

$$\text{Expected unit cost of illegally hired salaried workers} = w_i + \lambda_z^{CSI}(.)\phi \qquad (5)$$

where $\phi \equiv [\sigma^{CSI}(1-\theta)\tau^{CSI}w_i]$. Importantly, this cost increases with the number of illegally hired workers.

Firms must also pay income and value-added taxes. As with CSI taxes, firms have an incentive to evade and face a probability $\lambda_z^{VAT}(K_z)$ of being detected by the authority, which is assumed to be an increasing function of the physical capital K_z of the firm.[6] In turn, if a firm is detected, it must cover the amount of taxes evaded times a penalty $\sigma^{VAT} > 1$. Thus the expected VAT payment for a firm of size K_z is $\sigma^{VAT}\tau_z^{VAT}\lambda_z^{VAT}(K_z)VA(K_z)$, where $VA(K_z)$ denotes value added. Similarly, the corresponding expected income tax payment is $\sigma^{IT}\tau^{IT}\lambda_z^{IT}\left(K_z\right)\prod\left(K_z\right)$, where $\prod\left(K_z\right)$ is the gross profit for a firm of capital size K_z.

We define the rate of VAT compliance, $\xi_z^{VAT}(K_z) \in [0,1]$, as the ratio of a firm's expected VAT payment over the VAT that would be paid under full observance of the law:

$$\xi_z^{VAT}(K_z) = \frac{\min\{\sigma^{VAT}\tau_z^{VAT}\lambda_z^{VAT}(K_z)VA(K_z), \tau_z^{VAT}VA(K_z)\}}{\tau_z^{VAT}VA(K_z)} \qquad (6)$$

Calculating a similar ratio for income taxes, we find that for a firm of size K_z the *effective tax rates* are $\tau_z^{VAT}\xi_z^{VAT}(K_z)$ and $\tau^{IT}\xi_z^{IT}(K_z)$.

We are now ready to define the problem of a representative firm in the intermediate goods sector. For given capital K_z, a firm must choose the amount of formal and informal labor, $\{L_{fz}, L_{iz}\}$, to maximize expected profits:

$$Max \prod_z = [1-\tau^{IT}\xi_z^{IT}(K_z)]\{[1-\tau_z^{VAT}\xi_z^{VAT}(K_z)]p_z I_z[K_z, (L_{fz}+L_{iz})] \qquad (7)$$
$$-[1+(1-\theta)\tau^{CSI}]w_f L_{fz} - [w_i + \phi\lambda_z^{CSI}(L_{iz}, K_z)]L_{iz}\}$$

[6] This assumption reflects the fact that in Mexico collections of CSI taxes and value-added/income taxes are performed by different government agencies. However, the fact that both probabilities of detection depend on the amount of capital implies a correlation between them.

The solution is a pair of demand functions for formal and informal labor of the form:

$$L_{fz} = L_{fz}[K_z, p_z; \tau_z^{VAT}, \tau^{CSI}, \theta; w_f(\tau^{CSI}, \tau^{NCSI}), w_i(\tau^{CSI}, \tau^{NCSI})] \tag{8}$$

$$L_{iz} = L_{iz}[K_z, p_z; \tau_z^{VAT}, \tau^{CSI}, \theta; w_f(\tau^{CSI}, \tau^{NCSI}), w_i(\tau^{CSI}, \tau^{NCSI})] \tag{9}$$

Equations (8) and (9) are very important. They capture how firms combine formal and informal (illegal) salaried labor in a context of evasion. As expected, demand for both types of labor increases with output price and decreases with the VAT rate, as the net price received by firms falls (for a given level of evasion). However, given output price and VAT rates and the government's enforcement efforts, the composition of the firm's labor demand depends on CSI and NCSI taxes and subsidies, as firms optimally mix formal and informal workers. Higher CSI taxes increase the price of formal vs. informal labor and induce firms to hire more informal workers. Conversely, higher subsidies for CSI, θ, lower the relative price of formal vs. informal labor and induce more formal hiring. On the other hand, individual firms take wage rates for formal and informal labor as given. However, as elaborated below, these wage rates depend on the level of CSI and NCSI benefits, and on how workers value those benefits. Thus, even though NCSI benefits do not appear directly in the firm's labor demand functions (8) and (9), they do so indirectly through their effect on wages. As a result, the level and composition of firms' labor demands depends on the dual structure of SI.

We next define the *aggregate* rate of tax compliance in the intermediate goods sector, $\hat{\xi}_z^{VAT} \in [0,1]$, as total revenue collected over potential revenue (if all firms fully complied with their tax obligations):

$$\hat{\xi}_z^{VAT} = \frac{\tau_z^{VAT} \int_{\underline{K}_z}^{\overline{K}_z} \xi_z^{VAT}(K_z) VA(K_z) f(K_z) dK_z}{\tau_z^{VAT} \int_{\underline{K}_z}^{\overline{K}_z} VA(K_z) f(K_z) dK_z} \tag{10}$$

A similar expression applies to income taxes.

The aggregate compliance rate determines the extent to which the VAT impacts intermediate goods prices. In particular, the "VAT included" prices of I_1 and I_2 are:

$$\tilde{p}_z = p_z(1+\tau_z^{VAT}\hat{\xi}_z^{VAT}) \tag{11}$$

reflecting the fact that under imperfect compliance the VAT is not fully transmitted to prices.

4.2 The Final Good A Sector

This sector is composed of a large number of representative firms that behave in a competitive fashion. Firms use intermediate goods I_1 and I_2 to produce A, and must pay income and value-added taxes. Firms can also evade and, as before, ξ_A^{VAT} and ξ_A^{IT} are the rates of compliance with each tax, which are assumed to be a weighted average of the corresponding aggregate rates of compliance in the intermediate goods sector. Thus, the tax rates effectively paid by firms in the final sector are $\tau_A^{VAT}\xi_A^{VAT}$ and $\tau^{IT}\xi_A^{IT}$.

VAT in Mexico is collected by the credit method: the tax applies to each sale, and firms in the final good sector receive a credit for the VAT paid in the previous stage of production. Hence if the cost of the intermediate good (before taxes) is $p_z I_z$, the firm in the final good sector receives a tax credit of $\tau_z^{VAT}\hat{\xi}_z^{VAT}p_z I_z$. As a result, tax evasion by firms in the intermediate sector implies a trade-off for firms in the final sector. On one hand, a lower rate of compliance (that is, higher evasion) in the intermediate sector implies that taxes effectively paid by firms in the final sector are lower. On the other, lower compliance rates in the intermediate sector translate into lower tax credit claims by final sector firms. In the extreme case where tax evasion in the intermediate sector is zero, the rate of compliance in the final sector is one and, in principle, these firms have the right to a full tax claim (unless final firms understate sales to reduce VAT payments in the last phase of the value added chain). Thus, the intermediate-final good structure of our model gives place to a transmission mechanism of tax evasion between sectors, as in de Paula and Scheinkman (2010). Since tax credits cannot be generated from informal suppliers and tax payments from formal suppliers cannot be used by informal buyers, there is an incentive for informal firms to conduct business with other informal firms. This scheme thus predicts that tax evasion of a firm in the final good sector is correlated to the tax evasion of firms from which it buys intermediate goods.[7]

[7] De Paula and Sheinkman (2010) present empirical evidence for Brazil supporting this idea, labeled by them as "chain effects". In Table 13 we illustrate that these effects are quantitatively relevant for Mexico.

In such context, the problem of a representative firm in the final good sector is to choose intermediate goods $\{I_1, I_2\}$ to maximize expected profits:

$$Max \prod_A = (1-\tau^{IT}\xi_A^{IT})\{(1-\tau_A^{VAT}\xi_A^{VAT})p_A A(I_1,I_2) - \sum_{z=1}^{2}(1-\tau_z^{VAT}\hat{\xi}_z^{VAT})p_z I_z\} \quad (12)$$

taking prices $\{p_1, p_2\}$, tax rates $\{\tau^{IT}, \tau_1^{VAT}, \tau_2^{VAT}\}$, and rates of compliance by firms in the intermediate sector $\{\hat{\xi}_z^{VAT}, \hat{\xi}_z^{IT}\}_{z=1,2}$ as given.[8] The solution is a pair of demand functions for I_1 and I_2, whose proportions will depend on relative prices and the substitution possibilities allowed by the technology. Appendix 1 shows that when this function takes the standard CES form, these proportions are:

$$\frac{I_1}{I_2} = [(\frac{\gamma}{1-\gamma})(\frac{1-\tau_1^{VAT}\hat{\xi}_1^{VAT}}{1-\tau_2^{VAT}\hat{\xi}_2^{VAT}})(\frac{p_1}{p_2})]^{1/(1-\mu)} \quad (13)$$

where γ and μ are parameters of the production function.

This expression indicates that the relative sizes of the two intermediate good sectors are affected by the degree of compliance with the VAT in each sector, as well as by the existence of differentiated VAT rates. In particular, since $\tau_1^{VAT} = 0$ as a result of the exemption given to food, medicine and related necessities, there is an underlying distortion that negatively affects the size of the non-exempt sector. This is an important observation, as the fiscal reform contemplated in Section 7 consists precisely in eliminating this exemption.

4.3 The Final Good B Sector

This sector captures economic activity by self-employed workers and workers in family firms. The key aspect, of course, is that these workers are not obligated to enroll in CSI. The cost of labor is simply the informal wage w_i:

$$\text{Unit cost of nonsalaried labor} = w_i \quad (14)$$

Sector B faces the special Repeco tax regime. However, as noted, high enforcement costs and non-credible sanction mechanisms imply that in practice such

[8] When evasion rates are zero ($\hat{\xi}_z^{VAT} = \hat{\xi}_z^{IT} = 1$ for all z) and VAT rates are identical, the profit function is

$$Max \prod_A = (1-\tau^{IT})\{(1-\tau^{VAT})p_A A(I_1,I_2) - \sum_{z=1}^{2} p_z I_z\},$$

as expected in an economy with no evasion.

economic activity is not taxed. As a result, the relationship between establishment size and evasion is not central here, and little is lost by treating this sector as consisting of many identical establishments where output is produced only with labor, L_B, which is sold only to final consumers at the exogenous price p_B.[9] The production function, $B = B(L_B)$, is assumed to have decreasing returns to scale. Thus, the profit function is simply $Max \prod_B = p_B B(L_B) - w_i L_B$. This leads to a demand for nonsalaried labor of the form:

$$L_B = L_B[p_B; w_i(\tau^{CSI}, \tau^{NCSI})] \tag{15}$$

Equation (15) is very important. Notice that, as with the demands for legal and illegal salaried labor in equations (8) and (9), L_B depends on CSI and NCSI taxes and subsidies. Of course, self-employed workers and family firms do not directly pay for either τ^{CSI} or τ^{NCSI}; but this fact does not invalidate the more important fact that, as discussed immediately below, wage rates are determined in the labor market, where these taxes and subsidies play a prominent role.

4.4 Social Insurance, Wage Rates and the Labor Market

Equations (8), (9) and (15) determine the demand side of the market for labor. Assuming an inelastic labor supply $\bar{L}$, equilibrium in the labor market is given by:

$$\int_{\underline{K}_1}^{\bar{K}_1} L_{f1} f(K_1) dK_1 + \int_{\underline{K}_2}^{\bar{K}_2} L_{f2} f(K_2) dK_2 + \int_{\underline{K}_1}^{\bar{K}_1} L_{i1} f(K_1) dK_1 + \int_{\underline{K}_2}^{\bar{K}_2} L_{i2} f(K_2) dK_2 + L_B = \bar{L} \tag{16}$$

The first two terms are firms' demand for legal salaried labor given by (8); the next two terms are firms' demand for illegal salaried labor given by (9); the

[9] This is true only as long as sales by self-employed workers or family firms do not exceed the threshold established to qualify for Repeco (or else taxation would occur under the normal VAT/income tax regime). Our model fails to capture this discontinuity; see Valero and Sánchez (2010) for a proper treatment. The assumption that good B requires no intermediate inputs is not innocuous. If good B required I_1 and I_2 as intermediates, a VAT reform like the one we consider below would also serve to indirectly tax sector B, as input prices would increase without firms having the possibility of crediting the higher VAT on inputs since they are in the Repeco regime (or, more likely, are not registered and pay no taxes at all). Thus, the combination of either high evasion and/or the Repeco regime implies that the VAT is not fully a tax on final consumption, and a higher VAT through this channel would serve to tax the informal sector. This important point is emphasized by Keen (2008).

fifth term, lastly, is the demand for nonsalaried labor given by (15). In turn, formal employment (henceforth denoted as L_f) is given by the first two terms, while informal employment (henceforth L_i) is given by the next three, comprised of illegal salaried employment and legal nonsalaried employment.

When salaried workers are formally employed they are paid the formal wage and receive the benefits of CSI; when they are informally employed (either as illegally hired salaried workers or as nonsalaried workers), they are paid the informal wage and receive the benefits of NCSI. As opposed to CSI, the benefits of NCSI are expressed as a monetary value which is simply the amount that the government spends in SI benefits per informal worker. Thus the utility of formal and informal employment are:[10]

$$U_f = w_f(1+\beta^{CSI}\tau^{CSI}) \tag{17}$$

$$U_i = w_i + \beta^{NCSI}\tau^{NCSI} \tag{18}$$

Parameters $\beta^{CSI}, \beta^{NCSI} \in [0,1]$ capture the value that workers give to SI benefits. They represent the benefit side of SI taxes and subsidies, in the understanding that from the point of view of workers' behavior what matters is how they perceive these benefits. Thus, the fact that CSI benefits are bundled while NCSI benefits are unbundled is important. In the first case workers are forced to consume a basket of goods and services of fixed composition. In the second workers are given the option to consume any combination of benefits. Further, matters of quality and access to service are key (particularly for health care), as are workers perceptions of the value of contingent benefits (like death or disability insurance) or benefits that accrue in the long run (like savings for retirement).[11]

Table 5 pulls together the information of firms and workers, and contrasts the unit cost of labor on the basis of the labor contracts as given by (4), (5) and (14), on one hand, with the value of those contracts to workers as given by (17) and (18), on the other.

[10] We could separate the utility of informal employment between that of salaried and nonsalaried employment, and assume nonsalaried workers also derive utility from not having a boss, having flexible working hours, and so on; see Maloney (1999, 2004). As long as these factors are invariant to wage rates and the benefits of SI, they do not matter for our analysis, and to avoid cluttering the notation we ignore them here.

[11] See Levy (2008) for further discussion.

Table 5: Costs and Benefits of Labor Contracts

Labor contract	Firms pay	Workers receive	Implicit tax/subsidy
Legal salaried (formal)	$w_f[1+(1-\theta)\tau^{CSI}]$	$w_f(1+\beta^{CSI}\tau^{CSI})$	$1-(\beta^{CSI}+\theta)$
Illegal salaried (informal)	$w_i+\phi\lambda_z{}^{CSI}(.)$	$w_i+\beta^{NCSI}\tau^{NCSI}$	$\phi\lambda_z{}^{CSI}(.)-\beta^{NCSI}\tau^{NCSI}$
Nonsalaried (informal)	w_i	$w_i+\beta^{NCSI}\tau^{NCSI}$	$-\beta^{NCSI}\tau^{NCSI}$

Source: Authors.

The last column of Table 5 highlights the structure of taxes and subsidies to different labor contracts implicit in the CSI+NCSI configuration. When $(\beta^{CSI}+\theta)<1$, formal labor is subject to a "pure" tax, which arises because workers do not fully value the benefits of CSI on a peso-by-peso basis. As a result, firms pay more for labor than what workers receive (despite the fact that CSI is partly subsidized by the government). On the other hand, in a context in which enforcement of CSI taxes is imperfect, illegal salaried labor is implicitly subsidized by NCSI. Moreover, this subsidy is inversely proportional to firm size, as smaller firms face lower probabilities of detection than larger ones. Finally, nonsalaried labor is unambiguously subsidized by NCSI. Note that the implicit subsidy to informal employment is larger for nonsalaried vs. salaried labor given that self-employed workers and family firms are not obligated to pay CSI taxes at all, with the difference between the two narrowing as firm size falls (given falling detection costs).[12] It is natural to expect that a tax-cum-subsidy structure that depends on the size of the firms and the type of labor contract will bias the size distribution of firms towards smaller firms, and the distribution of workers towards nonsalaried and illegal salaried contracts. These biases are consistent with the size distribution of firms and the composition of employment presented in Tables 1 and 2.

A critical question is how CSI+NCSI tax-cum-subsidies impact the labor market. If this market was fully segmented, with no possibility for formal workers to obtain informal jobs, and no possibility for informal workers to obtain formal jobs, these taxes and subsidies would separately impact the formal and the informal wage. For instance, a decrease in CSI taxes would increase firms' demand for formal workers. Under complete segmentation, informal workers could not become

[12] Figure 2 in Section 7 maps the precise shape of these taxes and subsidies.

formal because there are barriers to entry into formality; as a result, the formal wage would increase, but the informal wage would not change. Similarly, an increase in NCSI benefits would increase the utility of workers who are self-employed, work in a family firm or are illegally hired, but firms would not be able to change the composition of their work force in favor of more illegal workers, nor would it induce any salaried workers to enter self-employment or start a family firm, because there are barriers to entry into informal employment. As a result, the formal wage would remain invariant.

The empirical evidence for Mexico does not support the hypothesis of a completely segmented labor market, with no transits of individual workers between formal and informal status. On the contrary, large formal-informal mobility has been extensively documented.[13] A key implication is that formal and informal wage rates cannot be determined by two independent mechanisms. On the contrary, one expects that as τ^{CSI} increases the demand for formal labor will fall, increasing the supply of labor to the informal sector and putting downward pressure on the informal wage. Conversely, one expects that a higher τ^{NCSI} will stimulate the supply of labor to the informal sector, putting upward pressure on the formal wage.

In fact, as shown in Section 6, and in accordance with the available empirical evidence for Mexico, CSI taxes are not fully shifted to formal workers, implying in turn that firms adjust employment as a response to higher labor costs, or that $\partial L_f / \partial \tau^{CSI} < 0$.[14] On the other hand, more recent evidence shows that for individual programs that comprise τ^{NCSI} it is the case that $\partial L_i / \partial \tau^{NCSI} > 0$.[15] Here we take advantage of these results, and of the observed large mobility of workers between

[13] See Maloney (1999, 2004), Gong, Soest and Villagomez (2004), Navarro and Schrimpf (2004) and Calderon-Madrid (2000, 2006). These studies exploit the panel structure of Mexico's employment survey, allowing them to follow individual worker transitions between formal and informal status, finding that in any given year between 10 to 15 percent of workers change labor status; see also Table 3. Levy (2008) uses the social security registries to follow individual workers over a ten year period and finds high mobility between the formal and the informal sector. Duval and Smith (2010) test the hypothesis of segmentation in Mexico's labor market and find that when public sector employment is excluded and segmentation is measured as the share of informal salaried workers unable to find a formal salaried job at any wage, less than 27 percent of informal workers are rationed from formal jobs. Bell (1997) and Maloney and Nunez-Mendez (2004), on the other hand, provide evidence that the minimum wage is not binding; Duval and Smith (2010) find that 99 percent of informal workers have a reservation wage higher than the minimum wage.

[14] See Marrufo (2010), Heckman and Pages (2004) and Kugler (2011).

[15] The available evidence refers to individual NCSI programs, as opposed to CSI programs which almost always are legislated and their effects captured under a single statutory rate τ^{CSI}.

formal and informal status, to assume that worker's utilities are equalized across forms of employment. Given (17) and (18), this implies a relationship between w_f and w_i of the form:[16]

$$w_i = w_f(1+\beta^{CSI}\tau^{CSI}) - \beta^{NCSI}\tau^{NCSI} \tag{19}$$

Given this relationship, one can use condition (16) in the labor market to find the equilibrium formal and informal wage rates that are consistent with firm's and worker's decisions, given value added, income and CSI and NCSI taxes and subsidies, and the government's enforcement efforts.

It is useful, finally, to introduce an index of the real wage. In Appendix 1 we show that the "VAT included" price of good A is:

$$\tilde{p}_A = \left[\left(\frac{\tilde{p}_1^{\mu}}{\gamma}\right)^{\frac{1}{\mu-1}} + \left(\frac{\tilde{p}_2^{\mu}}{1-\gamma}\right)^{\frac{1}{\mu-1}}\right]^{\frac{\mu-1}{\mu}} \tag{20}$$

Juárez (2009) finds that a health program for female workers in Mexico City increases the probability of informal employment for those with low education and decreases informal wages. Galiani and Gertler (2009) find that a pension program for adults over 70 years of age lowers participation in salaried employment for workers close to retirement age. For a health program for informal workers introduced in 2002 known as Seguro Popular, studies by Barros (2009), Gallardo-García (2006) and Campos-Vázquez and Knox (2010) find no impact on informal employment. However, recent evidence points to positive effects on informal employment or a decrease in the share of formal employment, although the magnitude varies depending on the data used; see Azuara and Marinescu (2011), Duval and Smith (2011) and Aterido, Hallward-Driemer and Pages (2011). Bosch and Campos (2010) find decreases in formal employment and in the share of formal employment, and Bosch and Cobacho (2011) find decreases in formal employment for young workers in small firms. Pérez-Estrada (2011) finds decreases in formal employment and a decrease in informal wages. See Bosch, Cobacho and Pages (2012) for a survey. To the best of our knowledge, however, there are no studies of the joint effects of all NCSI programs on L_i (which conceptually is what one should measure, and for which we present some estimates in Section 6).

16 The assumption of utility equalization simplifies the math, but is not essential. One can posit as well that for some unspecified reason there is a utility differential across sectors such that $U_f - U_i = \kappa > 0$. Then a variant of (19) is

$$\Delta L^{fi} = \kappa\left[\frac{U_f / U_i}{U_f^o / U_i^o}\right]^{\eta} - \kappa,$$

where the superscript o refers to an initial equilibrium, ΔL^{fi} to the flows of workers between the formal and informal sector after any exogenous change, and $\eta \geq 0$ the elasticity of labor flows to utility differentials. The key point is not whether utilities are fully equalized or not, but whether, given any differential (including no differential), *at the margin* there is any change in labor flows as utilities change.

Since there is no VAT in good B, $p_B = \tilde{p}_B$. Thus, the consumer price index, CPI, is:

$$CPI = \delta \tilde{p}_A + (1-\delta)\tilde{p}_B \tag{21}$$

where δ is the share of final good A in total consumer expenditures. We next define indices of the real formal and informal wage rates, respectively, as w_f / CPI, and w_i / CPI . The important point, of course, is that real wages depend on outcomes in the labor market as determined by the incentives faced by firms and workers coming from the VAT and SI taxes and subsidies, but also directly on the VAT regime as it affects consumer prices.

4.5 The Government's Budget Constraint under the CSI+NCSI Configuration

Given our focus on the fiscal implications of the CSI+NCSI duality, we turn to the government's budget constraint. Revenues consist of endogenously determined value added, income and CSI taxes, plus other exogenous revenues denoted by $\overline{R}$ (including oil rents). The corresponding expressions for value added and income tax revenues are in Appendix 1. They are derived aggregating over all firms producing intermediates given the compliance rate of each firm, and also calculating value added and income taxes on final good A (netting out VAT paid on intermediates). In turn, expenditures consist of endogenously determined subsidies to CSI and NCSI programs, and all other expenditures, which we take as exogenous and denote by $\overline{G}$. Importantly, spending in Progresa-Oportunidades and other targeted programs that transfer income to the poor, as well as all non-insurance related social spending is included in $\overline{G}$.[17] The government's fiscal balance, FB, is:

$$FB = [\overline{R} + R^{VAT}(..) + R^{IT}(..) + (1-\theta)\tau^{CSI} w_f(..) L_f(..)] \tag{22}$$
$$-[\overline{G} + (1-\theta)\tau^{CSI} w_f(..) L_f(..) + \theta\tau^{CSI} w_f(..) L_f(..) + \tau^{NCSI} L_i(..)]$$

where (..) highlights the variables that are endogenously determined in our model. Note that the revenue side includes only CSI taxes paid by firms and workers,

[17] In 1997 Mexico transited from a pay-as-you-go to a defined contribution system of retirement pensions. As a result, the pensions of the transition generation are paid directly from government revenues. This is included in $\overline{G}$ as this spending has no bearing on firms' labor costs or workers' utility. Spending in CSI includes only subsidies for currently active workers, which affect firms' labor costs and workers' utility.

$(1-\theta)\tau^{CSI}w_f(..)L_f(..)$, while the expenditure side includes all CSI spending (which for clarity we separate into two parts). As a result, CSI exerts a net pressure on the fiscal balance only to the extent that it is subsidized.

We now discuss the channels through which the VAT and CSI+NCSI taxes and subsidies impact the fiscal balance in a context of informality and evasion. Consider expenditures first. Regardless of the formal-informal division of employment, the SI of all workers is subsidized by the government. From the spending point of view the question is whether the per worker CSI subsidy, $\theta\tau^{CSI}w_f(..)$, is higher or lower than the per worker NCSI subsidy, τ^{NCSI}. As shown in Appendix 2, for Mexico in 2008 we find that:[18]

$$\tau^{NCSI} > \theta\tau^{CSI}w_f(..) \tag{23}$$

Inequality (23) indicates that from the point of view of spending, the formal-informal composition of the labor force is not irrelevant: *ceteris paribus*, higher informal employment reduces the fiscal balance.

Consider now the revenue side. Note first that higher VAT rates have a contradictory impact on the fiscal balance. On the one hand, they increase revenues; on the other, they induce more evasion and informality. Firms in the intermediate goods sector will decrease their demand for salaried labor, with the effect stronger for larger firms (as they can evade less); in parallel, the non-taxed sector B will expand. These two effects erode the tax base and lower value added and income tax revenues. In addition, because higher VAT rates increase informal employment, there is also a positive impact on expenditures, given (23). Thus, although the expectation is that the net effect of higher VAT rates is to increase the fiscal balance, this impact is partly offset by higher evasion and higher informal employment.

What about CSI taxes? Given $\beta^{CSI}$and θ, an increase in τ^{CSI} lowers firms' demand for salaried labor and tilts its composition in the direction of more informal workers as the relative price of legal to illegal salaried workers increases. Larger firms—which comply more with VA and income taxes—will reduce employment relatively more than smaller ones. As the taxable sector of the economy contracts the same will happen to the tax base. Expenditures are also affected as informal

[18] Inequality (23) follows from the observed growth in spending for NCSI programs since the mid-1990s. One would expect the difference to widen as these programs continue to expand. See Levy (2008).

employment expands. On the other hand, an increase in the share of CSI taxes that is subsidized by the government, θ, operates in the opposite direction: from the point of view of firms, legal salaried workers are less costly and thus firms expand their demand for labor and tilt its composition in the direction of formality. As the taxable sector expands, value added and income taxes increase. In parallel, expenditures in CSI increase, of course, although this effect is partly compensated by smaller subsidies to NCSI.

Finally, the effects of augmenting τ^{NCSI} are as follows. First, informal employment expands both because sector B is more subsidized, and because firms tilt the composition of their labor force towards more illegal employment (with smaller firms benefiting from the higher subsidy proportionately more than larger firms). Revenues fall as sector B expands and evasion increases in sectors I_1 and I_2. In addition, expenditures increase as informal employment expands (given (23)), so the net effect is a deterioration of the fiscal balance.

The next sections quantify these effects. We close here with three observations. First, the discussion highlights the importance of considering the spillover effects of value added taxes on informality and, in turn, the spillover effects of CSI and NCSI taxes and subsidies on value added and income tax revenues. Second, it clarifies that the composition of spending in SI between CSI and NCSI matters not only from the social point of view (as it determines which workers are covered against what risks), but also from a fiscal point of view, as it affects tax revenues and total spending in SI. It also indicates that, while the root cause of informality is found in the CSI+NCSI configuration, in a context of evasion and special tax regimes (and a sector of the economy, B, which is basically out of the reach of the tax authorities), value added taxes can also strengthen informality.

Third, the discussion illustrates the dilemmas faced by SI policy in the context of the CSI+NCSI configuration. From the social point of view, setting $\tau^{NCSI} = 0$ is clearly unacceptable, as it leaves nonsalaried workers and illegally hired salaried workers without any protection against risks; on the contrary, from a social point of view one would in principle like to set NCSI benefits close to the levels of CSI benefits, as workers face similar risks regardless of their salaried or nonsalaried status. At the same time, however, expanding NCSI programs contracts the tax base and increases the level of informality and illegality in the economy (and lowers productivity).

CHAPTER 5

Data and Model Calibration

We fit our model to Mexico for 2008. Appendix 2 gives details of data sources and calibration; here we only provide a general overview.

5.1 Data

All tax and subsidy rates and penalty parameters are set at their legislated values, except for the income tax rate.[1] Per worker NCSI subsidy is calculated dividing observed spending in NCSI programs by observed informal employment. Data from the 2008 Economic Census is matched with IMSS registries to calculate the distribution of salaried employment by firm size, sector (I_1 and I_2) and formal-informal composition. The same Census is used to obtain the distribution of the capital stock in each sector and calculate $f(K_1)$ and $f(K_2)$; see the discussion in Appendix 2 and equation A2.1. Numbers on formal employment from IMSS registries are complemented with the Employment Survey to calculate L_B and $\bar{L}$ (excluding public sector workers). We use official fiscal accounts for total revenues from value added, income and CSI taxes. Workers' valuations of CSI and NCSI, β^{CSI} and β^{NCSI}, are taken from the estimates of Levy (2008). Evasion rates are set parametrically to reproduce the same level of revenues given the tax base and statutory rates. Other parameters are chosen from the national accounts or, when this is not possible, set to replicate the data. Finally, consistency is checked by calculating GDP on the income and value added side, as well as testing for homogeneity of degree one (zero) for nominal (real) variables with respect to p_1, p_2 and p_B.

[1] The statutory rate for 2008 is 28 percent, but the income tax law has many deductions and deferrals associated with capital investments that are not captured in our model. In this case we simply fix the rate to reproduce the same level of revenues observed in 2008 (=10.5 percent).

Table 6: Macroeconomic and Fiscal Accounts

	Observed		Calibrated	
	Pesos*	% GDP	Pesos*	% GDP
GDP	12,110.5		12,146.0	
Public expenditures				
Subsidies to NCSI	151.5	1.25	151.0	1.24
Subsidies to CSI	63.7	0.52	62.2	0.51
Other exogenous	2,679.5	22.1	2,679.5	22.0
Public revenues				
Value-added tax	457.2	3.77	457.9	3.76
Corporate income tax	393.0	3.24	392.4	3.23
Other exogenous	1,852.0	15.29	1,852.0	15.24
Fiscal balance**	–192.5	–1.58	–190.4	–1.56

Source: Authors.
*Thousands of million of 2008 pesos.
** The negative sign denotes a deficit.

5.2 Model Fitness

We evaluate the fitness of our model in four dimensions: macroeconomic and fiscal accounts; social insurance accounts; distribution of employment; and VAT evasion rates. Table 6 compares the macroeconomic and fiscal accounts generated by the model with those observed in 2008. The exogenous components of expenditures and revenues, $\overline{G}$ and $\overline{R}$ are by construction set equal to those in the data; the remaining entries are endogenously obtained in the model. For clarity, we net out CSI taxes paid by firms and workers from both the revenue and the expenditure side; see equation (22). As may be seen, these accounts are replicated remarkably well. Note that in 2008 subsidies to NCSI were almost two and half times subsidies to CSI (1.25 percent versus 0.52 percent of GDP).[2]

Social insurance accounts are presented in Table 7, where we have broken down τ^{CSI} and τ^{NCSI} into their various components. For the case of CSI, this consists

[2] Our data captures only spending in NCSI programs by the federal government, except for health, where we also include sub-national spending. However, some state governments also subsidize noncontributory pensions, day care and housing programs; we do not measure here as data are fairly incomplete. Total public spending in NCSI programs is in all likelihood higher than 1.25 percent of GDP.

Table 7: Social Insurance Accounts
(Thousands of million of 2008 pesos)

	Observed		Calibrated	
	Firms and workers	Government	Firms and workers	Government
Panel A. Contributory social insurance				
IMSS				
Health	109.3	44.3	111.9	43.2
Disability	21.0	1.9	21.5	1.9
Work-risk	16.8	0	17.2	0
Day care	8.4	0	8.6	0
Afores				
Retirement	54.9	17.5	55.4	17.1
Infonavit				
Housing	43.4	0	44.0	0
State taxes	25.7	0	26.4	0
Panel B. Noncontributory social insurance				
Health	0	131.0	0	130.6
Pensions	0	9.5	0	9.5
Housing	0	9.2	0	9.1
Day care	0	1.7	0	1.7

Source: Authors.

of: health, disability and work-risk insurance and day care services (under the IMSS heading, as this is the entity in charge of their administration); retirement pensions (under Afores, the private firms that administer workers retirement savings), housing (Infonavit, the housing institute for formal workers), and state labor taxes (which, while not directly related to SI benefits, are bundled with CSI taxes). For the case of NCSI, the break-down consists of health, retirement pensions, housing, and day care (and no state taxes). Again, the model closely replicates the data for all items.

Table 8 presents employment data according to different criteria. Panel A divides total employment into the I_1 (food, medicine and other necessities exempt from VAT), I_2 (all other goods with a VAT rate of 15 percent) and B (self-employment and family firms) sectors. Panel B presents data according to formality status; Panel C focuses on its distribution by firm size. The model replicates the structure

Table 8: Composition of Employment
(Millions of workers)

	Observed	Calibrated
Panel A. By sector		
I_1 (food, medicine)	5.28	5.24
I_2 (all other)	14.84	14.86
B (self-employed and family firms)	18.91	18.93
Total	39.03	39.03
Panel B. By formality status		
Formal	12.76	12.29
Informal	26.27	26.73
Salaried	7.36	7.80
Nonsalaried	18.91	18.93

Panel C. By firm size				
	I_1 (food, medicine)		**I_2 (all other goods)**	
	Observed	**Calibrated**	**Observed**	**Calibrated**
1–5 employees	2.53	2.39	4.24	3.87
6–20 employees	0.70	0.66	2.31	1.89
21–50 employees	0.44	0.49	1.27	1.71
50–100 employees	0.34	0.40	0.97	1.71
101+ employees	1.27	1.29	6.05	5.69

Source: Authors.
Note: Data do not coincide with those in Table 2; see Appendix 2 for details.

of employment fairly closely, but fails somewhat in the middle of the distribution in the I_2 sector.[3]

Finally, Table 9 presents VAT revenues. The calculated revenue to GDP ratio of 0.0376 is very close to the observed value of 0.0377. In parallel, we carry out

[3] An important assumption is that all employment in firms captured by the Census is salaried, while all employment in activities excluded from the Census is nonsalaried. This is not exactly so. On one hand, there is salaried employment in some rural firms and, probably, in urban firms excluded from the Census; however, we have no data on the number of firms in this situation, nor on their size or capital stock, and as a result treat their workers as nonsalaried. On the other, some firms captured in the Census may have nonsalaried contractual relations. That said, the aggregate numbers on formal and informal employment are very close to the ones obtained from the Employment Survey; see Appendix 2.

Table 9: VAT Revenues and Evasion
(percent of GDP)

	Observed or calculated from national accounts	Calibrated
$\tau_1^{VAT} = 0, \tau_2^{VAT} = 0.15$		
Under current enforcement	3.77*	3.76
Assuming full compliance	6.08**	6.12
$\tau_1^{VAT} = \tau_2^{VAT} = 0.15$		
Under current enforcement	n.o.	6.2
Assuming full compliance	10.7**	10.6

Source: Authors.
* Observed.
** Calculated from national accounts by Antón and Hernández (2010).
n.o. = not observable.

an exercise where we estimate VAT revenues under full compliance, and compare it with the calculations made from the National Accounts by Antón and Hernández (2010). Finally, we also carry out an exercise where we eliminate exemptions in sector I_1, so that both VAT rates are equal at 15 percent and assume full compliance, and also compare it with the calculations made by Antón and Hernández (2010). The levels of revenues are again very close, indicating that the underlying evasion rates are also close to the actual ones.

All in all, the model replicates Mexican data pretty closely along these four dimensions. In the next two sections we proceed, first, to simulate how the economy responds to various parameter changes under the CSI+NCSI configuration and, second, to simulate a fiscal reform that funds replacing this configuration with USI.

CHAPTER 6

Four Preliminary Questions

6.1 Who Pays for Social Insurance?

Table 10 decomposes the effects of CSI and NCSI taxes and subsidies on wage rates and worker's utility (Panel A), employment (Panel B) and spending and tax revenues (Panel C). We take as the benchmark scenario the situation where there is no SI (column two); next, we assume that CSI is introduced with τ^{CSI} at its current rate of 0.38, but with no subsidies (column three); further, we introduce subsidies to CSI at the current rate (θ = 0.16, implying a subsidy per worker of 5,062 pesos), but assume there is no NCSI (column four); finally, we introduce NCSI at the observed subsidy of 5,650 pesos per worker so this scenario is the 2008 status quo (last column). To interpret this and the following tables, we note that the estimated "pure" tax on formal labor is in the order of 20 percent of the formal wage, while the estimated subsidy to informal labor is in the order of 7 percent of the informal wage (see Table 5).[1]

Start with unsubsidized CSI. First, very importantly, wage rates decline vis-à-vis the no SI case; the formal wage, in particular, drops by about 21 percent. An immediate implication is that the incidence of CSI taxes falls mostly on workers: in fact, in this case they pay 70 per cent of CSI taxes. This indicates that CSI is basically changing the composition of workers' consumption (less disposable income and more SI benefits), rather than re-distributing income from firms to them.

[1] However, a more accurate measurement of these taxes and subsidies is obtained taking as the reference point not the formal and informal wage rates, but the undistorted wage rate that would be observed in the absence of these taxes and subsidies. This wage rate is calculated in the next section and shown in Figure 2. The important point is that the tax on salaried labor is lower and the subsidy to nonsalaried labor higher, because the reference wage rate is higher when the distortions in the labor market produced by SI policy are removed. See the discussion in section 7.

Table 10: The Impact of CSI and NCSI

	No SI	Only CSI	Subsidies to CSI	Status quo: subsidized CSI+NCSI
Panel A: Wages and utility*				
Formal wage	1.00	0.79	0.81	0.83
Informal wage	1.00	0.88	0.90	0.88
Worker's utility	1.00	0.88	0.90	0.93
Panel B: Employment**				
Formal salaried	26.04	12.65	13.65	12.29
Informal salaried	0	7.68	7.97	7.80
Nonsalaried	12.99	18.70	17.41	18.93
Panel C: Fiscal***				
Subsidies to CSI	0	0	67.3	62.2
Subsidies to NCSI	0	0	0	151.1
VAT revenues	496.7	459.5	468.2	457.9
IT revenues	399.0	392.4	393.8	392.4
Net fiscal impact#	–	(–) 43.8	(–) 101.0	(–) 258.7

Source: Authors.
* Index
** millions of workers
*** thousands of millions of 2008 pesos
# vs. the no SI situation.

Put differently, it is as if when workers are formally employed they pay a "VAT ear-marked for SI benefits", but labeled as "SI Contribution"; a "SI Contribution but really a VAT" of 21 percent which is additional to a (non ear-marked) VAT that they pay when they make their purchases. At the same time, and usually less noted, CSI taxes also lower informal workers' wages (by 12 percent); however, informal workers get no SI coverage in return.[2]

Second, formal workers' utility falls by less than their wage, 12 percent vs. 21 percent. Utility is lower than in the no SI case because workers under value the

[2] Our findings are consistent with results for other countries in Latin America. IDB (2004, p. 208) notes that "All in all, the available evidence for Latin America suggests that at least part of the costs of the non-wage benefits is passed on to workers in the form of lower wages. A few studies find evidence that workers pay for the entirety of benefits, but the majority find that employers bear a share of the cost…Therefore, the evidence is fairly robust that although a large share of the benefits is likely to be paid by employees, mandatory benefits regulations have a cost in terms of (formal) employment". See also Heckman and Pagés (2004) and Kugler (2011).

benefits of CSI. This highlights the critical difference between worker's individual utility and the government's welfare function. From the perspective of the government, the CSI equilibrium is presumably better than the no SI equilibrium because it is assured that workers consume the bundle of goods that it considers they should consume: purchasing disability, life and health insurance, saving for retirement and for a house, and so on. From workers perspective, on the other hand, the CSI equilibrium is worse than the no SI equilibrium, as their wages are taxed with the proceeds used to give them in return something they do not value as much.

Third, CSI taxes have large revenue-reducing effects. Total revenues from value added and income taxes fall by 5 percent (or 0.3 percent of GDP), given increased informality of workers and firms (see discussion below). Thus, while CSI taxes generate revenue, they in parallel induce losses of other sources of revenue by expanding the nontaxable sector of the economy and inducing firms to pursue illegal behavior. Of course, the official fiscal accounts do not register the foregone revenue, as there is no item in the budget labeled "Lost Revenue from Informality". But the absence of an explicit line-item in the fiscal accounts should not mask the fact that informality is fiscally costly.

Subsidies to CSI partly offset the changes noted above. As the tax on salaried labor is reduced, real wages and worker's utility increase, and evasion of value added and income taxes falls marginally. On the other hand, the total fiscal cost of CSI is higher, as the (explicitly recorded) cost of subsidies to CSI is added to the foregone (though unrecorded) revenues from value added and income taxes.

NCSI programs, for their part, have the following effects. First, the government is closer to achieving its objective of providing all workers with coverage against risks, as now informal workers receive some SI benefits. Second, because informal workers now get some SI benefits that neither they, nor the firms that may hire them, must pay for directly, they have higher utility. Third, real wages move in opposite directions: as the supply of labor to the informal sector expands the formal wage increases, while the informal wage falls. Thus, NCSI programs (like subsidies to CSI) modify the incidence of CSI taxes. In this case, which is the one that corresponds to the 2008 *status quo* and therefore the relevant one for our purposes, only 64 percent of CSI taxes are shifted to workers (vs. 70 percent in the absence of subsidies to CSI and NCSI programs).[3] Fourth, a new item appears and is explicitly recorded in the expenditure side of the budget under the

[3] Our estimate of the net incidence of CSI taxes can be contrasted with Marrufo's (2010), who analyses the 1997 reform to Mexico's Social Security Law and finds that 57 percent of CSI taxes were shifted to workers.

label of subsidies to NCSI programs (or, more precisely, under the label of health, pension, day care programs, and so on, for informal workers); and the unrecorded item in the revenue side of the budget expands as higher informality increases foregone revenues from value added and income taxes.

We close bringing up a point at times under-emphasized in discussions of the incidence of CSI taxes. Observed wages reflect subsidies to CSI and NCSI worth 1.7 percent of GDP. As shown, in their absence workers would pay more for CSI benefits. In this context, however, we cannot really establish the full incidence of CSI taxes, because our model is silent about the incidence of the taxes necessary to pay for CSI+NCSI subsidies. Put differently, a richer structure is needed to answer the incidence question. That said, our model does indicate that, contrary to what is often assumed in policy discussions (and more often in political discourse), CSI taxes are not serving to redistribute income from firms to workers.[4]

6.2 What are the Effects of SI on Employment?

Table 10 also serves to assess the impact of the CSI+NCSI configuration on the composition of employment (recall that we assume constant participation rates). Begin again with unsubsidized CSI. Because firms do pay for a share of CSI taxes, they reduce their total demand for salaried labor and tilt its composition in the direction of illegal workers. Informal employment expands both because firms now hire salaried workers illegally and because nonsalaried employment in sector B grows.[5] Relative to the no SI benchmark, salaried employment falls by 22 percent and changes in composition, as 36 percent of workers are now hired illegally; in parallel, there is a 44 percent increase in employment in sector B. These effects are partly reversed when CSI is subsidized. In this case, relative to the no SI equilibrium, salaried employment falls by 17 percent, while relative to the unsubsidized CSI case it expands by 6.3 percent (while its composition changes slightly in the direction of legality); in parallel, employment in sector B contracts by 7 percent.

[4] It is useful to recall that 89 percent of all firms have at most five workers. Although we have no precise data, it is likely that many of these are family firms, where redistribution from firm owners to workers would occur within the same household. Even within firms registered with IMSS, the majority has up to five workers; see Table 1. The point here, of course, is not that there should be no redistribution from high-income to low-income households, but that CSI taxes are a very coarse redistributive tool, because the assumption that all firm owners belong to high income households and all workers to low income ones is in all likelihood flawed.

[5] Although we do not quantify these effects, the change in the composition of employment also increases profits or quasi-rents in the nonsalaried sector of the economy (the value of land, street corners). Clearly this is an unintended redistributive impact of CSI.

NCSI programs, as expected, lower salaried employment, tilt its composition in the direction of illegality, and promote employment by family firms and self-employed workers. Relative to the case where CSI is subsidized, the joint effect of all NCSI programs is to lower salaried employment by 7 percent (and increase the share of illegal employment from 37 to 39 percent); in parallel, employment in sector B grows by 8.7 percent. As a result, total informal employment grows by 5.3 percent. We highlight that our model picks up the effects of *all NCSI programs simultaneously*, in contrast to the papers cited in Section 4, which measure the effects of individual programs.[6]

Contrasting the changes in employment caused by CSI versus NCSI programs, it follows that the distortion created by the former is larger than that created by the latter. Thus, from the point of view of efficiency, reducing the tax on formal labor would have the highest return. That said, our model also indicates that the subsidy to informality deepens the economic distortion and, at the same time, puts additional pressure on the fiscal accounts. This is an important observation considering that resources for NCSI programs have increased noticeably over the last decade and, on current trends, will continue to do so.

From an economy-wide perspective, of course, what matters are not the effects of CSI or NCSI programs, but their joint impact (which, to the best of our knowledge, has not been measured previously). All in all, the impact of the CSI+NCSI tax-cum-subsidies on employment is substantial: salaried employment falls by 23 percent with its illegal component accounting for a 39 percent share; in parallel, employment in sector B is 45 percent higher. As seen, the effects on wages and the fiscal accounts are also large. Why? CSI taxes paid by firms and workers are 2.3 percent of GDP; this compares with 3.7 percent for the VAT. In addition, total subsidies to CSI and NCSI represent an additional 1.7 percent of GDP. Thus, taxes and subsidies worth 4 percent of GDP are being collected or channeled through the market for the most important nontraded input, labor; they are also being collected or channeled based on worker's labor contract (and,

[6] It is difficult to make a direct comparison of our results with those measuring the impact of individual NCSI programs. With that *caveat*, we note that, for instance, Bosch and Campos-Vázquez (2010) find that formal employment fell by 2.4 percent as a result of the Seguro Popular program, representing a loss of around 300,000 formal jobs. As shown in Table A2.2, this program accounts for 24 percent of subsidies to all NCSI programs. Table 10, on the other hand, shows a 10 percent reduction in formal employment (or 1.36 million jobs) as a result of *all* NCSI programs. Clearly, one expects the impact of subsidies worth 1.25 percent of GDP to be larger than the impact of subsidies one-fourth that amount (although it is less clear that the relationship should be linear).

implicitly, firm's size). It is not surprising that such a capricious mechanism to tax and subsidize, by distorting decisions of all firms and workers, has deep economic implications.

6.3 What are the Fiscal Costs of Subsidies to CSI and NCSI?

Table 11 presents the results of an exercise where, starting from the *status quo*, government spending in SI is exogenously increased under two alternatives: first, a higher subsidy rate to CSI; second, increasing the per worker subsidy to NCSI. In both cases the increase is the same, arbitrarily set at 15,000 million pesos (or 0.12 percent of GDP). As expected, higher θ tilts the composition of employment towards formality while higher τ^{NCSI} does the opposite. In parallel, real wages and workers' utility increase relatively more when CSI is subsidized, a result that follows from the fact that these subsidies reduce the distortion associated with the tax on formal employment, while subsidies to NCSI augment this distortion.

But the more interesting result centers on the impact on the fiscal balance. Because higher subsidies to CSI increase formality, the tax base expands and revenues from value added and income taxes increase; as a result, even though

Table 11: Net Fiscal Costs of CSI and NCSI Subsidies

	Calibrated	Increase in CSI subsidies of 15,000 mp	Increase in NCSI subsidies of 15,000 mp
Subsidies to CSI*	62.2	77.2	61.7
Subsidies to NCSI*	151.0	149.8	166.0
VAT revenues*	457.9	459.9	456.9
IT revenues*	392.4	392.7	392.3
Net impact on FB*	–	(–) 11.2	(–) 15.3
Net impact per peso	–	0.76	1.03
Formal employment**	12.29	12.50	12.17
Informal employment**	26.73	26.52	26.86
Formal wage***	1.000	1.005	1.002
Informal wage***	1.000	1.005	0.997
Worker's utility***	1.000	1.005	1.003

Source: Authors.
*Thousands of million of pesos
**millions of workers
*** index.

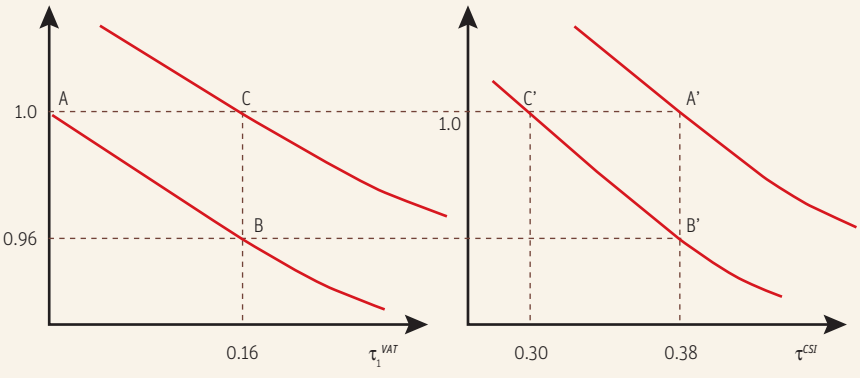
spending goes up by 15,000 million pesos, the fiscal balance deteriorates only by 11,200 million pesos. On the other hand, higher subsidies to NCSI increase informality and contract the tax base with a negative impact on tax revenues; as a result, the fiscal balance deteriorates by more than 15,000 million pesos. The final outcome is this: the net cost of one peso of subsidies to CSI is 0.76 pesos compared to 1.03 pesos for subsidies for NCSI. This difference of 27 percent sharply illustrates the fact that the composition of spending in SI programs has substantive implications for the fiscal sustainability of SI policy.

6.4 What is the Trade-off between VAT and CSI Taxes?

Finally, we examine the impact on the real formal wage of different VA-CSI tax combinations. The left panel of Figure 1 plots an index of the real wage as a function of the VAT rate on food and medicine given the τ^{CSI} rate and the evasion behavior of firms. We set this index at unity when both rates are set at their current value, that is, τ_1^{VAT} = 0 and τ^{CSI} = 0.38; this is point A. The right panel plots the relationship between the real wage and the CSI rate given the same evasion behavior; it is downward sloping since CSI taxes are partly shifted to workers. The relationship is also drawn for τ_1^{VAT} = 0 and τ^{CSI} = 0.38. This is point A'.

We now carry out two sequential changes. First, we increase the VAT rate on food and medicine to 16 percent. On the left panel the real wage falls as workers face higher consumer prices; this is point B. Importantly, this impact is mediated by the extent of VAT compliance. Indeed, if all firms were able to evade the VAT on food and medicine, there would be no impact on consumer prices; conversely,

Figure 1: Trade-offs between VAT and CSI Taxes



Source: Authors

under full compliance the impact on the real wage would be stronger. Our model indicates that with the observed compliance rates, when the VAT on food and medicine is set at 16 percent the real wage falls by 4 percent.[7] On the right panel the increase in τ_1^{VAT} shifts the curve down, since for the same CSI rate the real wage is now lower. This is point B'. The second change consists in lowering τ^{CSI} to return the real wage to level it had before the change in τ_1^{VAT}. On the right panel this is point C', while on the left it is point C.

The result is that the same real wage is obtained by the pair $(\tau_1^{VAT}, \tau^{CSI}) = (0,0.38)$ and by the pair $(\tau_1^{VAT}, \tau^{CSI}) = (0.16,0.30)$. The difference between the two is the point at which taxation is occurring. In the first, taxes are collected "at the door of the factory". In the second case, taxation shifts partly to "the door of the store". Of course, the revenues obtained in each case are different as the bases of these taxes are different (as are the possibilities of evading them). Further, under current law the destiny of the revenues is different: taxes collected at the door of the factory can be used only for CSI benefits, while taxes collected at the door of the store can be freely disposed of (including paying for NCSI benefits and subsidizing CSI benefits). But these two differences are secondary. On one hand, the rates can be adjusted for given revenue targets; on the other, the final disposition of the VAT can be earmarked by law.

What is critical for our purposes is the reaction of firms and workers to these two changes. The VAT increase by itself will raise more revenues but will increase informality; the CSI rate reduction by itself will lower revenues but increase formality. The combination of the two is in principle ambiguous, and depends on how these rates are changed. But if revenues from the VAT could be earmarked for SI, this tax would achieve the same purpose as CSI taxes: changing the composition of worker's consumption by lowering their disposable earnings and giving them SI benefits in return. There would be three substantive differences. First, formal workers would pay less VAT (labeled CSI tax) at the door of the factory and more VAT (labeled VAT) at the door of the store. Second, informal workers would pay more VAT at the door of the store.[8] Third, the base of the

[7] We set the VAT at 16 percent, as the general VAT rate was raised from 15 to 16 percent in 2010. In addition, a rate of at least 16 percent is needed to finance the benefits of USI; see next section.

[8] Further, if family firms and the self-employed, in a more realistic setting than in our model, purchase some intermediate inputs that are subject to VAT, there is also a tax on the informal sector through the input side (since, as noted, under Repeco or high evasion this tax cannot be credited against VAT paid on the output).

VAT would be wider than that of CSI taxes (as it includes profits and rents), and would not distort firms' and workers' decisions regarding salaried vs. nonsalaried or legal vs. illegal contracts.

6.5 Assessment

We began this paper observing that redistribution and administrative convenience were the two main motivations behind Bismarck's idea to fund SI out of wage-based taxes. Our results show that in the case of Mexico, however, CSI's redistributive motivation is hardly achieved: CSI taxes are largely paid by workers. Moreover, this motivation has two undesirable results: inequitable outcomes, as the wages of informal workers—who are not direct beneficiaries of CSI taxes—are reduced; and unintended outcomes, as profits and quasi-rents in nonsalaried activities increase. On the other hand, administrative convenience comes at a high price in terms of foregone revenues from income and value added taxes, and an equally high price in terms of economic efficiency, given the large distortions that CSI taxes introduce in the labor market. At the same time, even under full compliance, the coverage objectives of CSI are only partly met, as nonsalaried workers are excluded. When attempts are made to remedy this situation through NCSI programs, the redistribution and administrative motivations are lost, as these programs are funded completely from other sources of revenues, while efficiency is further punished and fiscal costs augmented given higher evasion.

The net result is a very distorting system for financing SI and very erratic coverage against risks, in a context of large mobility of workers between formal and informal status. Given subsidies to CSI and the actual incidence of CSI taxes, when a Mexican worker is formally employed, he receives a bundled package of SI benefits that is 16 per cent subsidized by the government (from VAT, other taxes or oil rents), 54 percent (= 0.84*0.64) subsidized by himself and 30 percent (=0.84*0.36) subsidized by the firm that hires him (since as seen, 64 percent of CSI taxes are shifted to workers). While he holds this status, he is obligated to contribute to the revenues of state governments given their tax on salaried labor; to save for his retirement and for a house; to purchase health, disability and work-risk insurance and day care services; and is protected by severance payments in case of job loss. However, when the same worker is informally employed, he can benefit from an unbundled package of NCSI programs that are 100 percent subsidized by the government. While he holds this status, he does not have to pay any state labor tax; he can voluntarily access a health insurance program; eventually receive a pension without having saved for one; maybe access a day care

center or receive a housing subsidy; but be left without any severance pay in case of job loss. Firms, in turn, face different obligations depending on whether they hire workers under one labor contract or another, inducing them into illegal behavior and socially inefficient choices. And the fisc, finally, loses revenue given a narrowed tax base.

This state of affairs would be amply justified, of course, if there were no other alternatives for the government to provide SI to workers, as the option of leaving them unprotected against risks is not an option. The relevant question in this context is thus not whether SI should be funded from value added taxes; as shown, taxes at the door of the store (and other sources of revenue) already fund a 100 percent of NCSI and 16 percent of CSI. Moreover, it is inevitable that this be so because there will always be nonsalaried contractual relations in the economy and, given imperfect enforcement of the tax on salaried labor, illegal salaried workers. Rather, in a context where the government wants formal and informal workers to be covered by SI, the relevant question, in our view, is twofold. First, does it make sense to continue to provide different SI benefits to the same worker depending on his labor contract, and to fund these benefits with a mix of labor and other taxes? Second, is there an alternative mix of financing that produces fewer productivity-reducing distortions, enlarges the tax base, and—critically—is able to offer the same protection against risks that are common to all workers?

CHAPTER 7

Universal Social Insurance and the End of Informality

7.1 What Does USI Consist of?

This and the next section describe our proposal for USI. This section assumes that there are a set of risks against which all workers need to be protected regardless of labor status, namely, illness, disability, longevity and death. We separate these risks from others that workers may face but that are specific to their salaried status such as being fired by their boss or suffering an accident at work because the firm fails to comply with safety standards. These latter risks are dealt with in the next section, where we also propose complementary pension benefits for salaried workers. We highlight that when these complementary pension benefits are taken into account, our proposal implies that the health, life and disability and work-risk insurance as well as retirement pensions that formal workers currently receive under CSI would remain the same under USI.

For the purposes of this section, we define universal social insurance, USI, as the provision of health, life and disability insurance and retirement pensions of the same level of quality (health) or monetary payment (pensions) to all workers or their families. We denote the per worker monetary cost of those benefits as τ^{USI}. More precisely, we assume that under USI all workers are entitled to: (i) the same health benefits currently provided by CSI when they are formally employed; this is the IMSS health program, whose coverage is broader than that provided by NCSI health programs when they are informally employed, (ii) a contribution for life, disability and retirement pensions equal to that received by a worker earning two times the minimum wage, and (iii) a guarantee of a minimum pension equivalent to one minimum wage if workers, as is currently the case under CSI, are registered with USI for at least 25 years. (In the next section

we extend USI to include additional pension benefits.) We exclude housing and day care services from USI.[1]

The benefits of USI are delivered in a similar fashion as those currently provided by CSI. Retirement pensions would operate as a defined contribution program with monthly contributions deposited in workers' individual retirement accounts in the Afore of their choice, and with annuities bought from private insurance companies at the time of retirement; in turn, for risk pooling purposes, contributions for death and disability insurance would be deposited in the same common reserve fund managed by IMSS as currently occurs under CSI, with payouts for permanent disability or survivorship pensions also taking the form of annuities. Thus, very importantly, the pension components of USI are fully funded, with no contingent liabilities. In parallel, health benefits would continue to be provided by IMSS and state governments. In particular, IMSS would receive the same payment for health per enrolled worker as under CSI, while state governments would receive a higher per worker payment vis-à-vis what they currently get from the NCSI health programs (equal to that received by IMSS).

Appendix 3 provides details of how τ^{USI} was calculated; suffice it to say here that it equals 14,330 pesos per worker annually, which compares with subsidies for CSI and NCSI of 5,062 and 5,652 pesos, respectively. Of this total, 70.6 percent corresponds to health benefits, 24.3 percent to retirement pensions, and 5 percent to life and disability insurance. Very importantly, this benefit level implies more than doubling public subsidies for SI, from 1.7 percent of GDP under CSI+NCSI, to 4.4 percent under USI; clearly, a major change.[2]

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[1] Mexico is one of the few countries in the world to include housing and day care as obligatory components of CSI. These needs are of a different nature than the risks traditionally associated with SI; see Levy (2008). Our calculations exclude the resources necessary to provide housing and day care benefits to all workers. Of course, the government could continue to subsidize housing and day care programs, but these would no longer be considered part of SI. Our calculations also assume that state taxes on salaried labor are eliminated, and that state governments are compensated by the federal government for the foregone revenues; see the discussion below.

[2] The proposal also implies increasing total national spending in SI. Under CSI+NCSI this spending is 3.9 percent of GDP (excluding SI spending for public sector workers and the transition costs of the change from the pay-as-you-go to the defined-contribution scheme resulting from the 1997 pension reform). Of this total, 1.7 percent are government subsidies (for CSI and NCSI), and 2.2 percent CSI taxes paid by firms and formal workers. Under USI public spending in SI is 4.4 percent of GDP, as noted. As discussed in the next section, however, to this sum one needs to add complementary pension benefits paid by firms and salaried workers worth 0.4 percent of GDP. Thus, all in all, spending in SI would increase from 3.9 percent to 4.8 percent of GDP. There would also be a change in composition as public spending in day care and housing would disappear (by the equivalent of 0.5 percent of GDP), with spending in health and pensions therefore increasing by 1.4 percent of GDP.

7.2 The Labor Market and the Fiscal Balance under USI

There are three critical implications of USI. First, CSI and NCSI benefits are eliminated and replaced by USI benefits, so worker's utility is:

$$U_f = w_f + \beta^{USI}\tau^{USI} \tag{24}$$

$$U_i = w_i + \beta^{USI}\tau^{USI} \tag{25}$$

where $\beta^{USI} \in [0,1]$ refers to workers valuation of the bundle of USI benefits. As a result, there are no incentives for workers to seek one form of employment versus another just on the basis of differences in SI benefits.

Second, the cost of labor is the same regardless of the nature of the labor contract. In terms of Table 5 this implies—critically—removing all taxes on formal employment and subsidies to informal employment. As a result, firms have no incentive to offer workers one type of contract versus another, to change their size as a strategy to avoid CSI taxes, to mask a salaried contract as nonsalaried, or to out-source activities or rotate workers just to evade SI regulations. Put differently, USI implies eliminating all distortions in firms' and workers' behavior in the labor market stemming from SI policy, a situation that would have an unambiguously positive impact on productivity.[3]

The third implication is that an ear-marked consumption tax is needed to cover the costs of USI, a tax that has the same base, method of accreditation and enforcement technology as the VAT. Indeed, were it not for the fact that the proceeds of this tax are ear-marked for USI, it would be exactly the VAT. Because operationally this tax is collected along with the non ear-marked VAT, we can divide the VAT rate in two parts:

$$\tau^{VAT} = \alpha\tau^{VAT} + (1-\alpha)\tau^{VAT} = \tau^{VAT/USI} + \tau^{VAT/GP} \tag{26}$$

where α is the share of the total VAT rate ear-marked for USI, $\tau^{VAT/USI}$, with the remainder being the share used for general purposes, $\tau^{VAT/GP}$. Under our proposal, τ^{VAT} is obtained by equalizing the VAT rate on I_1 (food and medicine) and I_2 (all other goods) and setting both at 16 percent.[4] In turn, total VAT revenues, $R^{VAT}(..)$, are

[3] An important exception is the distortions created by severance pay which so far have been excluded from the analysis; see the discussion in Section 8.3.

[4] Our proposal also implies raising VAT rates in the borders to 16 percent (from 11 percent), although this is not captured by our model since there is no regional dimension.

separated into revenues ear-marked for USI, $R^{VAT/USI}(..) = \alpha R^{VAT}(..)$, and non-ear-marked revenues $R^{VAT/GP}(..) = (1-\alpha)R^{VAT}(..)$.

Very importantly, from a legal perspective $\tau^{VAT/USI}$ is labeled as "contribution for USI", implying that proceeds from this contribution are wholly ear-marked for SI. In turn, $R^{VAT/USI}(..)$ is registered in a separate account of the federal government's budget, is not subject to revenue-sharing with the states, and is divided in three separate sub-accounts with no possibilities of transfers between them, so as to clearly identify and manage resources for health, life and disability pensions, and retirement pensions. Resources from the health subaccount are transferred to IMSS and state governments to provide health services of equal quality to all workers; resources from the life and disability insurance subaccount are transferred to the common IMSS-managed reserve fund; and resources from the retirement pension subaccount are transferred on a per worker basis to their individual retirement accounts.

A critical condition for the fiscal sustainability of USI is that:

$$R^{VAT/USI}(..,\tau^{VAT/USI},..) = \tau^{USI}\bar{L} \tag{27}$$

Equation (27) is central: it states that the costs of USI, given by the exogenously chosen level of benefits and the size of the labor force, must be fully financed from the share of VAT revenues legally ear-marked for USI. This implies, as noted, that $R^{VAT/USI}$ cannot be used for purposes other than SI but, conversely, that USI must be fully funded from these revenues; the government could not transfer resources from other sources (including oil rents!) to fund SI. Critically, therefore, τ^{USI} could not be set independently of $\tau^{VAT/USI}$, and any increases to τ^{USI} that are deemed socially desirable would have to be funded with additional contributions.

The government's fiscal balance under USI is therefore written as:

$$FB = [\bar{R} + R^{VAT/USI}(..) + R^{VAT/GP}(..) + R^{IT}(..)] \; -[\bar{G} + \tau^{USI}\bar{L}] \tag{28}$$

Comparing this with the fiscal balance under the CSI+NCSI configuration given by equation (22), and considering the constraint imposed by equation (27), it is obvious that this particular method of funding SI has two major advantages. First, it ensures the long term fiscal sustainability of Mexico's SI policy. Second, it makes the effort made by society to fund SI fully transparent, tightly linking benefits with contributions.[5]

[5] Note that something akin to equation (27) already holds for CSI, given Mexico's defined-contribution retirement system. Indeed, it is the existence of NCSI programs that breaks the link

In sum, we propose a social-cum-fiscal reform that provides all workers with the same SI benefits; that eliminates subsidies to nonsalaried labor and taxes on salaried labor while shifting the burden of taxation towards consumption; that explicitly links contributions with benefits; and that creates no contingent liabilities and puts no pressure on the government's fiscal balance. This proposal, of course, needs to be evaluated in a context where firms' can evade the VAT; where there are numerous family firms and self-employed workers (sector B) which are by-and-large beyond the reach of the tax authority (although in principle contributing under the Repeco regime); and where compensation needs to be offered to poor households to fully offset any negative effects of the VAT increase.

7.3 Fiscal Reform under CSI and NCSI versus USI

Table 12 shows the impact a VAT reform that sets all rates at 16 percent under three scenarios: one with the current configuration of CSI and NCSI taxes and subsidies; one where this configuration is replaced by USI but no compensation is offered to anyone; and one where compensations are included as part of the fiscal costs of USI. We focus on the impact of the reform on the fiscal balance (Panel A), wages and utility (Panel B), and employment (Panel C).

Consider first the VAT reform in the absence of any changes to SI policy. As expected, there is an important increase in VAT revenues, of approximately 3 percent of GDP (although there is a loss of revenue from income taxes as firms pay more VAT). As also expected, the real wage falls given higher consumer prices. But, very importantly, the reform increases the level of informality in the economy, as employment in the non-taxed sector B expands and as firms producing I_1 and I_2 increase the share of salaried workers hired illegally. This increases spending in subsidies to NCSI (and reduces it in subsidies for CSI), with a net increase in spending (given equation (23)). Because the VAT reform is centered in food and medicine (I_1), this sector contracts while there is a marginal increase in the already taxed sector (I_2); indeed, following expression (13), as the price of I_1 in terms of I_2 increases the composition of good A tilts toward I_2. But the biggest

between contributions and SI benefits, and has opened the door for unfunded commitments and new contingent liabilities derived from health or pension programs. Our proposal re-establishes that link and closes the door to future unfunded commitments. The political economy implications of this are large, as neither the President nor Congress could offer additional SI benefits to workers without in parallel assuring the source of funding. This is already the case for CSI programs, but not for NCSI programs. See Lindert (2004) for a historical discussion of the fiscal sustainability of SI policy.

gainer is the nontaxed sector B; evidently, as the average VAT rate in sector A increases the non-taxed sector of the economy absorbs more resources. On the other hand, when the effects of these spending and revenue changes are factored into the fiscal balance, the result is a surplus of 1.32 percent of GDP, representing a turnaround of 2.8 percent of GDP from the pre-VAT reform situation (since in this scenario none of the additional revenues are spent).[6]

The fiscal-cum-SI policy reform produces a very different outcome. First, for the same increase in the VAT rate there is an extra gain in revenues of approximately 0.3 percent of GDP; there is also a small gain in income taxes. Since enforcement efforts are assumed constant, these gains derive only from the fact that, despite the VAT change, the level of informality in the economy is reduced as the tax on formality and the subsidy to informality stemming from SI policy are removed. Indeed, salaried employment increases by 27 percent, illegal salaried employment disappears (as there is no tax to evade), and nonsalaried employment in sector B contracts since the supply of labor to this sector falls.[7]

Second, note that despite the VAT increase, employment in sectors I_1 and I_2 increases. The gain in I_2 is expected: firms pay the same VAT rate as before but now face lower labor taxes, so clearly output and employment expand while the incentives to evade fall. The gain in I_1 is more interesting. On the one hand, this sector now pays VAT, so *ceteris paribus* one would expect it to contract and evade more (as indeed is the case, as shown in column 2 of Table 12). On the other hand, when the tax on formal labor is removed one would expect the sector to expand and to evade less. What is noteworthy is that the net effect is positive. Contrasting this result with the one obtained when only the VAT is increased highlights the importance of the *simultaneity* of the fiscal and social reform, a point that from the point of view of policy is of the essence. The net loser, unsurprisingly, is sector B. This last result in turn highlights the fact that the root cause of the large sector of self-employment and family firms that characterizes the current labor market in Mexico is the CSI+NCSI configuration, not the VAT. The net impact of these effects is to expand the tax base, generating the extra 0.3 percent of GDP in VAT revenues vis-à-vis the reform under the CSI+NCSI configuration.

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[6] It is easy to see that if the additional revenues produced by the VAT reform were spent in NCSI programs, the increase in informality would be more pronounced. This is a relevant point as in Mexico strengthening NCSI programs has been used as a justification to increase the VAT (as occurred in the 2010 Budget Proposal).

[7] If, more realistically, sector B also required intermediate inputs from sector I_1, sector B would contract more as, for the reasons discussed earlier, input prices would increase without family firms or self-employed workers having the possibility of receiving a credit for the higher VAT.

Table 12: Fiscal Reform for USI: All VAT Rates at 16 Percent

	Calibrated	VAT reform under CSI+NCSI	VAT reform under USI	VAT reform, USI and compensation
Panel A: Fiscal balance (thousands of million of pesos)				
VAT revenues	457.9	824.2	873.6	873.6
(% GDP)	3.76	6.79	7.1	7.1
IT revenues	392.4	377.3	383.0	383.0
Subsidies to CSI	62.2	58.5	none	none
Subsidies to NCSI	151.0	154.6	none	none
Subsidies to USI	none	none	559.3	559.3
Compensations to the poor	none	none	none	28.8
Compensations to states	none	none	none	26.0
IMSS pension liabilities	none	none	none	27.0
Fiscal balance	(–) 190.4	160.7	(–) 148.5	(–) 230.3
(as a percent of GDP)	(–) 1.56	1.32	(–) 1.21	(–) 1.88
Panel B: Wages and utility (index)				
CPI	1.000	1.026	1.027	1.027
Real wage	1.000	0.965	1.158	1.158
Worker's utility	1.000	0.991	1.203	1.203
Panel C: Employment (millions of workers)				
Employment I_1	5.24	4.63	6.06	6.06
Employment I_2	14.86	14.97	19.55	19.55
Employment sector B	18.93	19.42	13.41	13.41
Legal salaried employment	12.29	11.66	25.61	25.61
Illegal salaried employment	7.80	7.94	none	none

Source: Authors.

Third, the reform produces an increase in the real wage despite higher VAT taxes. This result is, in part, the converse of the fact that CSI taxes are to a large extent shifted to workers: their removal is reflected in a higher wage. In part, however, it also reflects the fact that eliminating the CSI tax results in a more efficient labor allocation as firms' labor costs fall. In addition, eliminating NCSI subsidies makes employment in sector B less profitable and increases the supply of labor to the segment of the economy where its marginal revenue product is highest: that is, to sectors I_1, I_2 and A. Thus, the reduction in the size of the

non-taxable sector B has two effects: as noted, it expands the tax base; but it also contributes to increase the average productivity of labor.

But most important for our purposes, fourth, note that ignoring any compensations, the social-cum-fiscal reform *reduces* the fiscal deficit by 0.35 percent of GDP vis-à-vis the *status quo*, given the level at which USI benefits are set. These benefits represent 64 percent of total VAT revenues, suggesting in turn that $\tau^{VAT/USI}$ and $\tau^{VAT/GP}$ are on the order of 10 percent and 6 percent, respectively; see equation (26).

The last column of Table 12, finally, includes three additional costs as part of the fiscal costs of the proposal: (i) direct transfers to the poor to offset the negative income effect of the VAT increases, as discussed in Section 9; (ii) compensations to state governments for the foregone revenue from eliminating state taxes on salaried workers;[8] and (iii) servicing the pension liabilities of IMSS-own workers directly by the federal government (as explained in Appendix 3). The relevant point to note is that when these costs are included, the net fiscal impact changes from a reduction in the fiscal deficit of 0.35 percent of GDP vis-a-vis the *status-quo*, as noted above, to an additional deficit of 0.34 percent of GDP.[9]

We could present results with a higher VAT rate or with lower USI benefits so as to leave the fiscal balance unchanged.[10] But that is not the point here.

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[8] Given the already high vertical imbalance and dependence of state governments on transfers from the federal government, it would be better if the revenues foregone by state government were replaced from another source like a state gasoline tax or improved incentives to collect in the Repeco regime, as opposed to being compensated by the federal government. This would reduce the costs of compensations by 0.2 percent of GDP.

[9] As noted, our calculations ignore the costs of maintaining subsidies for housing and day care programs, for approximately 0.5 percent of GDP (of which housing represents 0.4 percent). Assuming these are maintained along with all compensations, the fiscal deficit would increase relative to the status quo by 0.82 percent of GDP (or 0.62 percent excluding compensations to state governments).

[10] A scenario where the general VAT rate is set at 17 percent produces about 50,000 million pesos of additional revenues, or 0.4 percent of GDP. This would *reduce* the fiscal deficit vis-a-vis the status quo to 0.1 percent of GDP after considering all compensations (or to 0.3 percent if compensations to state governments are excluded). Alternatively, if housing and day care programs are maintained, the fiscal deficit vias-a-vis the *status quo* would increase by about 0.4 percent of GDP (or 0.2 percent if compensation to states is excluded). This suggests setting the VAT rate somewhere between 16 percent and 17 percent. On the other hand, our proposal would also have important implications for personal income taxes that we do not model here, and which could likely generate more revenues as salaried employment expands, or certain exemptions are eliminated (such as deductions for health insurance), given a context where the government provides all workers with SI benefits.

Rather, the point is that our calculations show that a proposal for USI financed from a consumption tax need not represent an unmanageable burden on the fiscal balance. Of course, whether this is so or not depends on considerations that lie beyond the scope of our paper, having to do with societal choices for taxation and other claims on public resources. That said, it is useful to be clear about the real policy alternatives, as the relevant comparison is in all likelihood not between USI and the 2008 *status quo*. The more relevant comparison is between USI and the observed trends in SI policy. In particular, if the Mexican government continues to respond as it has done so far to societal demands for increased social equity and improved coverage of risks for informal workers through further growth in NCSI programs in parallel to existing CSI programs, the result will be a narrower tax base, persistent productivity losses, increased incentives to informality, and further de-linking of benefits from contributions.

7.4 The End of Informality?

Fiscal and efficiency considerations aside, the most important effect of our proposal is to provide all workers with the same coverage against risks. If, following Kanbur (2009) and the discussion of Section 2, informality is defined with respect to the absence of observance of a particular regulation—SI coverage—, the reform indeed ends informality: all workers are covered by the same SI.

Completing Mexico's truncated welfare state, that is, replacing CSI+NCSI with USI, helps solve six critical problems present in a labor market characterized by frequent transitions across forms of employment. First, workers receive the IMSS health package regardless of their labor contract, with positive implications for their own welfare (and large implications for public subsidies for health which, as shown in Appendix 3, would increase by 52 percent, or an additional 1.1 percent of GDP). Second, the adverse selection problem created by the co-existence of two health insurance systems, one free and voluntary and the other costly and obligatory, are eliminated; health risks are pooled more effectively. Third, workers contribute to their retirement pension during their entire working life, not only when they are formally employed; as a result, as elaborated on in the next section, retirement pensions would be more generous. Fourth, all workers could qualify for the minimum pension guarantee because they would accumulate for their retirement pension throughout their working life. This feature is particularly relevant for low wage workers, the majority of whom, as a result of frequent transitions between formal and informal status, will not benefit from this guarantee (despite being the intended

beneficiaries).[11] Fifth and more generally, workers would be protected against risks regardless of the vagaries of their labor contract, increasing the efficacy of insurance. Finally, sixth, one would expect that because CSI taxes are eliminated, contractual changes and worker rotations that result from firms' strategies to evade these taxes would be likely to cease, facilitating more durable relations between firms and workers, more on-the-job learning, and increased investments in labor training.

But the end of informality is not the end of illegality. In our model, after the reform firms producing I_1, I_2 and A continue to evade value added and income taxes, and a sector beyond the reach of the tax authorities (sector B) continues to exist, although it is smaller. Our reform proposal does not solve the difficulties of imperfect enforcement, nor does it directly affect other determinants of the size distribution of firms, which in turn have an impact on enforcement (such as access to credit). Further, our proposal fails to address issues associated with the high costs of registration and compliance with sanitary, environmental and related regulations, which would also need to be tackled as part of a larger effort to reduce illegal behavior.

That said, there are additional potentially positive effects of our proposal not captured by our model. On the one hand, unifying the VAT rates would significantly simplify the administration of this tax, as the current cumbersome system of exemptions by location and type of good—and associated possibilities for arbitrage and graft—would be unneeded; in principle, this should facilitate enforcement. On the other hand, recall that our model takes the distribution of the capital stock in each sector—$f(K_1)$and $f(K_2)$—as given. In this context, we speculate that as the implicit tax on firm size associated with the CSI+NCSI configuration is removed, the profitability of larger vis-à-vis smaller firms would increase changing the size distribution of firms toward larger firms; this in itself would be a factor facilitating enforcement. Exploring these issues, however, is left for further research.

7.5 Decomposition of the Increase in VAT Revenues

To shed further light into our results, Table 13 divides total VAT collections into those originating from goods I_1, I_2 and final good A, and provides the estimated

[11] As noted, from 1997 to 2006, the average contribution density for low wage workers was 49 percent, implying the need to work 50 years to benefit from this guarantee (since under CSI 25 years of formality are needed to qualify). In contrast, under USI nonsalaried employment would also be considered (implying contribution densities of 100 percent).

Table 13: Decomposition of the Total Increase in VAT Revenues

	Calibrated	VAT = 15%, $\hat{\xi}_1^{VAT} = 0$, CSI+NCSI	VAT = 16%, $\hat{\xi}_1^{VAT} = 0$, CSI+NCSI	VAT = 16%, $\hat{\xi}_1^{VAT} = 0.36$, CSI+NCSI	VAT = 16%, $\hat{\xi}_1^{VAT} = 0.36$, USI
VAT revenues*	457.9	683.7	726.6	824.2	873.6
I_1	0	0	0	36.0	42.8
I_2	211.6	211.6	222.2	224.8	267.4
A	246.3	472.1	504.4	563.4	563.4
Compliance rates					
$\hat{\xi}_1^{VAT}$	0.00	0.00	0.00	0.36	0.36
$\hat{\xi}_2^{VAT}$	0.61	0.61	0.61	0.61	0.61
ξ_A^{VAT}	0.43	0.43	0.43	0.53	0.53

Source: Authors
*Thousands of million of pesos.

values of the aggregate rates of compliance for each of the VAT reform scenarios (see equation (10) and Appendix 1).

The calibrated equilibrium in the second column shows, as expected, that the compliance rate in I_1 is zero when τ_1^{VAT} = 0. VAT collections all come from I_2, where the VAT rate is 15 percent and the rate of compliance 0.61; and from final good A, where the VAT rate and the rate of compliance is a weighted average of the corresponding rates in sectors I_1 and I_2. Column three measures the impact of the VAT reform when τ_1^{VAT} = 15 percent, while column four sets the VAT rate in both sectors I_1 and I_2 at 16 percent. In these two columns we assume that the VAT reform occurs in isolation (that is, the CSI+NCSI configuration is maintained).

Now, to identify the impact that compliance in intermediate sector I_1 has on compliance in the final sector A, in columns three and four we artificially assume that, despite the fact that all firms in sector I_1 now face a positive VAT rate, none comply with the VAT (clearly not a profit maximizing point). As a result, in both these columns the compliance rate in sector A is the same as before. Under this assumption, a VAT reform where rates are set at 15 percent produces total VAT revenues of 683,700 million pesos (column three); and of 726,600 million pesos when these rates are set at 16 percent (column four). Note that in both cases most of the additional revenues come from final good A since, by assumption, sector I_1 pays no additional VAT (and sector I_2 pays a VAT rate that is only one percentage point higher in column four).

The interesting result arises in column five where, while still maintaining the CSI+NCSI configuration, we now allow sector's I_1 aggregate compliance rate to be determined by equation (10) which, given the size distribution of firms in that sector, is 0.36. Two effects follow. First, firms in that sector now pay 36,000 million pesos of VAT, compared to none before. Second, VAT paid by sector A increases by 59,000 million pesos, with the net result that total VAT revenues increase by 13 percent (from 726,600 million pesos to 824,200 million pesos or by 0.8 percent of GDP), for the same 16 percent VAT rates. These two effects, particularly the revenue increase in sector A, sharply illustrate, in accordance with our earlier discussion and with De Paula and Scheinkman's (2010) "chain effects", that higher compliance in the intermediate sector induces higher compliance in the final sector. Indeed, sector's A compliance rate increases from 0.43 to 0.53.[12] Put differently, reduced evasion in I_1 translates into reduced evasion in sector A. The chain of accreditation and payment is strengthened. Because firms in sector I_1 pay more VAT, they issue more VAT invoices, which in turn induces firms in sector A to pay more VAT to be able to get credit for the VAT paid to firms in sector I_1.

We highlight that these "chain effects" are not small: the increase in revenues in sector A from having sector I_1 pay some VAT translates into 59,000 million pesos of additional revenues, or approximately 0.4 percent of GDP. This compares with the direct VAT payments of sector I_1 of 36,000 million pesos (or 0.3 percent of GDP). Thus, "chain effects" matter greatly for policy: they show that focusing only on the additional VAT that firms in sector I_1 would pay by eliminating the exemptions to food and medicine misses the significant fact that, by completing the value added chain, the higher rate on I_1 induces greater compliance with the VAT throughout the whole economy.

Finally, the last column in Table 13 picks up the effect of the SI reform, from CSI+NCSI to USI. As discussed, firms in sectors I_1 and I_2 face lower labor costs, expand employment and output and, for the same compliance rates, pay more VAT. The net result is that the increase in total VAT revenues from 457,900 mp (or 3.7 percent of GDP) under the *status quo* to 873,600 mp (or 7.1 percent of GDP) under our proposal, results from four factors: (i) an increase in VAT in I_1 from 0 to 15 percent (as captured in column three vs. column two); (ii) an increase in

[12] In parallel, note that the aggregate compliance rate in sector I_1 is lower than in sector I_2, 0.61 vis-a-vis 0.31. This result follows from the fact that the size distribution of firms in sector I_1, where food and medicine are produced, is skewed to the left in comparison to that of sector I_2. This can be verified by noting that a larger share of employment in sector I_1 occurs in small firms versus sector I_2 (see Table 8).

VAT from 15 percent to 16 percent for sectors I_1 and I_2 (as captured in column four vs. three); (iii) compliance in I_1 and its impact on compliance in sector A (as captured in column five vs. four); and (iv) reforming the SI regime (as captured in column six vs. five).

7.6 Are VAT Collections of 7.1 Percent of GDP Feasible?

We turn to a brief discussion of the robustness of our results, with emphasis on the fiscal estimates. Because the costs of USI benefits are exogenously given, the additional revenue generated by the VAT reform is the central question to determine the fiscal feasibility of our proposal.

Table 14 compares the VAT to GDP ratio observed in ten Latin American countries with three ratios for Mexico: the one observed in 2008 with a 15 percent general rate but exemptions to food and medicine; the one predicted by our model when rates are set at a uniform value of 16 percent but CSI+NCSI taxes and subsidies remain; and the one predicted by our model with the same reform but with USI replacing the CSI+NCSI configuration. Rates and revenue ratios vary given country differences in exemption regimes, shares of exports and imports in

Table 14: Rates, Revenues and Productivity of VAT

	Basic rate (%)	Revenues/ GDP	Productivity
Mexico:			
CSI+NCSI and exemptions (2008)	15*	3.8	0.25
CSI+NCSI no exceptions	16	6.8	0.42
USI no exceptions	16	7.1	0.44
Uruguay	22	10.7	0.48
Brazil	17	8.3	0.48
Chile	19	7.4	0.39
Nicaragua	15	7.3	0.48
Argentina	21	7.2	0.34
El Salvador	13	7.0	0.54
Bolivia	13	6.4	0.49
Venezuela	12	6.4	0.53
Colombia	16	5.5	0.34
Guatemala	12	5.4	0.45

Source: Authors' calculations from country data.
*The average rate given exemptions is close to 10 percent.

GDP, evasion and informality (as reflected in the "productivity" measure obtained from dividing the revenue ratio over the basic rate).

We make four points: first, by Latin American standards Mexico is currently an outlier in terms of its very low revenue ratio. Second, a uniform 16 percent rate is not higher than that observed in Uruguay, Brazil, Chile, Argentina and Colombia.[13] Third, our model prediction of a revenue ratio of 7.1 is within the range of experiences observed in Latin America, particularly taking into account that this ratio would derive from a reduction in the size of the non-taxed sector and of firms' incentives to evade.

The fourth point follows from comparing the two simulated VAT to GDP ratios. In our model, changes in VAT revenues result from labor reallocations as firms and workers respond to changes in value added and SI tax and subsidy rates. As discussed, the VAT reform that maintains CSI+NCSI taxes and subsidies re-allocates labor in the direction of informality, eroding the tax base. This suggests that if USI replaced the CSI+NCSI configuration in parallel with the VAT reform, VAT revenues would be at least 6.8 percent of GDP. Indeed, this figure would result from eliminating the tax on formal labor and the subsidy to informal labor, but with firms demanding fewer legal salaried workers, while illegal salaried employment, self-employment and employment in family firms would expand in response! Put differently, even if the elasticities of the demand for labor in all firms and sectors were not only different in value from the ones implied by our model, but of the opposite sign, the lower bound for the VAT/GDP ratio would be 6.8 percent. Of course, we expect labor to flow in the opposite direction when USI is introduced generating an additional 0.3 percent of GDP in VAT revenues, according to our model. From this perspective and in the light of the comparison of Mexico vis-à-vis other countries in Latin America, it seems reasonable to expect VAT revenues on the order of 7.1 percent of GDP in response to the proposed fiscal-cum-SI policy reform.[14]

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[13] By contrast, VAT rates for OECD countries (of which Mexico is a member), as of 2007 were: Sweden 25, Finland 22, Italy, 20, Belgium, 21; France, 19; Greece, 18; United Kingdom, 17.5; Portugal, 17; and Spain, 16; see Bird and Gendron (2007). More recently some of these countries have raised their rates. In parallel, Hernández (2009) compares Mexico's performance with countries like Canada and South Korea, which also have important exemptions and special treatments, and finds that VAT revenues in Mexico are low.

[14] Indeed, over the medium term one would expect even higher VAT revenues as the marginal product of capital in the taxable sector of the economy increases with the reform (because salaried employment expands), thus inducing more investments in that sector; while it falls in the non-taxable sector (because the subsidy to nonsalaried employment disappears), thus reducing the incentives to invest there.

7.7 Costs of Labor Contracts: USI versus CSI+NCSI

We end this section quantifying the implications of USI for the costs of salaried and nonsalaried labor contracts. The solid lines in Figure 2 plot the average expected cost of salaried and nonsalaried contracts to individual firms under CSI+NCSI, given the formal and informal wage rates w_f and w_i observed in this scenario. The horizontal line at w_i shows that the expected average costs of nonsalaried labor is constant, since regardless of the number of workers engaged with firms, they pay no CSI taxes; these are the costs of labor in sector B. The curved line, on the other hand, depicts the expected average cost of salaried labor to firms producing intermediate good I_2 (the line for firms in sector I_1 is very similar); it is drawn for all firms in the sector, each ordered by their respective capital stock $k_2 \in [\underline{K}_2, \overline{K}_2]$.[15] It begins at w_i since a firm hiring only one salaried worker would do so illegally at the informal wage (given that the probability of detection is practically nil), but is upward-sloping because firms with more capital employ more workers, and as the number of workers in the firm increases, firms optimally chooses to employ a larger proportion of formal than informal workers given increasing probabilities of detection. Note that for firms with more than 50 workers the line flattens as the average cost of salaried labor converges to the cost of formal labor, $w_f[1+(1-\theta)\tau^{CSI}]$, at which point expected average labor costs are basically constant, with firms hiring all their salaried workers formally.

These lines illustrate sharply two distortions in the labor market created by the CSI+NCSI duality. The first is the large difference between the cost of nonsalaried and salaried labor. Indeed, the estimated difference between w_i and $w_f[1+(1-\theta)\tau^{CSI}]$ is 24 percent, a result that helps explain the large share of total employment accounted for by self-employed workers and family firms shown in Table 2. The second is that the average costs of salaried labor increase steeply as firms become larger and hire more workers. This is particularly the case for firms hiring up to around ten workers, and is a graphic depiction of the implicit tax on firm size that occurs in a context of evasion and imperfect tax enforcement. This result is consistent with the large number of firms with fewer than ten workers shown in Table 1; see also the discussion of Table 5.

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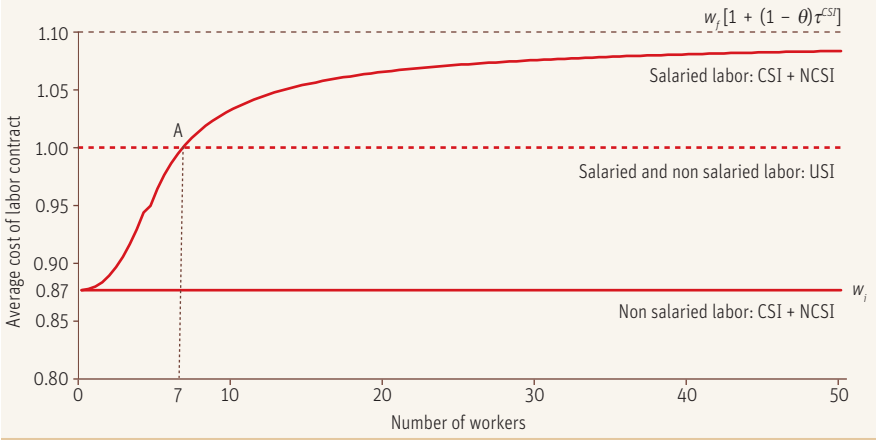
15 In particular, for each firm we solve the maximization problem in equation (7) given the formal and informal wage rates observed under CSI+NCSI, assuming the same probability of detection function $\lambda_2^{CSI}(..)$ used in all our calculations. For each firm we obtain the optimal combination of legally and illegally hired salaried labor given by equations (8) and (9), and compute the average cost of labor for the firm's optimal level of employment.

Figure 2: Costs of Salaried and Nonsalaried Labor Contracts



On the other hand, the dotted line in Figure 2 depicts the costs of nonsalaried and salaried labor contracts under USI which, by construction, are the same. As expected, the unified cost of labor lies between the costs of nonsalaried and salaried labor under CSI+NCSI, and provides a useful reference against which the tax-cum-subsidies implicit in CSI+NCSI can be quantified. In particular, we find that all nonsalaried contracts receive an implicit subsidy of almost 14 percent, while salaried contracts may be subsidized or taxed, depending on the size of the firm. As shown in point A, for the calibrated probabilities of detection and fines, the labor costs of firms hiring up to seven salaried workers are subsidized, while they are taxed for those hiring more than that, with the tax increasing to almost 10 percent for firms with over 50 workers.[16] The implication is clear: the transition from CSI+NCSI to USI would average lower labor costs for all firms hiring more than seven salaried workers, and would increase them for firms hiring up to seven salaried workers and for all family firms with nonsalaried workers; in addition, it would increase the opportunity costs of self-employment.

[16] At times the tax-cum-subsidies on nonsalaried and salaried labor under CSI+NCSI are measured with regards to the observed formal and informal wage. We think it is more appropriate to measure them with respect to the wage that would be observed when these tax-cum-subsidies are absent, in our case the wage that would be observed under USI. The point here is that wages themselves are a function of these taxes and subsidies. The difference is important: taking as reference the formal and informal wage, as noted before, the tax on salaried labor is about 20 percent and the subsidy to nonsalaried of about seven percent, while as shown in Figure 2, taking as reference the USI wage the tax is 10 percent and the subsidy 15 percent.

CHAPTER 8

Complementary Social Insurance for Salaried Workers

This section extends our proposal to cover risks that are specific to salaried status and to allow for pensions that are proportional to workers' wages.

8.1 A Second Pillar for Pensions

We begin with retirement pensions. In a context where there are wage differences across workers (due to skill differences, for example), our proposal so far implies that workers who earn less than twice the minimum wage would save a higher share of their earnings than what workers in that earnings range save under CSI (since under USI all workers receive a contribution to their individual retirement account equal to that received by a worker earning twice the minimum wage); workers earning twice the minimum wage would save the same share as under CSI; and workers earning more than twice the minimum wage would save a lower share. Therefore, retirement pensions would also be the same, implying declining replacement rates as earnings increase. However, some arguments suggest that retirement pensions should also help workers smooth consumption between their active time and their time as retirees. To achieve constant replacement rates, contributions need to be set as a share of individual worker's earnings and not as the same amount for all workers.

We add consumption smoothing to our proposal through a two-pillar retirement pensions system. The first pillar consists of a fixed contribution to workers' individual retirement accounts regardless of their wages as described in the previous section. The second pillar consists of a variable contribution to the same accounts, which depends on worker's wages. We elaborate on this proposal immediately below but point out a critical limitation up-front. Savings for the second pillar would occur only when workers are in salaried employment, because only

then could their wages be observed and taxed "at the door of the factory", in the same way CSI taxes currently operate. For the reasons discussed earlier in this paper, self-employed workers and workers in family firms could not be taxed for the second pillar, and the government would be unable to smooth their consumption through time.[1]

We set the contribution rate for the second pillar as a function of salaried workers' wages after considering the fixed contribution corresponding to the first pillar. In particular, we set it such that contributions from both pillars add up to the total contribution made under CSI (including the government subsidy). The result is a variable rate, $\tau_{sj}^{CB}(w_{sj})$, obtained from the difference between the amount contributed for retirement pensions under CSI for each wage level j (j = 1, 2, .., J) and the amount corresponding to a worker earning twice the minimum wage, expressed as a share of the wage (where the superscript CB denotes complementary SI benefits and w_{sj} denotes the wage of salaried workers in wage level j). By construction, this complementary contribution would only be positive for workers earning more than twice the minimum wage, and would be increasing in wage levels expressed both as a share of the wage and in absolute terms (since twice the minimum wage represents a decreasing proportion of earnings as wages increase).[2]

The same procedure can be repeated for life and disability pensions. In this case, τ_{sj}^{CB} is reinterpreted as the complementary contribution rate for both retirement, and life and disability pensions, and is calculated as described above. The only difference is that revenues for life and disability pensions are deposited in the IMSS-managed common reserve fund for risk pooling purposes, while revenues for retirement pensions are deposited in workers' individual retirement accounts.

Consider, finally, risks that are specific to salaried workers: in particular, accidents suffered in the work-place because the firm fails to comply with safety standards. These risks are covered through work-risk insurance, and two points

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[1] The government could induce nonsalaried workers to save more for their retirement with matching contributions or incentives through the income tax law. But these savings would be voluntary, in contrast to the forced savings imposed on salaried workers.

[2] Since the second pillar is fully funded from ear-marked wage-based taxes, there are no implications for the government's fiscal balance. In equation (28) one would just add on both the revenue and the expenditure side the term

$$\sum_{j=1}^{J} \tau_{sj}^{CB}(w_{sj}) w_{sj} L_{sj}$$

which measures the contributions made to the retirement pensions of salaried workers under the second pillar.

are relevant in this context. First, for moral hazard reasons contributions need to be firm-specific, based on firm's safety records. Second, contributions need to be made for all salaried workers, including those earning less than twice the minimum wage, as work accidents are not insured by USI. In this context, we reinterpret $\tau_{sj}^{CB}(w_{sj})$ as the wage-based contribution rate that covers work-risk pensions for all salaried workers; and for those earning more than twice the minimum wage, complementary contributions for retirement and life and disability pensions.

8.2 Complementary Pension Benefits and Taxes on Salaried Labor

Table 15 shows the implications of complementary pension benefits for workers' utility and firms' labor costs. Following the discussion above, we refer to workers as salaried and nonsalaried rather than formal or informal, given that in a context where all workers benefit from USI the adjectives formal and informal are no longer relevant. Note that $\beta_s^{CB} \in [0,1]$ is salaried worker's valuation of the complementary pension benefits (assumed the same for all workers), and w_{ns} the wage rate or, more precisely, equivalent earnings of nonsalaried workers.

Clearly, if $\beta_s^{CB} = 1$, complementary pension contributions do not create a "pure" tax on salaried labor, nor distort the choices of firms and workers. The incidence of the tax is fully shifted to workers, with no changes to the composition of employment vis-à-vis the USI equilibrium with $\tau_{sj}^{CB}(w_{sj}) = 0$ for all s, j. However, if for reasons having to do with lack of trust in the system or hyperbolic discounting in the case of retirement pensions, or actuarially unfair fees for work-risk and life and disability pensions, $\beta_s^{CB} < 1$, a pure tax on salaried labor is introduced, with the accompanying distortions in the choices of firms and workers. That said, note that by construction $\tau_{sj}^{CB}(w_{sj}) < \tau^{CSI}$; additionally, one expects that $\beta^{CB} > \beta^{CSI}$, since in the bundle of complementary pension benefits there are no cross-subsidies for health, housing or day care. As a result, even if $\beta_s^{CB} < 1$,

Table 15: Workers' Utility and Firms' Labor Costs with Two-pillar Pension System

	Worker's utility	Cost of labor	"Pure" labor tax
Salaried	$w_{sj}[1+\beta_s^{CB}\tau_{sj}^{CB}(w_{sj})]+\beta^{USI}\tau^{USI}$	$w_{sj}[1+\tau_{sj}^{CB}(w_{sj})]$	$(1-\beta_s^{CB})\tau_{sj}^{CB}(w_{sj})$
Nonsalaried	$w_{ns}+\beta^{USI}\tau^{USI}$	w_{ns}	0

Source: Authors.

the pure tax is smaller than the one present under CSI and, in particular, lower for workers at the bottom end of the wage distribution.

Table 16 presents the values of τ^{CSI} and $\tau_{sj}^{CB}(w_{sj})$ by wage level measured in multiples of the minimum wage where, to reiterate, $\tau_{sj}^{CB}(w_{sj})$ is computed such that contributions for work-risk, retirement and life and disability pensions are the same as what formal workers receive under CSI. In addition, the table shows the (cumulative) distribution of workers by formality status and wage level in 2008.

Note first that for workers who earn up to twice the minimum wage our proposal implies a more than twenty-fold reduction in wage-based taxes, as these taxes only cover work-risk insurance. Second, for workers earning up to four times the minimum wage, representing 79 percent of the labor force, the reduction in wage-based taxes is also very large, from 32 percent of the formal wage to 6.1 percent. But, third, even for workers earning up to fifteen times the minimum wage, representing 98 percent of the labor force, these taxes would fall by more than two thirds. Thus, our proposal allows for a very large reduction in labor taxes for all currently formal workers, from 32 percent to a weighted average of 5.5 percent. These workers, at the same time, would receive at least the same health and pension benefits as under CSI.

The more relevant comparison, however, is between the pure taxes and subsidies in both cases. As noted, under the CSI+NCSI configuration the "pure" tax on salaried labor is 20 percent, and is accompanied by a subsidy to nonsalaried labor of 7 percent (of the informal wage). To determine the "pure" tax under our proposal we need to estimate the value of β_s^{CB}, which is not feasible since this scenario has not been observed. That said, assume arbitrarily that this parameter equals 0.85 (the same value calculated for β^{NCSI}). In this case, the "pure" tax ranges from a low of 0.22 percent for workers earning up to twice the minimum wage, to a high of

Table 16: Contribution Rates by Wage Level
(multiples of the minimum wage)

	Up to 2	2–3	3–4	4–5	9–10	14–15
τ^{CSI}	0.320	0.320	0.320	0.320	0.320	0.320
$\tau_{sj}^{CB}(w_{sj})$	0.015	0.045	0.061	0.069	0.087	0.093
Formal (%)*	34	56	69	77	91	96
Informal (%)*	49	72	86	90	98	99
Total (%)*	42	65	79	84	95	98

Source: Authors. *Cumulative.

1.4 percent for workers earning fifteen times the minimum wage; even if $\beta_s^{CB} = 0.5$, these taxes would range from 0.75 percent to 4.6 percent. In addition, there would be no subsidy to nonsalaried labor. Put differently, even when complementary pension benefits for salaried workers paid through a Bismarckian wage-based tax are incorporated into our proposal, there is still a drastic change in the tax-cum-subsidies on salaried and nonsalaried labor vis-à-vis the CSI+NCSI configuration.[3]

Table 16 is also of considerable importance from a macroeconomic point of view. In our model, all goods are traded and we cannot properly speak of a real exchange rate. That said, we can compute the ratio of an index of good prices to an index of the costs of salaried labor (wages plus SI benefits), which could be thought of as a proxy measure of the real exchange rate. This ratio changes from 1.00 under the CSI+NCSI configuration, to 1.09 under USI. This would be a measure of the—so-to-speak—real depreciation implied by our proposal, interpreted here as a reduction in the price that firms pay for labor in terms of the exogenously given goods prices. In parallel, note that the VAT increase has a different impact on export vs. imports, as only the former are VAT-exempt. As a result, the relative price of exports in term of imports would decrease, mimicking the result obtained in traditional trade models by combining a tax on imports and a subsidy to exports.[4]

8.3 Complementary Pension Benefits and Savings

Table 16 also has substantive implications for individual worker's retirement pensions, and for the level of aggregate savings associated with SI. On one hand, individual workers would enjoy higher retirement pensions vis-à-vis CSI because they would accumulate for their pensions throughout their working lives. When employed as salaried workers, they would accumulate in their individual accounts the same amount as under CSI (although the expectation is that average time in

[3] An extension of our model to incorporate skill and wage differences and capture how $\tau_{sj}^{CB}(w_{sj})$ impacts firms' decisions to evade these contributions and the VAT is left for further research. As noted, the weighted average of $\tau_{sj}^{CB}(w_{sj})$ is 5.5 percent. Incorporating this value into our model assuming that $\beta_s^{CB} = 0.85$ yields VAT revenues that are just 1 percent lower than in the USI equilibrium without complementary contributions, so a preliminary result is that the distortions introduced by these complementary contributions are fairly small (the average "pure" tax on salaried labor is 0.8 percent vis-a-vis 20.0 percent under CSI).

[4] These results are related to the literature on "fiscal devaluations", recently relevant in the context of attempts by some member countries of the euro currency union to regain competitiveness by lowering labor costs by shifting SI taxation from labor to consumption, given the impossibility of a nominal exchange rate devaluation; see Feldstein and Krugman (1990), Farhi, Gopinath and Itskhoki (2011) and IMF (2011).

Table 17: Aggregate Annual Flow of Savings for Retirement
(thousands of million of pesos)

	CSI	USI
Salaried workers		
From wage-based contributions	54.9	56.6*
From government contributions	17.5	89.4
Nonsalaried workers		
From wage-based contributions	0	0
From government contributions	0	46.8
Total	72.4	192.8

Source: Authors.
*Assuming the same wage distribution for all salaried workers under USI as the one observed under CSI.

salaried employment would increase). In addition, when employed in nonsalaried positions they would still accumulate through the first pillar. Put differently, contribution densities would be in principle 100 percent (vs. 45 percent under CSI), with at least the same amount of contributions as under CSI. Replacement rates would thus be unambiguously higher.[5]

On the other hand, Table 17 shows that the aggregate annual flow of savings for retirement under our proposal is higher than under CSI, for two reasons. The first one is an increase in the number of salaried workers under USI vs. formal workers under CSI (see Table 12). The second is due to the contributions made for nonsalaried workers under USI. The result is an increase in savings for retirement of 166 percent, or almost an additional 1 percent of GDP.[6] Of course, forced savings for retirement could be offset by lower voluntary savings. But unless this offset occurs on a one-to-one basis, there would be a net increase in aggregate domestic savings.[7] In turn, these additional savings could strengthen investment by firms since these savings would be long term resources deposited in the Afores.

[5] Incentives to firms to underreport salaried workers wages would also be lower, as wage-based taxes fall from 32 percent of the wage to an average of 5.5 percent. This would also augment resources accumulated for pensions.

[6] Over the medium term the proposal would also considerably deepen the market for annuities and resources channeled to private insurance firms, as all 39 million workers would purchase an annuity upon retirement, as opposed to 12.3 million formal workers under CSI. Similar observations hold for annuities derived from life, disability and work-risk pensions.

[7] Aguila (2011) studied the impact of Mexico's 1997 pension reform and found that only about 32 percent of forced savings in the new defined contribution system through individual retirement accounts was offset by reduced individual savings.

8.4 Unemployment Insurance as Part of USI?

We finish this section with a remark on risks faced by salaried workers as a result of negative output shocks. Mexico has no unemployment insurance. Rather, salaried workers are covered against this risk through severance pay and related regulations on firing. As discussed by Heckman and Pagés (2004), these regulations represent a contingent cost to formal hiring that needs to be added to the explicit costs of CSI. Indeed, the fact that these regulations do not generate a counterpart monetary flow recorded as revenue somewhere (like health insurance or retirement pensions), should not detract from the more important fact that they increase the expected costs of salaried labor, affecting firms' hiring decisions in much the same fashion that explicitly legislated CSI taxes do. It should also not detract from the fact that severance pay is an integral component of Mexico's SI architecture.

The evidence for Mexico suggests that severance pay is an ineffective mechanism to protect salaried workers against the loss of employment (Kaplan and Sadka 2008; Kaplan, Silva-Méndez and Sadka (2008); Calderon, 2010). In this context, our proposal facilitates a reform of severance pay that would protect workers more effectively through unemployment insurance, for three reasons. First, under the USI architecture, contributions for unemployment insurance can be added to $\tau_{sj}^{CB}(w_{sj})$ as another complementary SI benefit for salaried workers, and thus be paid by firms on a flow basis, perhaps through deposits in workers individual accounts, ensuring better protection for them.[8] Second, under our proposal, even if workers lose their salaried job, they are still covered by health, life and disability insurance and, at least for some period, continue to receive contributions for their retirement pensions (through the first pillar). Third, salaried employment would be higher than formal employment under the CSI+NCSI configuration, implying that more workers would be protected against these risks (see Table 12). Substituting severance pay, partly or wholly, with unemployment insurance in the context of USI is an important area of future research, with potentially large policy implications.

[8] Firms in Mexico are not legally required to set aside reserves for severance payments. This creates difficulties for workers, as firms must make large lump-sum payments to workers precisely when they are facing negative output shocks and may be cash- or credit-constrained. The result is an incentive for firms to either litigate severance payments in labor courts when they have to fire workers or, in the case of smaller firms, to declare bankruptcy. In any event, the implication is that workers fail to receive income support precisely when they need it most.

CHAPTER 9

Some Implications of USI for Poverty and Inequality, and for Productivity

9.1 The VAT, Poverty and Inequality

Perhaps the central argument against a VAT reform in Mexico, particularly one focused on raising the rate on food and medicine, is associated with its regressive effects on poor households. In our proposal this effect is in principle more than offset by the increase in the real wage resulting from lower CSI taxes (or, put differently, from a lower "VAT" at the door of the factory). Nevertheless, in a more realistic context where household composition differs, or where some households have only elderly members, the VAT increase could negatively impact the poor. To insure this is not the case, our proposal includes compensating them with direct income transfers to fully offset the effects of the VAT increase, ignoring the benefits of a higher real wage. To do so, we calculate the additional VAT paid by households in the first two deciles of the income distribution, which we assume to be the population living under conditions of extreme poverty, offset these extra taxes by direct income transfers (carried out perhaps through a targeted program like Progresa-Oportunidades), and add the costs of these compensations to the fiscal costs of our proposal.

Data from Mexico's 2008 income-expenditure survey indicates that households in the first two deciles of the income distribution account for 6.9 percent of total consumption. Our proposed VAT reform, on the other hand, extracts an additional 416.4 thousand million pesos from all households, of which 28.8 thousand million pesos correspond to poor households (this is the amount added to the fiscal costs of the proposal in the last column of Table 12). Setting compensations at this level, our proposal would have an unambiguously positive effect on the poor:

they would pay no additional net taxes; receive the same SI benefits as other households (including making effective the minimum pension guarantee); earn a higher real wage; and benefit from the largest reduction in CSI taxes, as these taxes are practically eliminated at the bottom of the wage distribution (see Table 16).

There are three additional positive effects on poverty. The first is associated with the incentive structure faced by poor workers in the labor market. Levy (2008) argues that because some NCSI programs are targeted to the poor, on one hand, and because the poor tend to place a lower value on the benefits of CSI programs than the non-poor, on the other, the tax on formality and the subsidy to informality are higher for them than for non-poor workers. As a result, poor workers are over-represented among informal workers: they are 24 percent of the labor force but account for 36 percent of informal employment (Levy, 2008). Because the marginal product of labor in informal employment is below that of formal employment, this implies that the CSI+NCSI configuration induces poor workers into lower productivity jobs. In this context, USI would improve the conditions under which poor workers participate in the labor market, removing impediments resulting from current SI policy to their finding higher productivity jobs.

Second, our proposal would align the incentives of Progresa-Oportunidades with the incentives generated by SI policy. At present, the investments in the human capital of poor youngsters made by Progresa-Oportunidades are unlikely to yield the expected returns because when these youngsters enter the labor market they are, in the CSI+NCSI configuration, induced into informal jobs. Our proposal would help increase the value of these investments, and through a better functioning labor market, raise the expected returns to education. In parallel, poverty policy could achieve a better pairing of instruments and objectives: USI would focus on protecting poor workers against risks, while Progresa-Oportunidades could focus exclusively on investments in the human capital of the poor (eliminating the use of this program to respond to shocks that should be covered by SI).[1]

The third effect has to do with vulnerability to negative shocks of non-poor Mexican households who have incomes just slightly over the poverty line. López-Calva and Ortiz-Juárez (2011a) show that uninsured shocks are a cause of downward mobility and high entry rates into poverty when these households experience negative systemic events like bad weather and natural disasters, but also idiosyncratic shocks like illness, disability and death. If these households could

[1] Our proposal thus implies that Progresa-Oportunidades would continue as a targeted poverty alleviation program, in parallel to USI.

Table 18: Distribution of VAT Burden and SI Benefits by Income Deciles
(thousands of million of pesos)

	I–II	III–IV	V–VI	VII–VIII	IX–X
Additional VAT	(–) 28.8	(–) 47.84	(–) 64.06	(–) 87.76	(–) 187.2
Compensations to the poor	(+) 28.8	0	0	0	0
Net gain in SI benefits	(+) 66.4	(+) 66.4	(+) 66.4	(+) 66.4	(+) 66.4
Net impact	(+) 66.4	(+) 18.56	(+) 2.3	(–) 21.36	(–) 120.8

Source: Authors.

better insure these latter shocks—as they would under our proposal—their negative impact would be lessened or eliminated, resulting in reduced downward mobility and, overtime, a lower aggregate poverty rate.[2]

USI would also reduce inequality. Table 18 presents the results of a simple exercise where we distribute the additional burden of the VAT under our proposal over all households in proportion to their share in total consumption. The table shows also direct compensations (only to the poor), and the change in subsidies for SI between CSI+NCSI and USI assuming benefits are distributed uniformly across income deciles. Though oversimplified, the table serves to make two points. First, our proposal would have a strong redistributive effect: all households up to the first six deciles of the distribution would benefit, while most of the net burden would be paid by households in the highest two deciles. The reason is simple: in a context like Mexico's, with high inequality in the distribution of income and consumption, in absolute terms the VAT extracts substantially more resources from higher-income households than from lower-income ones.[3] If those resources are evenly distributed to provide the same SI benefits to all regardless of income level, it is not surprising that the net result is reduced inequality.

[2] Further, using longitudinal data for 2002–05, López-Calva and Ortiz-Juárez (2011b) calculate the probability that a non-poor unskilled urban informal worker in Mexico with primary education and access to insurance has of falling into poverty, and compare that probability to the one that would obtain if that worker lost access to insurance, or the one that would obtain if he kept access to insurance and in addition had three more years of education. Interestingly, they find that the effect of having insurance is quantitatively larger than acquiring more education to prevent workers from falling into poverty, highlighting the importance of extending the coverage of insurance to the near-poor.

[3] This is why regardless of considerations about social insurance, exemptions to the VAT are a very inefficient instrument to redistribute income in Mexico. See Davila and Levy (2003).

The second point is related to the redistributive motivation of Bismarckian SI. Assume for a moment that all households in Mexico had the same income. Then our proposal would just change the composition of all households' consumption equally, reducing their disposable income as a result of the higher VAT by the same amount, and giving them in return the same bundle of SI benefits contained in τ^{USI}. This would achieve the government's aim that all households be protected against risks, but without any redistribution of income between them. In principle, even in a society characterized by perfect equality in the distribution of income, SI is still desirable to correct for market failures, aggregate risks, and so on. This exercise makes clear that the income redistribution that in Mexico's case would be achieved under USI is a byproduct of the underlying inequality in the distribution of income and consumption, rather than the express objective of SI. The point here is that in general one cannot expect one instrument, SI, to achieve two objectives at the same time: to change the composition of all workers' consumption *and* to redistribute income from high-income to low-income households. That said, the redistribution that would occur in Mexico under USI would of course be welcome but, more importantly, substantially more effective than the one that is tepidly being achieved today, if at all, under Bismarckian SI.[4]

9.2 Labor Market Distortions, USI and Productivity

Lagging productivity is the main reason why Mexico's growth performance has been lackluster over the last few decades.[5] Many factors account for this, and it is difficult to disentangle the relative weights of each. However, evidence suggests that misallocation of capital and labor resulting from distorted factor and output prices is a significant source of total factor productivity losses (Hsieh and Klenow, 2009b; IDB, 2010). In turn, distortions in the price of labor derive from Mexico's dual SI architecture, as in the CSI+NCSI configuration this price varies by the type of labor contract and firm size; see Table 5 and Figure 2. The results are large differences in the marginal revenue product of labor across firms and sectors, which misallocates factors and reduce productivity. Busso, Fazio and Levy (2012) classify

[4] Of course, there would still be room for re-distribution through other taxes, in particular income taxes, and through other components of expenditure policy.

[5] From 1960 to 2007 factor accumulation was faster in Mexico than the United States; if total factor productivity (TFP) had kept pace, relative income per capita would be 24 per cent higher in 2007 than in 1960. However, the sharp fall in Mexico's TFP relative to the United States since 1980 more than offset the gains from factor accumulation, with the result that in 2007 Mexico's relative income per capita was 14 per cent lower. See Busso, Fazio and Levy (2012).

Mexican firms in the 2008 Economic Census by formality status, group them into six-digit sectors, and estimate indices of total factor productivity for each firm. They find that controlling for size and sectors, informal firms with nonsalaried contractual relations are less productive than informal firms with illegal salaried labor, which in turn are less productive than formal firms with legal salaried labor. All in all, they find that formal firms produce about 35 percent more output from the same amount of capital and labor than informal firms.[6]

Firm's evasion strategies affect critical dimensions that impact productivity like size and legal status (with implications for firms' access to credit from the formal financial system, for investments in innovation or technology adoption, and for links with suppliers of inputs); or the duration and type of labor contracts (with implications for firm's investments in labor training or on-the-job learning). In general, an atmosphere of illegality and informality leads to inefficiently high levels of self-employment and nonsalaried employment in family firms, excessive labor turnover, a size distribution of firms skewed towards smallness, and a bias toward sectors and activities where evasion of labor and CSI regulations can occur more easily.

Our proposal would have a positive effect on productivity by closing the wedge between the price of salaried and nonsalaried labor; by removing the implicit tax on firm size derived from SI policy; and by eliminating labor turnover associated with firm's evasion strategies. We speculate as well that a context of more legality and reduced evasion could reduce uncertainty, improve firm's access to credit and expand their planning horizons, in turn facilitating more vertical integration, fuller exploitation of economies of scale, and increased investments in labor training, technology adoption and innovation. Quantifying these effects exceeds the scope of this paper, but the suggestion is clear: USI can simultaneously be better social policy, better fiscal policy, and better policy for productivity and growth.

[6] Their exercise excludes self-employment and firms in non-fixed locations not captured in the Census which, as shown in Table 2, account for a large share of employment. Incorporating these activities in the measurements of the productivity losses associated with the CSI+NCSI configuration is a pending challenge.

CHAPTER 10

Implementation Issues

This section discusses implementation issues, with emphasis on mechanisms to identify the beneficiary population of USI and provide benefits. Many other aspects are left out, as well as a discussion of transition issues, which merit a separate paper. The discussion here is indicative and meant to show the administrative feasibility of the proposal. We stress that there is no unique implementation mechanism. Many factors that bear on implementation design are neither budgetary nor technical but political (or philosophical), having to do with the appropriate balance between the exercise of social rights and the enforcement of obligations. Although inevitably technical and political issues overlap, we do not dwell into that discussion and simply point out some of the relevant trade-offs.

10.1 Registration and Reporting Requirements

We begin with a key aspect of our proposal. To receive the benefits of USI, workers must be registered with Finance Ministry and have an individual retirement account with the Afore of their choice. Under ideal circumstances there would be a one-to-one mapping through a unique identification number between individual workers, registries of workers in the Finance Ministry, registries of workers in IMSS (including nonsalaried workers), and workers' Afore accounts.

For the purposes of our proposal, a worker is a person who is either registered as such with the Finance Ministry by the firm that hires her or him (for the case of salaried workers), or by herself or himself in case she or he is self-employed, works for a small family firm or is associated with a firm but receiving payments in forms other than wages. In these latter cases, corresponding to nonsalaried contractual relations, the obligation to register would fall on the worker.

All registered workers, in turn, must report their earnings. For salaried workers this requirement, as at present, would be satisfied by the firms that hire them, since firms already report their workers' earnings to retain income taxes from gross wages. Nonsalaried workers would have to report their income directly to the Finance Ministry on a periodic basis, say quarterly.[1]

Importantly, the act of registration and reporting would be sufficient to qualify for USI benefits; failure to pay income taxes would not disqualify workers. Our proposal is not designed to solve the problems of compliance with the income tax law. But it would help improve its enforcement as compared to the *status quo* it enhances the incentives to register and report. On one hand, as discussed in section 8, since firms hiring salaried workers would continue to pay wage taxes for complementary SI benefits, the registries of IMSS could be used by the Finance Ministry for enforcement of income taxes. In parallel, firms' incentives to cheat would be substantially reduced, as wage-based taxes fall from 32 percent of wages to an average of 5.5 percent.

For nonsalaried workers, on the other hand, the situation is more complex since the income tax law taxes income differently depending on its source. These workers are already required to register but many decide not to. Our proposal changes the cost-benefit of that decision in favor of registration, as tax obligations in principle do not change while there would be no or restricted access to SI benefits, depending on the choices described below.[2]

The fact that more workers than at present would register and report earnings to the Finance Ministry is a positive side effect of our proposal, generating valuable information for tax enforcement (and for the design of public policies in general). It would be a step in the direction of reducing illegality and promoting

[1] Of course, workers who register could under-report earnings. But this problem is already present today and matters from the point of view of income tax collections. Under-reporting of earnings is not a problem from the perspective of financing USI benefits since under our proposal this occurs through the higher VAT on workers consumption (which presumably is a better proxy for their true earnings than those reported to the Finance Ministry). In practice, workers could register and cheat but still receive USI benefits, although if that behavior was recurrent it should sooner or later trigger an audit by the Finance Ministry.

[2] There would be transaction costs of registering (only once) and reporting (four times a year). But through the use of information technologies, these costs could be minimized. On the other hand, Paullada (2012) argues that the income tax law taxes earnings from wages unequally relative to other sources of income. This important point suggests that incentives to arbitrage between salaried and nonsalaried status and change labor contracts would be much reduced if, in parallel to our proposal, the income tax law was revised in the direction of more neutral treatment between income of salaried and nonsalaried workers. Equally important would be a consolidation of the various regimes for nonsalaried workers.

compliance with the law. But, equally important at least in the view of some, complying with an obligation in order to receive a benefit would balance workers' rights with responsibilities and reduce "free-riding" behavior.[3]

10.2 Pension Benefits

For salaried workers, pension benefits would operate as they currently do for formal workers, except that wage-based contributions for retirement pensions, and for life and disability insurance, would be reduced, with the concomitant increase in contributions by the government, along the lines of the discussion in section 8 (though contributions for work-risk insurance would not change). Similar procedures would operate for nonsalaried workers (excluding work-risk insurance). Upon compliance of the registration and reporting requirement, the Finance Ministry would transfer to IMSS the contributions for retirement pensions and life and disability insurance, in much the same way as it does today for formal workers. In turn, IMSS would use the same mechanisms already in place to transfer the contribution for retirement pensions to workers' individual retirement accounts, and deposit the contribution for life and disability insurance in the IMSS-managed common reserve fund.[4]

Nevertheless, some nonsalaried workers might prefer not to register and thus would avoid any reporting requirements. Those workers would in principle be excluded from the pension benefits of USI, including the minimum pension guarantee (and perhaps health benefits; see discussion below). But, critically, this would result from a personal choice, triggered by distrust of government, procrastination, or other motivation or behavior. It would be an individual decision not to exercise the right to receive a contribution for a pension, not a systematic exclusion from that right because of the design of the SI system.[5]

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[3] There is an important precedent in that context in Mexico, associated with the right to vote. Before this right can be exercised, citizens need to register with the Federal Electoral Institute, the relevant authority for these purposes. Similarly, before the right to USI benefits can be exercised, workers would need to register with the Finance Ministry.

[4] Informal workers would need to have an individual retirement account with the Afore of their choice. As a result of large transitions between formal and informal employment, many currently informal workers already have an account, given previous episodes of formality. In 2006 there were 37.4 million Afore accounts, for a total labor force of about 40 million workers (excluding public sector workers); see Levy (2008). Some of these accounts are duplicative, but this is estimated to be in the order of 10 percent. The implication is that probably over two thirds of all workers already have an account.

[5] One could argue that poor workers in remote rural areas might have difficulties exercising their rights given the complexities for them of the registration and reporting requirements. At

The decision of workers to register and report is not independent of their expectations of whether, when they reach old age, they would have access to any other type of pension, without having registered at all and thus having not accumulated for a USI retirement pension. The discussion so far has implied that all NCSI benefits would be replaced by USI benefits. But an exception needs to be made for the existing NCSI retirement pension, at least for some time. This is because even if our proposal was implemented immediately, low wage older workers would have relatively little time to accumulate sufficient resources in their individual retirement accounts before they reach retirement age to purchase an annuity that is at least as good as the existing NCSI pension, even if they register and accumulate for a USI pension. Further, many already retired workers have no pension. As a result, for a transition period it would likely be necessary to continue with some form of a NCSI pension (perhaps means-tested) and, indeed, even to expand its coverage.[6]

This issue is complex and merits more analysis.[7] Should NCSI pensions be gradually phased-out, or should a "low" old-age means-tested pension paid on a pay-as-you-go basis permanently co-exist with pensions financed from savings

present, however, these workers already receive the benefits of Progresa-Oportunidades, which imply that mechanisms exist to continuously up-date records to make the associated bimonthly cash payments. Registering households in remote rural areas, and monitoring indicators on their behavior, are problems that other institutions of the Mexican State have already solved. Moreover, poor workers would have strong incentives to register and report, as compliance would imply no tax payments (since their low earnings would exempt them from income taxes) but better health and pension benefits, including the possibility of attaining the minimum pension guarantee.

[6] The main NCSI pension program at the federal level is Adults over Seventy, although many state governments run similar programs. This program targets households by location, focusing on small rural communities, and pays a monthly pension of 500 pesos, or one third the minimum CSI pension (1,500 pesos a month). But, as noted, at present most low wage workers will not receive the minimum CSI pension since they will not accumulate the 25 years in formal employment needed to qualify as a result of their high transition between formal and informal status; for them the NCSI pension is a better alternative. The same would hold for older low-wage workers under our proposal, but not for young workers for whom the USI pension would be significantly better (at least equal to 1,500 pesos a month but probably higher). Maintaining the Adults over Seventy Program for some time would have minor budgetary implications. On one hand, Table A2.2 shows that in 2008 the cost of this program was 9.5 thousand million pesos (or 0.07 percent of GDP), which would need to be added to the costs of our proposal as quantified in Table 12. On the other, Table 12 assumes that the contribution for the USI retirement pension is made for all workers, including those who are close to retirement, which would be unnecessary if the Adults over Seventy program is maintained for a transition period.

[7] Galiani and Gertler (2009) is a step in this direction. They show that the introduction of the NCSI pension program "Adults over Seventy" led to lower participation rates in salaried employment for older workers close to retirement age (through an "anticipation effect").

accumulated in workers' individual retirement accounts, given that under USI *all* workers are entitled to receive a contribution for their pension? The point is that these two types of pension should be seen as part of the incentives faced by workers, specially in a context where two potentially conflicting objectives need to be met: on one hand, a major effort to induce all workers, particularly young ones, to accumulate for their pensions through their individual retirement accounts; and, on the other, the need to provide income support to avoid old-age poverty for retired, or soon-to-be-retired workers. Can an inter-temporally consistent mechanism be designed to provide income support to already retired workers without a pension (and to informal workers close to retirement), while at the same time inducing younger workers to accumulate for their pension in their individual retirement account, thus avoiding moral hazard behavior?

10.3 Health Benefits

At present, the health benefits of CSI cover the worker and his family, and retired workers with a CSI pension. Since under our proposal CSI health benefits extend to all workers, retired workers without a CSI pension as well as household members of currently informal workers would also be covered by the health component of USI. In fact, the per worker cost of USI included in our previous calculations, based as it is on the per worker cost of the health component of CSI, already contemplates this. Thus, our funding proposal, for all intents and purposes, would cover the entire population.[8]

Regardless of budgetary considerations, a difficult question is whether unregistered workers should be excluded from the health benefits of USI. At present, informal workers benefiting from NCSI health programs are not subject to any registration or reporting requirements, as opposed to formal workers who need to be registered with IMSS and the Finance Ministry to receive CSI health benefits. USI health benefits could then be conceptualized as either extending the NCSI modality, and therefore open to registered and unregistered workers; or extending the CSI modality, and therefore denying access to unregistered workers. Under the CSI modality, the incentives to register and report are substantially strengthened, but there is an issue as to whether the government can credibly (and fairly) deny health benefits for workers who do not register. Under the NCSI modality access

[8] Recall, however, the public sector workers are excluded from our proposal, as they are covered by their own social security institute.

to health is greatly facilitated, but the incentives to register and report weakened as the only benefits of doing so are a retirement pension (in the future) or a disability or survivorship pension (at some undetermined time). Our proposal is compatible with either modality (or intermediate situations), and the choice requires further discussion and debate.

Under any modality, the provision of health services would be carried out by IMSS and state governments, as occurs at present under the CSI+NCSI configuration. All that is needed is the number of salaried and nonsalaried workers in each state. On that basis, the Finance Ministry would provide the corresponding per worker fee to IMSS and to each state government.[9] Note that if the CSI modality is adopted the incentives for state governments to cooperate with the federal government and have workers in their state register with the Finance Ministry are stronger, as those registries would be the basis for resources transfers.

IMSS and state government would be responsible for providing services, with the Health Ministry responsible for regulatory issues and for monitoring quality of provision; since all state government and IMSS receive the same resources per worker, the expectation would be that quality should converge to the same national level, gradually reducing existing regional differences. There would be no changes to the ownership structure of public health infrastructure, but state governments and IMSS would be given the freedom to write service contracts between them to mutually complement their infrastructure, and as needed to subcontract activities or purchase inputs from private providers to improve quality.[10]

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[9] Because CSI health services already receive a subsidy from the federal government, the mechanism for transferring resources from the Finance Ministry on a per worker basis is already in place. On the other hand, at present the Finance Ministry transfers resources for some health programs to the Health Ministry, which in turn transfers them to state governments. These resources are complemented by state resources. Other NCSI health programs, however, are directly run by the federal government (including, confusingly, one by IMSS). The proposal thus requires unifying these budgetary mechanisms in a single one. This would ensure the same level of per worker financing as that provided to IMSS and also enhance transparency.

[10] There are large challenges in this context. A first one is to strengthen the incentives for state governments and for IMSS to deliver quality services and to minimize long-term costs by focusing on preventive care and on social behaviors that affect people's health. A second one is setting incentives to IMSS and state governments to choose the efficient combination of in-house and out-source provisioning. Because per worker transfers to each would be established by law, both providers could write long-term contracts between themselves and coordinate investment decisions to ensure, on one hand, the availability of appropriate infrastructure in remote rural areas and, on the other, avoid duplication of equipment and infrastructure in larger urban areas (as at times currently happens). A third challenge is to strengthen accountability and access to information. More generally, it is clear that our proposal focuses on the financing aspects of health, but that issues of provision require substantially more attention.

To conclude, the discussion in this section is not intended to assert that implementing USI will be trouble-free, or that there are no difficult trade-offs between competing objectives. On the contrary, it will require important adjustments to the functioning of various ministries and institutions, to budgetary relationships between the federal and state governments, and to many laws. It will also require a political discussion about the appropriate balance between the exercise of social rights and the enforcement of social obligations. After all, transiting from the current CSI+NCSI configuration to USI would be a major social and institutional change. Moreover, as implementation occurs unforeseen obstacles will be encountered; many adjustments will certainly have to be made. Thus, if the reform was to be implemented, it would need—as any major reform would—careful evaluation and error-correcting mechanisms; much will be learned along the way. That said, the discussion does mean to argue a simple but central point: implementing USI is feasible and within the reach of the administrative and operational capabilities of the Mexican state.

CHAPTER 11

Concluding Thoughts

"The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist…I am sure the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas. Not, indeed, immediately, but after a certain interval…. But soon or late, it is ideas, not vested interests, which are dangerous for good or evil".

When President Avila Camacho signed Mexico's first social security law in 1943, he was probably unaware that seven years earlier Keynes had concluded The General Theory with the words quoted above. Back then he probably thought that Bismarck's idea to fund SI from wage-based taxes would allow him to reach his goal of protecting all Mexican workers from various risks, to combat social exclusion, and to redistribute income from "capital" to "labor".

Were he alive today, he would most likely be intensely disappointed realizing that almost 70 years after his law came into effect, only one third of Mexican workers were covered by its provisions (despite important revisions in 1973 and 1997). He would also probably be distressed if he realized that today Mexico's SI architecture, rather than strengthening social inclusion, is the root cause of the segmentation of workers into formal and informal categories, with social rights and obligations determined by the form of their labor contract. Certainly, creating first and second class workers was not his intention. Moreover, he would likely be intensely concerned that this architecture generated large economic inefficiencies, as he was no doubt aware that sustained prosperity could not be built on stagnant productivity. In parallel, although undoubtedly he would agree with the social need to provide SI benefits to informal workers, and perhaps sympathize

with the political pressures, he nonetheless would probably be very preoccupied if he realized that the continuous growth of NCSI programs obscured the relationship between contributions and benefits, gradually eroding the long-term fiscal sustainability of Mexico's SI policy, and in parallel was undermining the rule of law. In sum, he would in all likelihood be strongly dissatisfied with the *status quo,* and would be eager for a new course.

We do not argue that Bismarck's idea was flawed in 1890. Quite the contrary, back then it was novel, bold and, for Germany, effective. We do not argue either that in 1943 President Avila Camacho was wrong to import Bismarck's idea to Mexico; in fact, at that time it was probably the best that could be achieved given the prevailing knowledge and administrative capabilities of the Mexican state. But every idea has a time and a place. With the benefit of hindsight, we do argue that Bismarck's idea has not served Mexico well. Every Mexican president from Avila Camacho then to Calderon today has struggled with Bismarck's inheritance, attempting through various means to extend SI coverage to informal workers. The result is the CSI+NCSI configuration: costly in terms of productivity, fiscally unsound, and socially ineffective.

The idea that social insurance should be largely funded from a wage-based tax is deeply ingrained in Mexico. This idea has generated a large body of legal thought and jurisprudence; a long-standing conviction that, somehow, social justice is achieved by taxing salaried labor; and some of Mexico's key social institutions. In turn, vested interests have evolved and profited from this whole construct. But, along with Keynes, we are convinced that "*the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas*". Without minimizing the political obstacles that vested interest represent, at this point we are convinced that the encroachment of Bismarck's idea is a central obstacle to a more prosperous and equitable Mexico. But Bismarck's idea is just that, an idea; it is not a Law of Nature. Paraphrasing Keynes's admonition about practical men being prisoners of the ideas of some defunct economist, we posit that in matters of social insurance the opposite may be true: economists are the prisoners of the idea of a long defunct politician. Mexico needs to break away from Bismarck's idea. This paper shows that it is fiscally and administratively feasible to do so, and that there would be large gains from doing so. Transforming Mexico's social insurance architecture will require political leadership as bold as that displayed by President Avila Camacho back in 1943. But before that leadership can be displayed again by another Mexican president, it is first necessary to turn Bismarck on his head.

APPENDIX 1

Model Structure

A.1 The Intermediate Goods Sector

Two intermediate goods I_z, indexed by z = 1,2, are produced by a large number of firms that behave in a competitive fashion. Firms sell their output to producers of final good A at the exogenous price p_z. Goods are produced with a Cobb-Douglas technology:

$$I_z = A_z L_z^{\alpha} K_z^{1-\alpha} \tag{A1.1}$$

where α satisfies $0 < \alpha < 1$. Physical capital K_z is fixed, so the representative firm makes positive profits in equilibrium. K_z is continuous and distributed exogenously among firms with a density function $f(K_z)$. Capital endowment in the economy is given by $\overline{K}$ and satisfies the resource constraint given by equation (2) in the paper. Labor input is the sum of formally and informally hired workers following equation (3) in the paper. If a firm hires a worker formally the unit cost is given by equation (4). If the firm hires the worker informally it faces an endogenous probability $\lambda_z^{CSI}(L_{iz}, K_z)$ of being detected by the authority and the expected unit cost of labor is given by equation (5). This probability is given by the function:

$$\lambda_z^{CSI}(L_{iz}, K_z) = \hat{\lambda}^{CSI} K_z^{\upsilon} L_{iz}^2 \tag{A1.2}$$

where $\hat{\lambda}^{CSI} > 0$ is a parameter, and $\upsilon > 0$. Note that (A1.2) implies that the probability of detection is increasing in both arguments.

Firms pay income and value-added taxes and have incentives to evade. They may be detected by the authority with a probability $\lambda_z^{VAT}(K_z) = \lambda_z^{IT}(K_z) = \lambda(K_z)$ given by:

$$\lambda(K_z) = \hat{\lambda} K_z / \overline{K}_z, \tag{A1.3}$$

where $\hat{\lambda} > 1$ is a parameter. This specification implies that relatively large firms (that is, firms with a capital $K_z \geq \overline{K}_z / \hat{\lambda}$) face a probability of detection equal to one. The effective VAT rate for each firm is defined by equation (6) in the text. The firm rate of compliance with income taxes, $\xi_z^{IT}(K_z) \in [0,1]$, is:

$$\xi_z^{IT}(K_z) = \frac{\min\left\{\sigma^{IT}\tau^{IT}\lambda_z^{IT}(K_z)\hat{\Pi}(K_z), \tau^{IT}\hat{\Pi}(K_z)\right\}}{\tau^{IT}\hat{\Pi}(K_z)} \tag{A1.4}$$

Accordingly, the *effective tax rates* faced for a firm of size K_z are $\tau_z^{VAT}\xi_z^{VAT}(K_z)$ and $\tau^{IT}\xi_z^{IT}(K_z)$.[1]

The problem of a representative firm in the intermediate goods sector is to choose formal and informal labor, $\{L_{fz}, L_{iz}\}$ to maximize expected profits:

$$\begin{aligned} \text{Max}\Pi_z = &\left[1-\tau^{IT}\xi_z^{IT}(K_z)\right]\left\{\left[1-\tau_z^{VAT}\xi_z^{VAT}(K_z)\right]p_z A_z L_z^{\alpha} K_z^{1-\alpha}\right. \\ &\left.-\left[1+(1-\theta)\tau^{CSI}\right]w_f L_{fz} - \left[w_i + \phi\lambda_z^{CSI}(L_{iz}, K_z)\right]L_{iz}\right\} \end{aligned} \tag{A1.5}$$

subject to $L_z(K_z) = L_{fz}(K_z) + L_{iz}(K_z)$ given prices $\{p_z, w_f, w_i\}$ and taxes $\left\{\tau^{CSI}, \tau_z^{VAT}, \tau^{IT}\right\}$. From first-order conditions, the expressions for total labor demand $L_z(K_z)$ and informal labor $L_{iz}(K_z)$ are:

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[1] Expressions (6) and (A1.4) imply that there is a level of capital K_z^+ at which the rates of compliance are one, that is

$$\xi_z^{VAT}(K_z^+) = \xi_z^{IT}(K_z^+) = 1.$$

Given the specification for $\lambda(K_z)$, this condition implies

$$K_z^+ = \frac{\overline{K}_z}{\sigma^{VAT}\hat{\lambda}}$$

and $K_z^+ = \dfrac{\overline{K}_z}{\sigma^{IT}\hat{\lambda}}$.

For firms with a relatively large capital endowment $(K_z \geq K_z^+)$, their rates of compliance are equal to one so their corresponding effective tax rates are τ_z^{VAT} and τ^{IT}. These firms fully comply with VAT and income taxes even though they have incentives to evade their payment.

$$L_z(K_z)=\left(\frac{\left(1-\tau_z^{VAT}\xi_z^{VAT}(K_z)\right)\alpha A_z p_z}{\left[1+(1-\theta)\tau^{CSI}\right]w_f}\right)^{1/(1-\alpha)} K_z,\ K_z\in\left[\underline{K}_z,\overline{K}_z\right] \text{ and} \quad \text{(A1.6)}$$

$$L_{iz}(K_z)=\left\{\left[\frac{\left[1+(1-\theta)\tau^{CSI}\right]w_f-w_i}{3\phi\hat{\lambda}^{CSI}}\right]\left(\frac{1}{K_z^{\upsilon}}\right)\right\}^{1/2} \quad \text{(A1.7)}$$

Formal labor demand is given by the difference $L_{fz}(K_z) = L_z(K_z)-L_{iz}(K_z)$.[2] These functional forms imply that the share of formal workers in total workers increases with capital size.

Expression (A1.6) indicates that the demand for salaried labor depends negatively on the effective tax rate $\tau_z^{VAT}\xi_z^{VAT}(K_z)$ and CSI taxes τ^{CSI}. This last result has important implications for the tax base and government revenue: an increase in τ^{CSI} lowers labor demand and thus value-added for a firm of capital size K_z. It also decreases profits for firms with a relatively large capital size K_z, given the high probability of being detected by the authority evading labor taxes. These two effects erode the tax base for both value-added and income taxes. Given that formal labor is now more costly than informal labor, informality increases.

The *aggregate* rate of compliance for the VAT is defined in equation (10) in the text. For income taxes, let $\hat{\Pi}_z^c(K_z)$ denote gross profits for a fully compliant firm. The aggregate rate of compliance for income taxes in sector z, $\hat{\xi}_z^{IT}\in[0,1]$, is:

$$\hat{\xi}_z^{IT}=\frac{\tau^{IT}\int_{\underline{K}_z}^{\overline{K}_z}\xi_z^{IT}(K_z)\hat{\Pi}(K_z)f(K_z)dK_z}{\tau^{IT}\int_{\underline{K}_z}^{\overline{K}_z}\hat{\Pi}_z^c(K_z)f(K_z)dK_z} \quad \text{(A1.8)}$$

The aggregate rates $\hat{\xi}_z^{VAT}$ and $\hat{\xi}_z^{IT}$ are used to compute the rates of compliance in the final good A sector and to determine "VAT included" prices of intermediate goods in equation (11) in the text.

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[2] Notice from expressions (A1.6) and (A1.7) that $L_{iz}(K_z) > L_z(K_z)$ for relatively small values of K_z, implying a negative labor demand for formal workers. To avoid this scenario, define K_z^- as the level of capital that uniquely solves

$$L_z(K_z^-)=L_{iz}(K_z^-).$$

This implies that firms with a capital level $\left[\underline{K}_z,K_z^-\right]$ will hire informal workers only, according to (A1.6). In contrast, firms with a capital level

$$\left(K_z^-,\overline{K}_z\right]$$

will demand a mix of formal and informal workers whose total amount is also given by (A1.6). In such a case, informal labor is determined by (A1.7) whereas formal labor is given by $L_z(K_z)-L_{iz}(K_z)$.

A.2 The Final Good A Sector

This sector is composed of a large number of representative firms that behave in a competitive fashion. Firms use intermediate goods I_1 and I_2 in combination with a fixed factor A_m to produce A. The production function is Cobb-Douglas:

$$A = \left[I\left(I_1, I_2\right) \right]^{\alpha_m} A_m^{1-\alpha_m} \tag{A1.9}$$

where $0 < \alpha_m < 1$. In turn, the function $I\left(I_1, I_2\right)$ is CES:

$$I\left(I_1, I_2\right) = \left[\gamma \left(I_1\right)^{\mu} + \left(1-\gamma\right)\left(I_2\right)^{\mu} \right]^{1/\mu} \tag{A1.10}$$

with restrictions $-\infty \leq \mu \leq 1$ and $0 \leq \gamma \leq 1$. The parameter represents the weight of intermediate good I_1 in the production of I. The elasticity of substitution between intermediate goods I_1 and I_2 is given by $1/\left(\mu - 1\right)$.

Firms pay income and value-added taxes. The VAT rate in this sector is a weighted average of the tax rates faced by intermediate goods firms, so $\tau_A^{VAT} \equiv \gamma \tau_1^{VAT} + \left(1-\gamma\right)\tau_2^{VAT}$. On the other hand, the income tax rate is the same as in the intermediate goods sector. Final good A firms also have incentives to evade taxes. Let ξ_A^{VAT} and ξ_A^{IT} be the respective rates of compliance, which are given by the weighted average of the corresponding aggregate rates of compliance in the intermediate goods sector. This implies $\xi_A^{VAT} \equiv \gamma \hat{\xi}_1^{VAT} + \left(1-\gamma\right)\hat{\xi}_2^{VAT}$ and $\xi_A^{IT} \equiv \gamma \hat{\xi}_1^{IT} + (1-\gamma)\hat{\xi}_2^{IT}$. Accordingly, the tax rates effectively paid by firms in the final good A sector are $\tau_A^{VAT}\xi_A^{VAT}$ and $\tau^{IT}\xi_A^{IT}$. Since value added taxes are collected by the credit method, the firm receives a tax credit for the amount $\tau_z^{VAT}\hat{\xi}_z^{VAT} p_z I_z$.

The problem of a representative firm is to choose intermediate goods $\left\{I_1, I_2\right\}$ to maximize expected profits:

$$\begin{aligned} \text{Max}\Pi_A = \left(1-\tau^{IT}\xi_A^{IT}\right)\Big\{ &\left(1-\tau_A^{VAT}\xi_A^{VAT}\right) p_A \left[I\left(I_1, I_2\right) \right]^{\alpha_m} A_m^{1-\alpha_m} \\ &- \sum\nolimits_z \left(1-\tau_z^{VAT}\hat{\xi}_z^{VAT}\right) p_z I_z \Big\} \end{aligned} \tag{A1.11}$$

taking prices $\left\{p_1, p_2, p_A\right\}$, taxes $\left\{\tau_1^{VAT}, \tau_2^{VAT}, \tau^{IT}\right\}$, and rates of compliance $\left\{\hat{\xi}_z^{VAT}, \hat{\xi}_z^{IT}\right\}_{z=1,2}$ as given. From first-order conditions, the relative demand of intermediate goods is:

$$\frac{I_1}{I_2}=\left[\left(\frac{\gamma}{1-\gamma}\right)\left(\frac{1-\tau_1^{VAT}\hat{\xi}_1^{VAT}}{1-\tau_2^{VAT}\hat{\xi}_2^{VAT}}\right)\left(\frac{p_1}{p_2}\right)\right]^{1/(1-\mu)} \tag{A1.12}$$

which is expression (13) in the main text.

A.3 The Final Good B Sector

Family firms or self-employed workers only require labor L_B to produce goods, which are sold at the exogenous price p_B. The production function has decreasing returns to scale in labor:

$$B = A_B L_B^{\alpha} \tag{A1.13}$$

Unit labor cost is just w_i since workers in family firms or that are self-employed are not obligated to contribute to CSI. Given that this sector does not pay any of the three taxes, the profit function is $Max\Pi_B = p_B A_B L_B^{\alpha} - w_i L_B$. Hence, family firms or self-employed workers choose the quantity of labor that maximizes profits, taking prices $\{p_B, w_i\}$ as given. Accordingly, optimal labor demand is:

$$L_B = \left(\frac{\alpha p_B A_B}{w_i}\right)^{1/(1-\alpha)} \tag{A1.14}$$

A.4 Social Insurance, Wage Rates and the Labor Market

Total demand for labor is obtained aggregating demand for salaried labor (A1.6) over all firms in the intermediate sectors plus demand for nonsalaried from the final sector B, given by (A1.14). Given an inelastic labor supply $\bar{L}$, the aggregate labor constraint is:

$$\sum_z \left\{\left[\frac{\alpha A_z p_z}{\left[1+(1-\theta)\tau^{CSI}\right]w_f}\right]^{\frac{1}{1-\alpha}} \int_{\underline{K}_z}^{\bar{K}_z}\left[1-\tau_z^{VAT}\xi_z^{VAT}\left(K_z\right)\right]^{\frac{1}{1-\alpha}} K_z f\left(K_z\right) dK_z\right\} + \left(\frac{\alpha p_B A_B}{w_i}\right)^{1/(1-\alpha)} = \bar{L} \tag{A1.15}$$

The relationship between the formal and the informal wage is captured in expression (19) in the text. With this we solve (A1.15) and (19) simultaneously for

equilibrium wages $\{w_f^*, w_i^*\}$, given value-added, income, and CSI and NCSI taxes and subsidies.

A.5 The Government's Budget Constraint

The government's fiscal balance is:

$$FB = \left(R^{VAT} + R^{IT} + R^{CSI} + \bar{R}\right) - \left(G^{CSI} + G^{NCSI} + \bar{G}\right) \tag{A1.16}$$

Revenue from value-added taxes is collected from the intermediate and final good A sectors, denoted respectively by R_I^{VAT} and R_A^{VAT}, so that $R^{VAT} = R_I^{VAT} + R_A^{VAT}$. Aggregating over all firms and sectors producing intermediate goods, revenues are:

$$R_I^{VAT} = \sum_z \left\{ \tau_z^{VAT} A_z p_z \int_{\underline{K}_z}^{\bar{K}_z} \xi_z^{VAT}(K_z) \left[L_z(K_z)\right]^{\alpha} K_z^{1-\alpha} f(K_z) dK_z \right\} \tag{A1.17}$$

where demand for salaried labor $L_z(K_z)$ is given by (A1.6). In the final good A sector, VAT revenue is:

$$R_A^{VAT} = \tau_A^{VAT} \xi_A^{VAT} \left[I(I_1, I_2)\right]^{\alpha_m} A_m^{1-\alpha_m} - \sum_z \tau_A^{VAT} \hat{\xi}_z^{VAT} p_z I_z \tag{A1.18}$$

where $I(I_1, I_2)$ is defined by (A1.10). Notice that expression (A1.18) subtracts the amount of tax credit $\tau_A^{VAT} \hat{\xi}_z^{VAT} p_z I_z$ to each sector.

Consider now revenues from income taxes. As before, government collects revenue from both intermediate and final good A sectors, denoted respectively by R_I^{IT} and R_A^{IT}. Hence $R^{IT} = R_I^{IT} + R_A^{IT}$. Aggregating over all firms and sectors, we get:

$$R_I^{IT} = \tau^{IT} \sum_z \left\{ \int_{\bar{K}_z}^{\bar{K}_z} \xi_z^{IT}(K_z) \hat{\Pi}_z(K_z) f(K_z) dK_z \right\} \tag{A1.19}$$

In the final sector government revenue from income taxes is:

$$R_A^{IT} = \tau^{IT} \xi_A^{IT} \left(1 - \tau_A^{VAT} \xi_A^{VAT}\right)(1 - \alpha_m) \left[I(I_1, I_2)\right]^{\alpha_m} A_m^{1-\alpha_m} \tag{A1.20}$$

CSI taxes paid by firms and formal workers are collected in the intermediate goods sector only, as firms in the final good A sector do not require labor. Hence:

$$R^{CSI} = (1-\theta)\tau^{CSI} w_f^* \sum_z \left\{ \int_{K_z^-}^{\bar{K}_z} L_{fz}(K_z) f(K_z) dK_z \right\}, \tag{A1.21}$$

where $L_{fz}(K_z)$ is the demand for formal workers.

Total spending on CSI is split in two parts:

$$G^{CSI} = (1-\theta)\tau^{CSI} w_f^* \sum_z \left\{ \int_{\underline{K}_z}^{\bar{K}_z} L_{fz}(K_z) f(K_z) dK_z \right\} + \theta\tau^{CSI} w_f^* \sum_z \left\{ \int_{\underline{K}_z}^{\bar{K}_z} L_{fz}(K_z) f(K_z) dK_z \right\} \quad \text{(A1.22)}$$

Considering (A1.16) and (A1.21), it follows that only subsidies to CSI constitute a net pressure on the fiscal balance.

Government spending on NCSI, G^{NCSI}, is given by the subsidy τ^{NCSI} per worker times the total number of informal workers. Aggregating over all firms and sectors leads to:

$$G^{NCSI} = \tau^{NCSI} \sum_z \left\{ \int_{\underline{K}_z}^{\bar{K}_z} L_{iz}(K_z) f(K_z) dK_z \right\} + \tau^{NCSI} \left(\frac{\alpha p_B A_B}{w_i^*} \right)^{1/(1-\alpha)} \quad \text{(A1.23)}$$

A.6 GDP and Prices

GDP is the sum of value added in each sector:

$$GDP = \sum_z p_z A_z \left\{ \int_{\underline{K}_z}^{\bar{K}_z} \left[L_z(K_z) \right]^{\alpha} K_z^{1-\alpha} f(K_z) dK_z \right\} + \left\{ p_A \left[I(I_1, I_2) \right]^{\alpha_m} A_m^{1-\alpha_m} - p_1 I_1 - p_2 I_2 \right\} + p_B A_B L_B^{\alpha} \quad \text{(A1.24)}$$

where the first term represents value added from intermediate sectors, and the second and third terms represent value added in the final good A and B sectors, respectively.

To compute the "VAT included" price of good A, consider the following cost minimization problem for a representative consumer demanding intermediate goods $\tilde{I}_1$ and $\tilde{I}_2$:

$$\min_{\{\tilde{I}_1, \tilde{I}_2\}} \left[p_1 \left(1 + \tau_1^{VAT} \hat{\xi}_1^{VAT} \right) \tilde{I}_1 + p_2 \left(1 + \tau_2^{VAT} \hat{\xi}_2^{VAT} \right) \tilde{I}_2 \right]$$

subject to $\left[\gamma \left(\tilde{I}_1 \right)^{\mu} + (1-\gamma) \left(\tilde{I}_2 \right)^{\mu} \right]^{1/\mu} = \tilde{I}$. Recall that prices p_1 and p_2 are given as the economy is small in world markets. Let $\tilde{p}_z \equiv (1 + \tau_z^{VAT} \hat{\xi}_z^{VAT}) p_z$ denote the "VAT included" price of intermediate good z. The demand functions arising from the cost-minimization problem are:

$$\tilde{I}_1 = \left[\frac{\gamma\kappa}{\tilde{p}_1}\right]^{\frac{1}{1-\mu}} \tilde{I} \text{ , and} \qquad \text{(A1.25)}$$

$$\tilde{I}_2 = \left[\frac{(1-\gamma)\kappa}{\tilde{p}_2}\right]^{\frac{1}{1-\mu}} \tilde{I} \qquad \text{(A1.26)}$$

where $\gamma\kappa$ is the Lagrange multiplier. After substituting these two functions into the expression for I, we obtain $\tilde{p}_A$ in expression (20) in the text. Finally, let C_A and C_B denote consumption of the final goods A and B so that $\delta \equiv C_A/(C_A+C_B)$ is the consumption share of the final good in total consumption. From this follows the CPI given by expression (21) in the text.

A.7 Good B as Nontraded

Taking all goods as traded considerably facilitates the model, as demand for all goods is simply the exogenously given world price; thus output and employment levels are determined by the corresponding points in the respective supply curves. The main implication of treating good B as nontraded is that its price would be endogenously determined. To calculate it, we would need to track income levels (from quasi-rents and wages) throughout the economy, introduce a demand system for A and B, and then solve an additional excess demand equation for B that would yield p_B jointly with wages and employment levels. It is straightforward to see that in this case changes in employment in the B sector resulting from changes in VA or CSI+NCSI taxes and subsidies as the supply curve of B shifts would be partly offset as p_B changes in the opposite direction. However, with a downward (upward) sloping demand (supply) curve for B, such price changes would not revert the sign of the employment changes predicted by our model. The result would be that the reductions in employment in the B sector associated with the transit from CSI+NCSI to USI would be smaller. In turn, the expansion of the tax base in the (I_1, I_2, A) sector would be smaller as well, as would be the additional revenues from the VAT reform. But as discussed in the text, the lower bound on such estimates occurs when in fact the VAT rate increases while CSI+NCSI taxes and subsidies remain constant (since labor re-allocations flow in the direction of higher informality in response to the higher average VAT). These lower bounds have been presented in Tables 12 and 13. Given this, there is little gain by the additional modeling required to make p_B endogenous.

APPENDIX 2

Data and Model Calibration

The reference year for all variables is 2008. Data on the government's fiscal balance is taken from official fiscal accounts (*Cuenta de la Hacienda Pública Federal*); data on employment from the Economic Census of 2008 together with the National Survey of Occupation and Employment (Encuesta Nacional de Ocupación y Empleo, ENOE) and registries of IMSS. Sources for other data are specified below.

1. Employment

We use two sources of data for employment, depending on the purpose of analysis.

1.1 Table 2: Total Private Occupied Labor Force, 2008

To present a complete and consistent distribution of the total occupied labor force by size and formality status we use the ENOE, given that the Census provides information on employment only on fixed establishments. The total occupied labor force reported in the ENOE in the second quarter of 2008 is 43,866,696 workers. To identify within this total the portion that is also captured in the Census, we analyzed the characteristics of the workplace that individuals reported in ENOE and compared them with the characteristics of the establishments captured by the Census. For this exercise we identified activities at the three-digit level using the ENOE and characteristics of the establishment (whether it was fixed or not). After mapping these characteristics we obtained a very similar number of workers in fixed, non-governmental urban establishments: 20,116,834 workers in the Census, and 20, 254,726 in the ENOE. [1]

[1] Table 2 reflects only 19,629 thousand workers because in this table the occupied population is classified by firm size, and the firm size variable in the ENOE was only defined for that population. The remaining weighted observations have missing values.

In addition to the 20,116,834 workers, the Census also identified 4,836,346 workers in government and religious activities. We found a very similar number in the ENOE: 4,645,104. Next, in the ENOE we identified 5,638,429 workers in rural areas (not captured in the Census). As a result, the remaining 13,456,430 workers captured by the ENOE worked in locations that are not fixed (selling in the streets, working as domestic servants, and so on) and were therefore excluded from the occupied labor force captured in the Census. Finally, we divided workers between informal and formal depending on whether they reported access to social security through their jobs, and classified them by firm size as captured in the ENOE.

1.2 Table 8: Composition of Employment for Model Calibration

For model calibration, we use data from the Census and IMSS registries and not from ENOE for three reasons. First, the ENOE is a household survey; for obvious reasons the information from a census is preferred. Second, the size distribution of firms reported in ENOE is not as precise as the one provided by the Census; as discussed below, this information is crucial to estimate the distribution of capital among firms. Third, ENOE classifies economic activities at the three-digit level; in contrast, the Census reports information at the five-digit level. This allows for a more accurate classification of workers between intermediate sectors 1 and 2. In these calculations, we exclude government employees and people engaged in religious activities for two reasons. First, the model considers only profit maximizing firms. Second, the proposal to reform social insurance is designed for workers in the private sector only (those covered by Chapter A in Article 123 of Mexico's Constitution). As indicated, 43.86 million workers were employed in the second quarter of 2008. Subtracting public sector employees and people engaged in religious activities from this number—which according to the Census are 4.83 million workers—leaves 39.03 million workers that need to be distributed among the intermediate and final good B sectors.

The distribution of workers between intermediate sectors 1 and 2 is taken from the Census, which captures 20.12 million workers, once government employees and people engaged in religious activities are excluded. Out of this number, 5.28 million work in intermediate sector 1 and 14.84 million in intermediate sector 2.[2] In terms of the model, the remaining 18.91 million workers (=39.03–20.12) are allocated to the final good B sector.

[2] Intermediate sector 1 includes workers related to: animal breeding, fishing, food and pharmaceutical industries; wholesale and retail trade of food, books, magazines and agricultural goods; passenger transportation; postal services; book and magazine publishing; educational services; and health care and social assistance services.

The 20.12 million workers included in the Census are considered salaried and classified as either formal or informal. Registries from IMSS report 14.18 million workers affiliated during 2008. However, as the Census does not include workers in agricultural, hunting, livestock, and forestry activities among others, employees in such sectors must be excluded from the IMSS registries. This leaves a total of 12.76 million workers registered at IMSS, which is then the total number of formal workers in the model. The remaining workers (7.36 million) are classified as informal.

2. Technology

For the case of intermediate and final good B sectors, α is set to 0.65, consistent with the results of García-Verdú (2005). For final good sector A, α_m is set to 0.48, which is the average share of intermediate goods in gross output once the production of the household informal sector is taken into account, according to data from National Statistics Office (INEGI) for the period 2003–07. Parameters A_1, A_2 and A_B are set at 1874.2, 1837.5 and 219.5, respectively, so that the number of workers replicate the total of formal, informal, and self-employed and family workers in the data. Given these values, parameter A_m is chosen to scale up activity to replicate the GDP observed in 2008, and is set at 158.1. On the other hand, the national accounts indicate that sector 1 represents approximately 30 percent of total consumption of intermediate goods, which corresponds to parameter Υ in equation (A1.10). To the best of our knowledge, there are no estimates available in the literature for the elasticity of substitution between intermediate sectors 1 and 2. Presumably, this elasticity is relatively low. We arbitrarily set $\mu = -4$, so that the corresponding elasticity is –0.20.

3. Price Indices

Prices p_1, p_2 and p_B are exogenous given our small open economy assumption. We set each to 1/3 to comply with our normalization condition. Parameter δ for the CPI in equation (21) in the main text is fixed to 0.9. This implies that relative consumption of goods from the final sector B, $1 - \delta$, is consistent with the share of the household informal sector in total output, according to national accounts and information from INEGI's *Cuentas Satélite del Subsector Informal de los Hogares*.

4. Capital Stock

Next we describe how the distribution function for capital K_z in each sector is calculated. This distribution is critical to derive the allocation of labor across firms of different sizes. For these purposes, a method similar to Guner, Ventura and Xu

(2008) and Leal (2010) is followed. In particular, capital is assumed to follow a truncated Pareto distribution of the form:

$$F(K_z) = \frac{1-\left(\frac{K_{z,\min}}{K_z}\right)^{s_z}}{1-\left(\frac{K_{z,\min}}{K_{z,\max}}\right)^{s_z}} \qquad \text{(A2.1)}$$

where $s_z > 0$ is a shape parameter associated to the distribution in sector z, with $K_{z,\min} \equiv \underline{K}_z$ and $K_{z,\max} \equiv \overline{K}_z$. The shape parameter is allowed to differ between sectors in order for the model to better fit the data. It turns out that the truncated Pareto distribution is able to explain most of the employment in each intermediate sector with a total mass $1-f_{z,\max}$. The remaining employment share (which corresponds to the right tail of the distribution with mass $f_{z,\max}$) is obtained by selecting an arbitrary value $K_{z,top} > \overline{K}_z$.[3] Hence, the distribution of capital has two parts: the bottom side, which accounts for most of the employment, is defined by a truncated Pareto distribution. In contrast, the top side is captured by an extreme value of physical capital. This approach helps to have a better fit for the share of employment in the upper tail of the distribution. The results of this calibration are shown in Panel C of Table 8 in the main text. The shape parameter values are fixed to s_1 = 0.9 and s_2 = 0.75 across all simulations. In general, the model does a good job in replicating the employment shares found in the data, including the values at the tail of each distribution.

5. Taxation, Evasion and Government Spending

Consider now the parameters related to taxation, evasion and government revenues and expenditures. In the model intermediate goods sector 1 represents the food and medicine sector of the economy; thus $\tau_1^{VAT} = 0$. On the other hand, intermediate sector 2 represents economic activity subject to the general VAT rate, which in 2008 was 15 percent; thus τ_2^{VAT} = 0.15.[4] The corporate income tax rate

[3] Under the benchmark, the corresponding mass $f_{z,max}$ in sectors 1 and 2 is 7.8e-06 and 4.8e-05, respectively.

[4] The statutory tax for these goods in the border Mexican states was 10 percent in 2008. The model abstracts from this geographical dimension and simply sets τ_2^{VAT} to 15 percent. Starting 2010, the general VAT rate was raised to 16 and 11 percent for non-border and border states, respectively.

τ^{IT} works like a lump-sum tax in the model. Its value is calibrated so that government revenue out of this tax replicates the data; this implies τ^{IT} = 0.106.[5] With regards to penalties, the social security law implies that the penalty imposed on a firm caught evading social security contributions is 150 percent of unpaid contributions; thus $\sigma^{CSI} = 1.5$. For the case of VAT and income taxes, the penalty imposed varies between 150 and 170 percent according to the Federal Fiscal Code, but may be higher if they are paid following a delay or if there is a previous record of non-compliance with the law; on the other hand, the penalty may decrease if it is paid promptly. Given the complexity of such scheme, penalties are simply set to 150 percent of the amount evaded, implying $\sigma^{VAT} = \sigma^{IT} = \sigma = 1.5$. Parameter $\hat{\lambda}$ in the probability of detection function $\lambda(K_z)$ is fixed to 2.14 so that VAT revenues match the data. Put differently, given the tax base and the tax rate, we endogenously calculate the level of evasion that is consistent with the revenues observed in 2008. Similarly, the values for υ = 0.1 and $\hat{\lambda}^{CSI}$ = 0.012 in function $\lambda_z^{CSI}(L_{iz}, K_z)$ were chosen so that government revenue out of CSI taxes replicates the data, given the level of evasion of these taxes. The exogenous components of revenue and expenditures from equation (22) in the main text are calculated as the difference from total revenues and expenditures in 2008 obtained from the official fiscal accounts, and the revenues from CSI, value added and income taxes, on the one hand; and expenditures in subsidies for CSI and NCSI, on the other. This implies that $\overline{R}$ = 1,852 and $\overline{G}$ = 2,679 thousand million pesos.

6. Social Insurance

Parameters related to the valuation of CSI and NCSI, β^{CSI} and β^{NCSI}, are taken from the econometric estimates of Levy (2008), equal to 0.3 and 0.85, respectively. On the other hand, Table A2.1 shows that the average tax rate on formal labor, τ^{CSI}, is 38 percent, with government subsidies representing 16 percent (allocated by law to health and life and disability insurance and retirement pensions); accordingly, θ = 0.16. These values imply that the average per worker subsidy for CSI, $\theta\tau^{CSI}$, was 5,062 pesos. Note that state taxes on salaried labor are included as part of CSI taxes even though the revenues are not allocated to SI. This is because these payments are bundled with other CSI taxes, are exclusive to salaried work, and must be absorbed by firms and workers. The corresponding rate

[5] As a reference, the statutory income tax rate was 0.28 in 2008. In 2010 the rate was increased to 30 percent.

Table A2.1 CSI Taxes and Subsidies*

	Total rate	Government subsidy	Firms and worker contribution
Health insurance	17.50	4.50	13.00
Life and disability insurance	2.75	0.25	2.50
Work-risk insurance	1.75	0	1.75
Retirement pensions	8.00	1.70	6.30
Day care services	1.00	0	1.00
Housing	5.00	0	5.00
State labor taxes	2.00	0	2.50
Total	$\tau^{CSI} = 0.38$	$\theta\tau^{CSI} = 0.06$	$(1-\theta)\tau^{CSI} = 0.32$

Source: Authors.
*Calculated as a percentage of the average formal wage as some contribution rates vary with wage levels. See IMSS (2005).

is set at 2 percent, which corresponds to its statutory value. On the other hand, per worker subsidies for NCSI are calculated by dividing total government subsidies for NCSI programs in 2008, as identified in Table A2.2, by the estimated number of informal workers. We list NCSI programs for 151,505 million pesos, which divided by 26.8 million informal workers implies that τ^{NCSI} = 5,652 pesos per worker. Note that public subsidies for health services include spending by sub-national governments, as according to the general health law they must contribute along with the federal government to financing health services for workers without CSI coverage, and are part of the benefits received by informal workers. State spending in health comes from revenue sharing formulas that are contained in the federal budget (under participaciones or aportaciones). In principle, we should also have added sub-national spending for pension, housing and day care programs (which are significant), but we were unable to put together a data set for all states and municipal governments. We list NCSI programs by their Spanish name to link directly to the federal budget.

Table A2.2 Subsidies to NCSI Programs
(million pesos)

Health	
Fassa (Ramo 33)	48,480
State spending for health services	24,715
Seguro de Salud para la Familia (IMSS)*	1,115
Seguro Popular	36,250
IMSS-Oportunidades*	6,370
Hospitales de Especialidad (Ramo 12)	12,416
Seguro Universal de Primera Generacion	1,699
Total health	**131,045**
Day care	
Estancias Infantiles (Sedesol)	1,711
Housing	
Fonhapo	2,342
Conavi	4,984
Habitat	1,887
Total housing	**9,213**
Pensions	
Adultos Mayores de Setenta	9,536
Total	**151, 505**

Source: Authors.
*These two programs, although operated by IMSS, provide health services for informal workers financed directly by the federal government. Despite the somewhat confusing name, the program IMSS-Oportunidades is different from the targeted poverty program Oportunidades, which is excluded from these accounts.

APPENDIX 3

Costs of USI

Per worker annual costs of USI of 14,330 pesos consist of three components: 10,118 pesos for health insurance; 3,492 pesos for retirement pensions; and 720 pesos for life and disability pensions.

1. Costs of Health Insurance

As discussed in the text, we take as reference the IMSS health package. In 2008 IMSS received 109.3 thousand million pesos in CSI taxes from firms and workers, and 44.3 thousand million pesos in CSI subsidies from the government, for a total expenditure of 153.7 thousand million pesos; see Table 7 in the text. As described in IMSS (2005), however, IMSS uses part of its revenues to pay for the pension liabilities of its own already retired workers (the Regimen de Jubilaciones y Pensiones, or RJP), not to provide health services to affiliated workers. In 2008 16 cents of every peso of IMSS revenues were diverted to the RJP, implying that actual expenditures in health services per worker were (153.7)(0.84)/12.76 = 10,118 pesos, given an estimate of 12.76 million formal workers in that year. Given a total occupied labor force of 39.03 million workers, the total costs of health insurance under USI are 394.9 thousand million pesos. On the other hand, the RJP pension liabilities would have to be paid directly by the federal government, for a total amount of 27 thousand million pesos in 2008 (including the payments to RJP from the other insurance items administered by IMSS), which is the amount added to the costs of the proposal in Table 12.

Table A3.1 compares health expenditure under CSI+NCSI vs. USI.

Note that under USI spending in health for informal workers increase by 106 percent while, by construction, spending stays constant for formal workers. As a result, resources for health insurance for workers increase from 260.1 thousand

Table A3.1: Annual Subsidies per Worker for Health Insurance			
	CSI*	NCSI	USI
Firm and worker contributions	7,166**	0	0
Government subsidies	2,952	4,904	10,118
Total	10,118	4,904	10,118

Source: Authors.
*After deducting contribution for RJP; **the incidence of which falls 64 percent on workers and 36 percent on firms.

million pesos (129.1 thousand million pesos from CSI net of RJP, and 131 thousand million pesos from NCSI) to 394.9 thousand million pesos under USI, a 52 percent increase, which in turn implies channeling an additional 1.1 percent of GDP to public health services under our proposal.

2. Retirement and Life and Disability Pensions

In 2008 twice the minimum wage was equivalent to a monthly salary of 3,000 pesos. Contributions by firms and workers to retirement pensions for a worker in that salary were 199 pesos. Adding 93 pesos from the contribution made by the government results in total contributions of 292 pesos a month, or 3,492 pesos a year. Multiplying this by 39.03 million workers yields a total cost of 136.3 thousand million pesos.

IMSS (2005) shows that the actuarial cost of life and disability insurance net of IMSS RJP costs (which, as described above, are absorbed by the federal government) is 2 percent of the wage. For a worker earning twice the minimum wage, the costs of life and disability insurance is then 60 pesos a month, or 720 pesos a year. Multiplying this by 39.03 million workers yields a total cost of 28.1 thousand million pesos. Adding this to the 394.9 thousand million pesos for health and 136.3 thousand million pesos for retirement pensions yields the total cost of USI of 559.3 thousand million pesos included in Table 12 in the text.

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Mexico is characterized by a dual social insurance architecture. Firms and workers in salaried contractual relations are obligated to pay for a bundled set of health, pension and related programs. Nonsalaried workers benefit from an unbundled set of parallel programs paid by the government. We develop a model to study the implications of this architecture in a context of informality and imperfect tax enforcement. We argue that this architecture: (i) provides workers with erratic and incomplete coverage against risks, (ii) fosters evasion and narrows the tax base, (iii) delinks contributions from benefits undermining fiscal sustainability, and (iv) distorts the labor market lowering real wages and total factor productivity.

We propose a reform to shift taxation for social insurance from labor to consumption. We show that by setting a uniform value added tax rate of 16 percent it is possible to provide all workers with the same health and pension benefits and Hicks-compensate poor households for the VAT increase at a net fiscal cost of 0.34 percent of GDP. We argue that our proposal: (i) effectively protects all workers against risks, (ii) reduces distortions in the labor market stemming from social insurance tax-cum-subsidies allowing for an increase in the real wage despite the higher VAT, (iii) raises total factor productivity, (iv) helps to reduce poverty and income inequality, (v) links contributions with benefits ensuring fiscal sustainability, (vi) increases aggregate savings for retirement, and (vii) reduces evasion and widens the tax base. While the focus of the paper is on Mexico, the issues discussed have broader relevance to other countries in Latin America, which are also characterized by high informality and high tax evasion.

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