

## Appendix 5. An Indifference-Curve Model and Analysis of Safelite

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This appendix presents an indifference-curve model and analysis of Safelite’s decision whether to keep the guarantee at 100% of previous wages or to reduce the guarantee to 70%. It *does not* deal at all with the noisy connection between technician effort and outcomes—it is based on the assumption that technicians can choose how much work they do each week. As such, it is incomplete, but (1) it does capture the essence of some of the arguments made by proponents of the 70% guarantee, and (2) it builds intuition of the screening and incentive effects of PPP in particularly simple form.

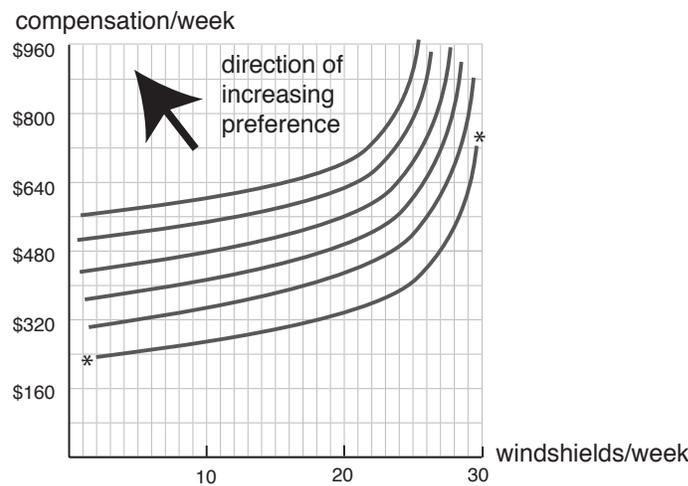
In this appendix, we develop and analyze a super-simple model of the choices made by a Safelite technician, to understand some of the tradeoffs facing Safelite as it contemplated whether to guarantee 100% of previous wages or only 70%. To keep the model simple, we will assume that technicians perform only one task, installing broken windshields. And we assume that a technician, evaluating the desirability of a job with Safelite, is concerned with two things: How much is he paid per week, and how many windshields does he install.

### Indifference curve diagrams in this context

We employ indifference curves to tell this story. Recall from Chapter 10 that indifference curves are like topographical maps, telling you which combinations of consumption bundles (when there are two goods) are equally desirable to a given consumer. The analogy to topographical maps is that each curve is an “iso-utility” or “equal-utility” surface; in the context of Chapter 10, where each commodity was desirable (with a few exceptions), utility increased as you moved north-east from one indifference curve to another.

In this context, things are and look a bit different. Instead of two consumption commodities, we look at an individual technician’s preferences over pairs of the form: (pre-tax) weekly wages, and number of windshields installed in the given week. We assume that our technicians like higher

wages and less work, so as we put wages on the vertical axis and number of windshields installed on the horizontal axis, the direction of increasing preference is up and to the left or what we can call, to the north-west. See, for instance, Figure A5.1.



*Figure A5.1. A typical indifference-curve diagram in this context.* This figure shows six indifference curves for some technician. Assuming (as we do) that as the technician likes more money to less (moving north) and less work to more (moving west), movements generally in the northwest direction are improvements from the perspective of the technician. Also, some indifference curve gives just as much satisfaction as our technician can get from working outside of Safelite; we mark that indifference curve with asterisks on either end.

The sort of picture in Figure A5.1 maps how this technician feels about different combinations of windshields installed and gross compensation, *if* the person is working at Safelite. But presumably this technician has other possible jobs, giving him different levels of satisfaction. Note, in Figure A5.1, the indifference curve marked on either end by the asterisks. These asterisks will mark the indifference curve with the level of preference / satisfaction / utility that this technician can get from his best opportunity for a job outside of Safelite. Therefore, if this individual can, by working at Safelite, get to a point on or to the northwest of this asterisk-marked indifference curve, he will work at Safelite. But if the best he can do at Safelite is southeast of this indifference curve, this person will not work for Safelite at all.

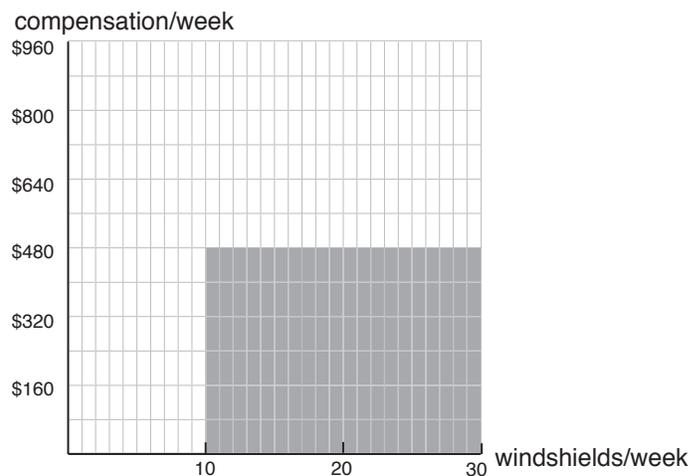
### **Safelite prior to the piece-rate system**

What did a job at Safelite look like, for a technician, prior to the institution of the piece-rate system, which Safelite called PPP, a name which I'll use

henceforth?

Assume that Safelite paid a flat wage of \$12 per hour, for a 40 hour workweek, ignoring the complications of overtime, hours off the job, and so forth. Of course, Safelite would not pay \$480 per week to anyone just for showing up; it expected a minimum amount of work from a technician, and I assume that the “minimum standard” is 10 windshields a week. That is, someone who installed fewer than 10 windshields a week would be fired.

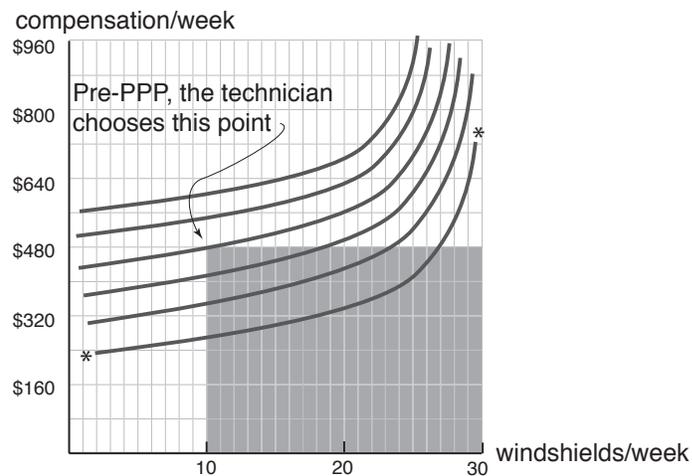
So, prior to PPP, Safelite is offering its technicians the following deal. Safelite will pay \$480 per week, in exchange for 10 windshields per week. In Figure A5.2, the shaded-in area is what Safelite is offering its technicians pre-PPP: They can have any of the points in this area. (That is, a technician could choose to install more than 10 windshields in a week, but this is an uncompensated gift to Safelite. Of course, in real life, technicians might choose to work above the minimum necessary for a variety of reasons—to stock up points with management, because of intrinsic motivation, because they don’t really know what the minimum acceptable is—but for a bare-bones model, I ignore these possibilities. And a technician could tell Safelite, “Pay me less than the \$480 to which I’m entitled,” another gift and one that is unlikely to happen for any reason.)



*Figure A5.2. The offer pre-PPP.* Someone who worked for Safelite pre-PPP could have \$480 per week if he installed at least 10 windshields per week (in my caricature model).

How will a pre-PPP technician react to the “offer” indicated by Figure A5.2? Absent a love for windshield installation or a dislike of money—that is, under our modeling assumption that the technician likes dollars and dislikes effort—the technician will choose to move as far to the northwest in

the shaded region as he can, if this combination of 10 windshields and \$480 gross pay provides him with enough utility so that he chooses to work for Safelite instead of his next best alternative. To see this point in a picture, Figure A5.3 is Figure A5.2 plus the indifference curves of the technician from Figure A5.1. As just argued, this technician maximizes his satisfaction or utility by choosing to work at Safelite, installing 10 windshields for the gross pay of \$480.



*Figure A5.3. The choice pre-PPP.* An employee offered the “deals” in the shaded region in Figure A5.2, with indifference curves as shown, chooses to work at Safelite, installing 10 windshields per week and pocketing \$480 in (gross) wages.

### PPP Is introduced, with the 100% guarantee

Now introduce PPP, assuming a piece-rate of \$30 per windshield, with a guarantee of \$480 in wages (as long as at least 10 windshields are installed). Now the “offer” to the technician is the shaded region in Figure A5.4; the old region, plus the new wedge representing enough windshields installed (16) so that, multiplied by the piece rate of \$30 each, the technician will earn more than the guarantee.

How will a technician respond to this new offer? In Figure A5.5, the indifference curves from Figure A5.1 are superimposed on Figure A5.4, showing just the sort of outcome that Safelite is hoping for: The technician who previously did 10 windshields per week and earned \$480, for a unit-labor-cost of \$48 per windshield, now chooses to do 23 windshields in a week, at \$30 per windshield. Safelite is paying this technician more, but with technicians like this, it can make do with fewer technicians and its overall labor bill goes down. Indeed, if it can manage things so that it hires just enough techni-

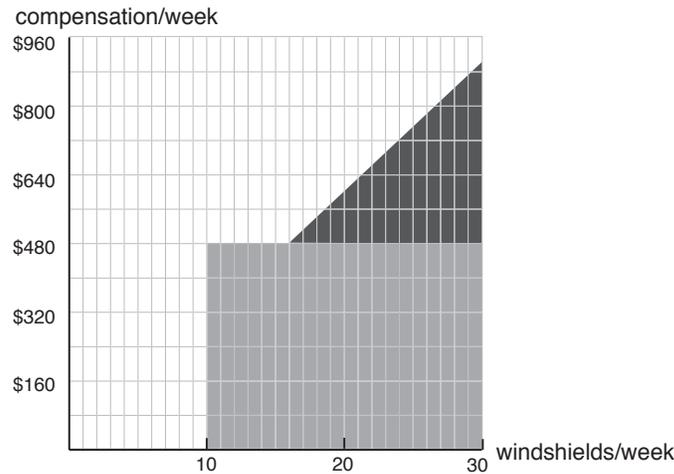


Figure A5.4. The offer after PPP is instituted.

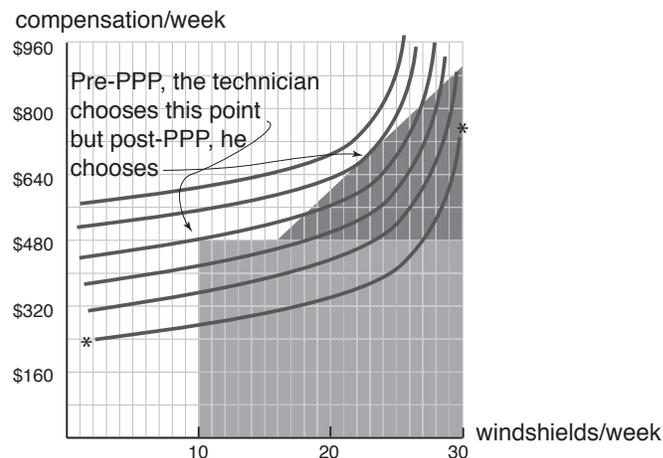


Figure A5.5. After PPP is instituted, this technician works harder, earns more, . . . and Safelite saves a bundle.

icians to service the jobs it gets, and if all technicians are like the technician in Figure A5.5, it will cut its labor bill by nearly 40%.

Not every technician will be so ambitious. Figure A5.6 shows the indifference curve of a different technician who, unimpressed by the new opportunities, sticks with 10 windshields and the guarantee of \$480.

### The Pay Guarantee

We are now in a position to compare the 100% wage guarantee—a guarantee of \$480 in gross pay as long as the technician does 10 windshields—with a 70% wage guarantee, or \$336. To begin, Figure A5.7 compares how this will affect the technicians whose indifference curves are, respectively, those in

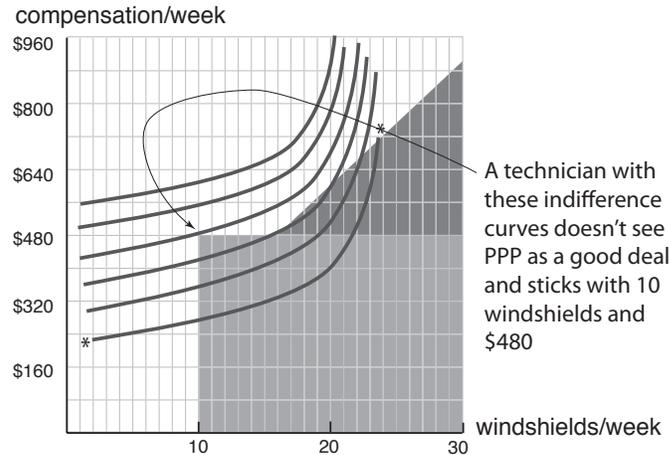


Figure A5.6. A less ambitious technician.

Figure A5.5 and A5.6.

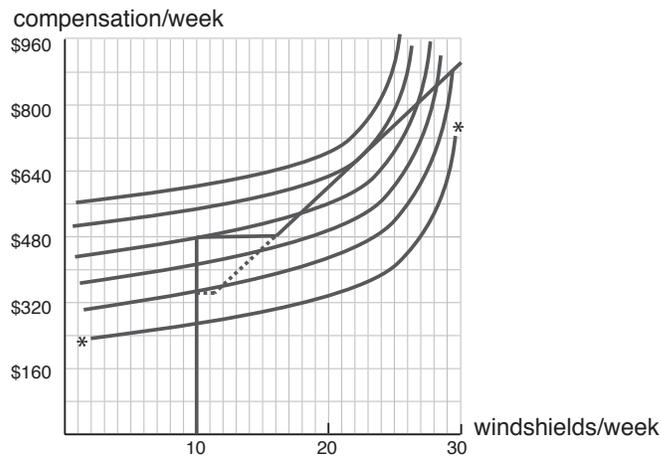
To make it easier to see what is going on, instead of shading in the “offers” of Safelite to the technicians, we outline the offer sets. The offer set with the 100% wage guarantee is outlined by the solid lines; with a 70% wage guarantee, a small piece is removed, with the change outlined by the dashed line. Note that with a wage guarantee of \$336, it only takes 12 windshields in a week to reach the region of piece-rate pay.

What Figure A5.7(b) tells us is that, for the more ambitious technician of Figures A5.1 through A5.5, the lower wage guarantee makes no difference at all. Once PPP is established, he is choosing to do 23 or so windshields and earn \$690 (gross); so he doesn't care whether the guarantee is \$480 or \$336. But panel b tells us that the lower guarantee is good (for Safelite) in its impact on the technician of Figure A5.6. With the higher guarantee, he is content to do 10 windshields and earn \$480. But cut the guarantee to \$336, and he is now motivated to move up to 19 windshields and \$570; this is good for Safelite because it cuts the unit labor cost of windshields done by this guy.

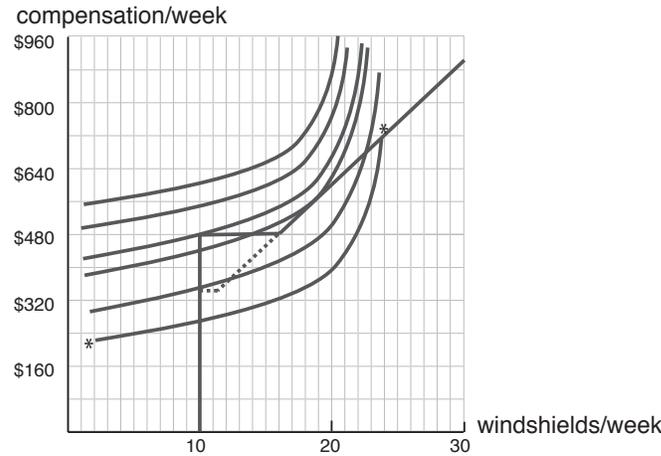
The two technicians aren't the only cases, though. Two more are depicted in Figure A5.8.

In panel a of Figure A5.8, is a very unambitious technician. With the 100% guarantee, he is uninterested in PPP; he does 10 windshields and pockets \$480. And with the 70% guarantee, he is still unmotivated by PPP; he'll grumble about the cut in pay, but given his next best alternative job (the indifference curve marked by the asterisks), he does 10 windshields and pockets \$336. Of course, this is a fine outcome for Safelite: They get the same amount of work out of this technician, for 30% less in wages.

The technician in panel b of Figure 5.8 has the same indifference curves



(a) The technician from Figure A5.5 is unaffected by the lower wage guarantee



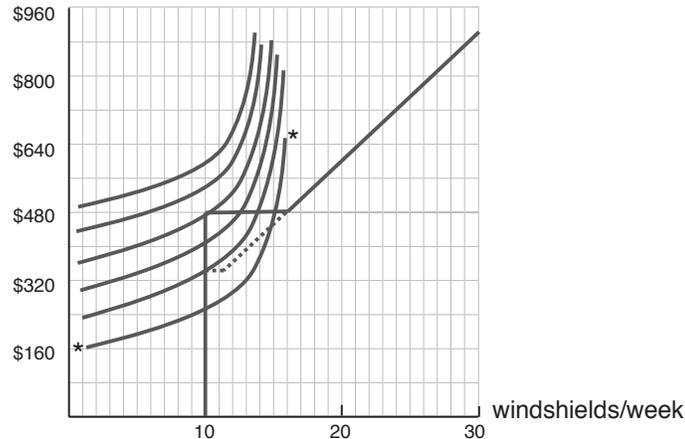
(b) But the technician from Figure A5.6 is motivated to work harder, which is good for Safelite

Figure A5.7. Impact of a lower wage guarantee

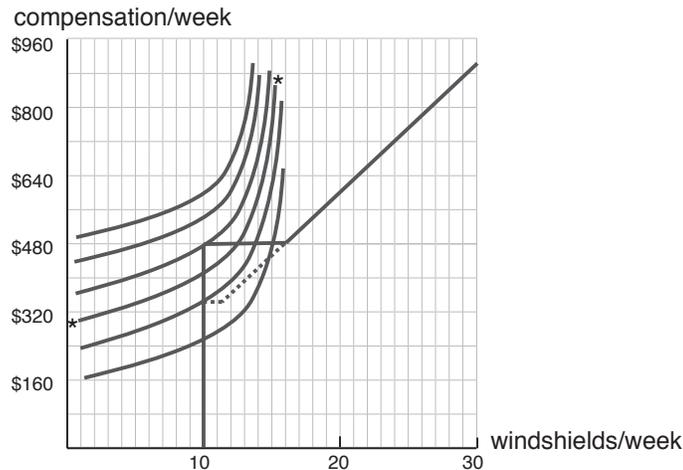
as the technician in panel a, with one important difference: The asterisks have moved, meaning that this technician’s next best job gives him a better outcome than 10 windshields and \$336. He’d stick with Safelite for the 100% guarantee; but cut the guarantee to \$336, and he leaves. Insofar as Safelite was concerned that a lower guarantee would mean a lot of turnover, *insofar as this model captures what is going on*, it is the sort of technician depicted in Figure A5.8(b) that is of concern.

So what’s the bottom line on the guarantee, at least as far as our model is concerned? For three out of the four cases we’ve depicted, Safelite does better with the lower guarantee. For the fourth case—the case depicted in Figure A5.8(b)—the outcome is ambiguous: If turnover is expensive and there are a lot of technicians with this sort of preferences, the lower guarantee will hurt. But in the longer run, if Safelite can attract technicians of the other

Appendix 5. An Indifference-Curve Model and Analysis of Safelite  
compensation/week



(a) This technician is so unambitious that he'll settle for 10 windshields and \$336



(b) And this technician will leave Safelite for his next best job, if the guarantee is cut

Figure A5.8. More impact of a lower wage guarantee

three types, then maybe shedding employees of the sort in Figure A5.8(b) is a good thing.

### Screening effects in both directions

As the text reports (page 482), in the event, Safelite went with the 100% guarantee and still got a very good outcome in terms of labor costs. About half was incentive effects, meaning technicians who had been employed by Safelite working harder. And about half came from screening effects: Some technicians moved to the piece-rate system while some stuck with the guaranteed wage and less work done; as time passed, the percentage of the workforce in the first group rose and the percentage in the second group fell.

We can see two causes for the screening effect in our simple model. Go back to Figure A5.5 and the technician who, even with the 100% guarantee,

takes advantage of the possibilities offered by PPP. This moves this technician onto a higher indifference curve. So as other job possibilities come along, this sort of technician is more content in his job with Safelite and so less likely to turn over, relative to a technician of the sort depicted in Figure A5.6. That is, Safelite should (and did) see a lower voluntary quit rate from those technicians who took advantage of PPP.

And the prospects of working under PPP increases the attractiveness of a job with Safelite for some technicians, namely those ambitious enough to see themselves taking advantage of PPP. But those are precisely the sort of technicians that Safelite wants to attract.

So, both in terms of who is recruited to Safelite and who leaves voluntarily, PPP should (and did) shift the balance of technicians toward those who take advantage of PPP.

### **The big thing the model misses**

That's about all we can wring out of this simple model. The chapter discusses a number of other issues, but I'll close this Appendix by reminding you of the most important missing issue from the perspective of the chapter:

This model presumes that the individual technician can look at the "offers" put on the table by Safelite in terms of windshields done and wages earned and choose his favorite point. Life isn't so simple. A technician may wish to do 23 windshields in a week, but circumstances may conspire against this. In this sense, a wage guarantee of \$480 instead of a wage guarantee of \$336 is insurance for the technician, insurance that kicks in whenever, through no fault of his own, the technician finds that he can't even get to 16 windshields in a given week. Insofar as advocates for the 100% wage guarantee were worried about turnover if the guarantee were cut, it may be that their concern was more ambitious technicians who would, despite their ambition, see the lower wage guarantee as too risky to be borne.<sup>1</sup> We can't see this in our model, because there is no uncertainty in the model. But, from the perspective of the economic theory of incentives, this inability to control outcomes but merely influence them through effort is the source of what in the chapter is called "the fundamental tradeoff."

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<sup>1</sup> There is also the psychological effect of telling folks that you are only guaranteeing 70% of what they used to make, but this is economics, not psychology, so I won't pursue that.