An Armchair View of Escalators and Moving Walkways

Roger W. Garrison
Auburn University

Introduction

There is much pedagogical value in applying the economist's standard analytical tools to issues about which students already have a common-sense understanding. By demonstrating this point repeatedly, Steven Landsburg has become the profession's pre-eminent *Armchair Economist* (Landsburg, 1993). "Why Popcorn Costs More at the Movies" (pp. 157-167) may not be a critical issue in its own right, but addressing it with just the right kernel of economic truth can be an effective way of teaching analytical skills.

Almost a decade after manning his armchair, Landsburg (2002) dealt with a pair of downright frivolous questions: Why don't people walk up escalators? And why don't people stand still on stairs? Landsburg's answer, which he attributes to Mark Bils, involves taking escalators and stairs to be instances of inferior and superior machines. Just as workers should spend less time with an inferior machine, people should spend less time on stairs. Well, all right, standing still on stairs clearly violates that maxim.

While Bils and Landsburg get points here for matching answer to question in terms of the degree of frivolity, they forgo the opportunity to showcase the economic way of thinking by applying standard indifference-curve analysis.

Resting and Moving

The relevant decision, undoubtedly made subconsciously by the typical stair climber or escalator rider, involves a tradeoff between resting and moving towards their ultimate destination. This tradeoff is perfectly analogous to the one that underlies much of labor economics, namely the tradeoff between leisure and income (McConnell *et al*., 2006, pp. 15-22). For a given period of time, enjoying leisure and earning income can be achieved in various proportions, and under favorable conditions, people can choose the optimal mix. For a given increment of time spent on stairs or escalators, resting and moving are the two relevant alternatives. And while resting can be interpreted as not moving at all, moving slowly entails a degree of resting—analogous to labor theory's "on-the-job leisure."

So, we let the two gerunds (resting and moving) label the vertical axis and the horizontal axis, respectively, of the indifference-curve map in Figure 1. That extreme form of resting, i.e., standing still, defines the

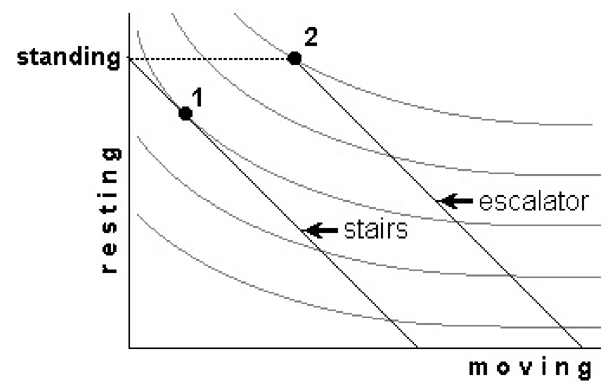

Figure I: Escalator with a Corner Solution

vertical intercept of a budget constraint, which we take to be linear. (A significant budget-constraint non-linearity in the case of moving walkways will be considered later.) The horizontal intercept corresponds to zero rest and has our stair climber racing at maximum speed. We take this budget constraint to be applicable only to ascending the stairs; the constraint applicable to descending would have a horizontal intercept lying further to the right. Most people can race down the stairs faster than they can race up them.[1] In either application and except in extreme circumstances, the actual tradeoff will be struck somewhere between standing still and racing as fast as possible.

Straightforwardly, the indifference-curve map shows our ascenders' preferences when faced with a choice between resting more and moving faster. A tangency between the budget constraint and an indifference curve occurs at Point 1, which identifies the optimal combination of resting and moving on the stairway.

If the stairway is replaced by an escalator, our budget constraint must be replaced as well. The new constraint has the same slope as the old one but is shifted to the right to take into account the speed of the escalator. Having the same slope implies that walking up an escalator and walking up stairs at a given speed are equally unrestful activities. If walking up an escalator is judged to be more unrestful (because of the higher steps and less suitable rise-to-run ratio) then the budget constraint for the escalator would be a little steeper than the one for the stairs.

Important for our application is the fact that the new budget constraint is truncated at the standing-still level of rest. The constraint does not extend upward from that point toward the vertical axis. This is only to say that you cannot improve on the restfulness associated with standing still by walking or running backwards on the escalator. Thus, the point that represents standing still and moving at escalator speed is a potential corner solution. The preference map shows that this corner, Point 2 (in Figure 1), is in fact the optimal choice for our typical rider.

We see from Figure 1 that our stair-climber-*cum*-escalator-rider deals with the gain offered by an escalator in conventional ways. The gain is taken partly in the form of more rest and partly in the form of more speed. The corner solution implies that some riders would actually go further in trading speed for rest at the margin if that were technologically

[1] One of my colleagues whose armchair is much newer than my own claims that she can go up the stairs (taking three steps at a time) faster than she can go down (having to use every step).

possible. But given their actual options, they are constrained to move at escalator speed while just standing still.

Would people be better off with escalators that allowed for tangency solutions? The general shape of the indifference curves suggests that achieving a tangency would require escalators to move more slowly. Figure 2 shows the case where the escalator moves at the optimal stair-climbing speed established in Figure 1. With the potential corner solution

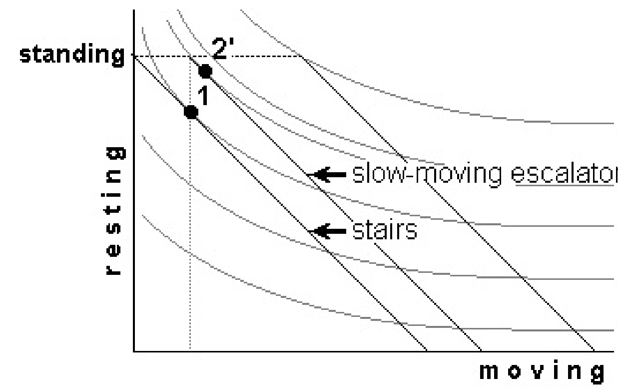

Figure 2: Escalator with a Tangency Solution

directly above Point 1, the typical rider would not adopt that corner as a solution. To stand still on the this slow-moving escalator would mean taking the whole gain in the form of more resting (a possible—but probably not a typical—choice). Most everyone would walk up—with some, presumably, ascending faster than others. Note, however, that the tangency solution entails a degree of utility that is less than that associated with the corner solution in Figure 1. Riders are better off with a corner solution on a faster-moving escalator.

Providing answers to the original inquiry (Why don't people walk up escalators?) leads us to a related question that has a more satisfying answer: On what basis do escalator manufactures set the speed of their escalators? It would seem that they set the speed at a level that puts most riders at a corner solution.[2] With most riders standing still, the problem of congestion is minimized. Further, the dominance of the corner solution justifies an escalator design that best accommodates standers. (The slow-moving escalator of Figure 2 should have a step height and rise-to-run ratio of a conventional stairway. That design would best accommodate the climbers.)

Even with the faster-moving escalator of Figure 1, some people will climb. Their preferences imply a tangency solution (with steeper indifference curves than the ones in Figures 1 and 2). Some may even climb as rapidly as they would climb stairs. These people are simply taking all of the gain provided by the escalator in the form of speed and none of the gain in the form of rest.[3] It may well be the case that an escalator speed set so high that literally no one would walk or run up it is, at the same time, set so high that virtually no one would get on it. Further, we see in the following section that it is no contradiction of economic theory for some people in some circumstances to move faster up an escalator than they would move on stairs.

Train Stations, Airports, Convention Hotels, and Shopping Malls

Figure 3 is identical to Figure 1 in terms of the shape and location of the budget constraints, but it differs from the earlier figure in terms of the preference map. Given the particular indifference curves of Figure 3, we get a tangency solution in which the rider actually leverages the gain provided by the escalator. As implied by a movement from Point 1 to Point 2, he runs up the escalator, though with stairs he would only have walked up. We can easily imagine the circumstances in which these

[2] Actually polling the manufacturers of escalators on this question, of course, would violate the spirit of armchair theorizing. In any case, we can claim they *behave as if* they have a corner solution in mind.

[3] According to Landsburg (2002), the Bils-Landsburg argument "proves...that even if you choose to walk on the escalator, you should *always* walk even faster on the stairs" (*emphasis added*). The "always," it turns out, makes their statement too strong.

preferences are understandable. Suppose it is very much worth while to get to the next floor quickly but failing that, it doesn't much matter whether you get there a little later or even later still. Train stations and airports provide circumstances where these indifference curves might apply.

The escalator may give the traveler just the leverage he or she needs to catch an on-time plane. But absent the escalator, all hope is lost. The stair-climber walks up the stairs at a normal pace on the chance that the train/plane is late or to check the time table for the next departure. (Undoubtedly, some of these travelers might have run up the stairs. Still, the case in which a traveler would walk up the stairs but run up the

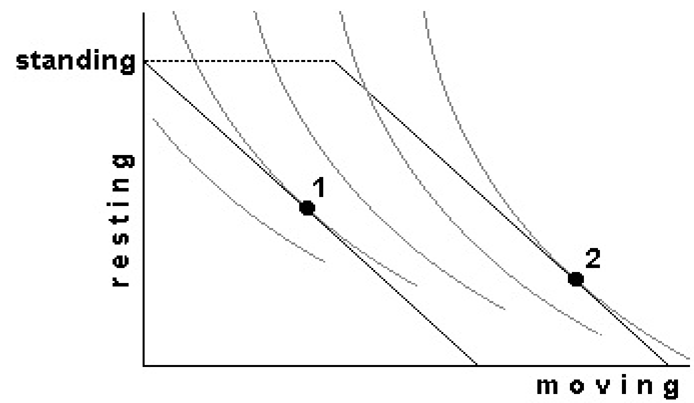

Figure 3: Allowance for Leveraging Speed

escalator is conceivable and even plausible.) The behavior motivated by the preference map in Figure 3 is probably common in train stations and airports but rare to non-existent in convention hotels. The conventioneers are not overly concerned about missing the first few minutes of some session on the application of indifference-curve analysis.

Shopping malls are usually like convention hotels but are sometimes like train stations and airports. On the day after Christmas or on other special sales days, it is critical to get to the merchandise ahead of the crowd; but failing that, it will do just to see what's left over after the mad scramble. Shoppers whose preferences are more conventional (i.e., similar to the ones shown in Figure 1) might want to be put on notice that there are other shoppers among them whose preference maps are similar to the one shown in Figure 3. Possibly, mall managers might find it worthwhile to create an iconic symbol that captures the pattern of indifference curves of Figure 3 and post it near the mall entrance on sales days. The notice could serve a function similar to a posting at the beach that warns of a riptide.

Moving Walkways

An indifference-curve treatment of moving walkways would seem to be similar in all respects to our treatment of escalators. But there are critical differences. The budget constraint has a much shallower slope and possibly is non-linear at strolling speeds, virtually precluding the kind of dominant corner solution that characterizes our analysis of escalators. Figure 4 adopts the same indifference-curve map used in Figure 1. But the budget constraint has a slope that is considerably less than the one in Figure 1: On a level playing field, people can trade rest for speed on much more favorable terms.

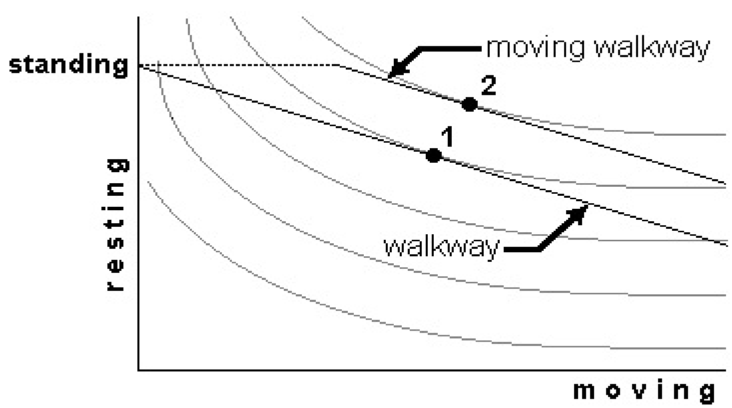

Figure 4: Moving Walkway with Linear Budget Constraint

The shallow slope alone makes it unlikely that a corner solution will dominate. In Figure 4, our typical rider takes advantage of a moving walkway by locating at Point 2, which constitutes a tangency solution. It is without contradiction, then, that many people (including the author) stand on an escalator but walk on a moving walkway. Making a corner solution even less likely is the fact that for many, strolling may seem more restful than standing. If strolling is preferred to walking *even on grounds of restfulness*, then the budget constraint itself rises from its standing-still level and then slopes downward at speeds beyond the stroll. As is clear in Figure 5, this kind of non-linearity precludes a corner solution.

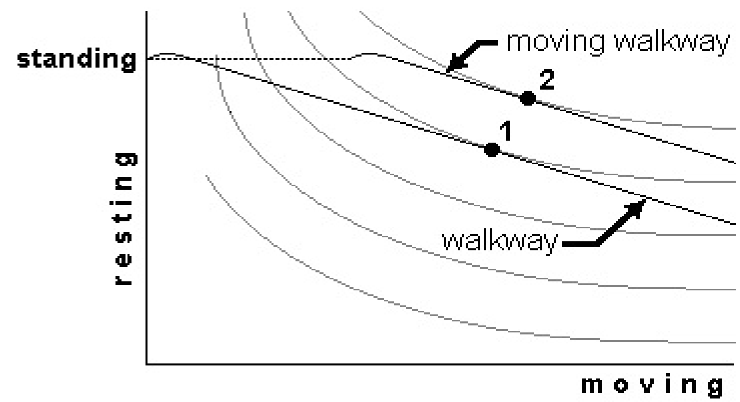

Figure 5: Moving Walkway with Non-Linear Budget Constraint

Of course, some people do stand on moving walkways. Standing may even be typical for riders who have luggage or are otherwise encumbered. Others stroll for added restfulness or to avoid boredom. Still others walk, taking only part of the gain provided by the moving walkway in the form of rest, or they walk fast, leveraging the gain. Without a corner solution to fix a dominant mode of usage, measures need to be taken to deal with the variety of modes. Typically, moving walkways are wider than escalators, and riders are reminded by conspicuous signs or by a taped voice to stand on the right or walk on the left. Though less common, this same convention can be prescribed for escalator riders.

Summary

Using indifference curve analysis to show why people stand still on escalators but walk on moving walkways helps establish the near-universal applicability of neoclassical microeconomic theory. Working with contrasting preference maps (such as those in Figures 1 and 3) to deal with an issue where the student's own intuition is fully in play may help the student to read indifference curves in less intuitive cases. And challenging the students to apply basic economic tools to similarly frivolous issues can result in fun and even learning. The only downside to exposing students to this armchair view of escalators and moving walkways is that they may never again be able to pass through an airport without thinking of indifference-curve analysis.

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About the Author

Roger W. Garrison is a Professor of Economics at Auburn University. Roger has been named Mortar Board Favorite Professor at his home university, where he has taught since 1978. Dating from the mid-1980s, he has been a regular lecturer on Austrian Economics for the Ludwig von Mises Institute and for the Foundation for Economic Education. His pedagogical research has been published in the *Journal of Economic Education*, while his work on Austrian Economics and other topics has appeared in the *American Economic Review*, the *Journal of Money, Credit, and Banking*, *Economic Inquiry*, the *Journal of Macroeconomics* and *History of Political Economy*, among others. In 2001 his book, *Time and Money: The Macroeconomics of Capital Structure*, was published by Routledge, and in 2003 Roger was named as the first Hayek Visiting Fellow at the London School of Economics. He currently serves on the editorial boards of the *Review of Austrian Economics* and the *Quarterly Journal of Austrian Economics*.