

Personalization, data portability and competitive dynamics^{*}

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Abstract

We study data portability in a model of dynamic price competition where product quality improves for each customer as personal data accumulates with usage. This can reflect AI-driven personalization based on customer data or customers embedding their own data into the firm’s product through usage. We show that when consumers are forward looking, a firm strictly benefits from offering portability if and only if doing so increases total future surplus per initial customer. We identify conditions ensuring that at least one firm strictly prefers to offer portability, with both firms preferring to do so when product differentiation is sufficiently strong relative to differences in net value. By contrast, when consumers are myopic, there are equilibria in which neither firm offers portability. We identify conditions under which a portability mandate harms or benefits consumers. We extend these results to settings with personalized prices and with imperfect data portability.

Keywords: data portability, artificial intelligence, algorithms, learning

1 Introduction

Personalization has become a central source of competitive advantage for firms that employ AI models in their products. Such products improve for each individual customer as usage generates data that can be leveraged to better satisfy customer needs. For instance, AI chatbots can learn from repeated interactions with the same user, using that user’s context to tailor their responses. In such settings, accumulated data create a form of endogenous

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switching cost: a customer who stays benefits from improved personalization, while a customer who switches forfeits those gains unless their data can be transferred. Similarly, many software services become more valuable with usage as customers embed their specific data, applications and workflows.

This raises a fundamental strategic question, which is our focus: should firms enable consumers to take their data to a rival when they decide to switch? We refer to this as data portability. By that, we mean effective portability, so data can be transferred in a form that allows the rival to preserve the productive value of that data. Some firms, particularly providers of business software (e.g., Salesforce, WordPress, Figma), voluntarily provide robust export tools and APIs that help customers port their data and thereby switch. Apple, Google and Meta are founding members of the Data Transfer Initiative, through which they promote data portability for some of their products.¹ Yet in many other cases, effective portability remains limited.

Existing laws such as the General Data Protection Regulation (GDPR) in Europe already give individuals a partial portability right over personal data, while the EU Data Act, applicable from 2025, extends these rights to business users. These rules create an important regulatory baseline, but they do not fully answer whether firms should offer more effective portability through richer data, metadata, APIs, or firm-generated outputs that go beyond minimum legal compliance, including in countries outside the EU. We expect this issue, along with the question of whether data portability needs to be mandated more broadly, to become even more central with the advance of AI-driven services.

A common intuition is that regulatory mandates for data portability are necessary to protect consumer interests. Portability weakens lock-in, benefits consumers, and hurts incumbent firms, so market participants would not readily offer it. However, our analysis shows that this logic is incomplete when consumers are forward looking and firms compete for the initial relationship.

We develop a dynamic model of price competition with two differentiated firms and two periods, in which a firm that serves a given consumer in period 1 obtains data on that consumer and therefore can offer them a higher quality product in period 2. Data portability allows a consumer that switches firms in period 2 to transfer this data to the rival, effectively neutralizing any incumbent data advantage for that individual. The firms can differ in both their initial product qualities and the improvements due to customer data (e.g., one may have a better algorithm than the other). Firms set a single initial price but can discriminate between returning and switching customers in period 2. In this context, we ask two main

¹Most active in this regard is Google, as evidenced by its comprehensive list of data portability options in Google Takeout: <https://takeout.google.com/>.

questions: (1) should firms voluntarily offer data portability? (2) if they don't, should they be required to do so?

Our key finding is that, with forward-looking consumers, a firm strictly benefits from committing to data portability if and only if doing so increases total future surplus (consumer surplus plus both firms' profits) per initial customer. The central mechanism is an intertemporal unbundling effect. Without portability, the initial purchase also determines which firm can use the resulting customer data later. An initially advantaged firm can therefore find its initial strength undermined by a rival's ability to generate greater future surplus. It must compensate for that future disadvantage when competing for the initial purchase. By offering portability, the firm allows its customers to obtain the rival's improved service later. When this increases future surplus, it reduces, and can even eliminate, the need to compensate for its future disadvantage, allowing the firm to earn more from its initial advantage even if it loses customers later. The rival has less reason to subsidize the initial purchase to secure the customer's data, while forward-looking consumers take future access to its improved service into account when choosing their initial supplier. Portability thus allows the initially advantaged firm to compete more on the strength of its initial offering.

Product differentiation can affect whether portability increases total future surplus. When both firms continue to serve consumers following one firm's decision to offer portability, differences in prices can induce some consumers to switch to a service that creates less net value for them. If these losses outweigh the gains from wider access to data, portability reduces total future surplus, so that firm prefers to withhold it. Strong product differentiation limits this problem by reducing the number of consumers induced to switch. We identify conditions under which differentiation is sufficiently strong relative to firms' net-value differences that both firms prefer to offer portability.

Portability can also increase total future surplus when differentiation is weak relative to one firm's data-enabled advantage. If that advantage is large enough for the firm to serve all consumers under portability, every induced switch raises total surplus because the advantage outweighs any loss from a poorer match with the consumer's preferences. We establish conditions ensuring that at least one firm strictly prefers to offer portability, both when firms continue to share the market under portability and when one firm serves everyone. Under these conditions, there is no equilibrium in which both firms withhold it.

These private incentives need not benefit consumers. We show that bilateral portability can reduce consumer surplus even when it increases total future surplus and both firms prefer to offer it. Wider access to data weakens firms' incentives to compete for the initial purchase. Higher initial prices can then outweigh consumers' subsequent gains. A portability mandate can therefore harm forward-looking consumers when firms don't voluntarily offer portability.

We then examine how these incentives change when consumers are myopic. When consumers do not account for the future benefits of taking their data to the rival or the implications for future competition, firms have less incentive to offer portability. In this case, what matters is not total future surplus but whether data portability increases future joint profits per initial customer. As a result, data portability is generally less profitable to offer, and we identify general conditions under which bilateral portability is never an equilibrium. Consumer myopia can strengthen the case for a portability mandate, because firms may withhold portability even when consumers would benefit from it. In particular, we identify cases in which one firm’s improvement from data is sufficiently greater than the other’s that portability benefits consumers but lowers future joint profits, so firms do not offer it voluntarily. A mandate can secure these otherwise unrealized consumer benefits. However, it can still reduce consumer surplus in other cases, including when the firms’ improvements from data are not very different.

We extend the analysis to environments with personalized pricing and with imperfect data portability. With personalized prices and forward-looking consumers, each firm always weakly prefers to offer portability because portability always weakly increases total future surplus. With imperfect portability, the same comparisons of total surplus and joint profits continue to determine firms’ decisions to offer portability. We show conditions under which greater portability effectiveness makes firms more willing to offer portability.

Finally, we provide managerial and policy guidance grounded in these mechanisms, clarifying when firms should voluntarily commit to portability and when regulatory intervention may be warranted.

2 Related literature

Relatively few economics papers study data portability. In a two-period model, Krämer and Stüdle (2019) study porting data from the incumbent content provider to a rival entering in the second period. Portability makes the entrant’s customers worse off and the incumbent’s customers better off by changing the incumbent’s first-period information disclosure and subsequent price competition. In a similar two-period setup, Lam and Liu (2020) look at whether a data portability policy that only applies to consumer-provided data facilitates entry, showing that it can actually hinder entry. This happens when the policy leads consumers to provide more data, thereby strengthening the incumbent through a data network effect. Because portability applies only to consumer-provided data and not to data derived by the firm through analytics, entry can become harder for a rival. Wohlfarth (2019) also studies an incumbent facing a second-period entrant, but firms choose how much

data to require from users rather than setting prices. Portability can harm consumers by inducing the entrant to collect more data; unlike in our model, disclosing data is costly for users without improving the service quality they receive. These papers do not model price competition between both firms from the outset.

Two more recent papers do model such dynamic price competition. Jeon et al. (2023) study firms' compatibility choices in two-period competition between two-product systems. If either firm chooses incompatibility, consumers must obtain a complete system from one of the firms. They show that a data portability policy, by reducing switching costs, can induce a change from incompatibility to compatibility. Jeon and Menicucci (2024) study data portability in a two-period model with switching costs in which firms cannot charge negative prices but can offer less efficient freebies tied to their products or services. They show that portability can increase both firms' profits and consumer surplus.

In contrast, we study firms' unilateral decisions to offer portability, rather than a policy that reduces switching costs. We model portability as enabling a rival to use a switching consumer's data, increasing willingness to pay for its product. Its effects can therefore differ across firms and even reverse their relative advantage, reflecting differences in their ability to extract value from data rather than a common reduction in switching costs.

Our paper also relates to the broader switching-cost literature (e.g., Klemperer, 1987a, 1987b). Relative to settings with exogenous switching costs common across firms, we allow each firm to unilaterally facilitate switching by its own customers. Moreover, reducing an exogenous switching cost weakens the incumbent's advantage without changing the underlying benefits offered by either supplier. In our setting, data generated through use of one firm's product may be more valuable in the rival's product. Portability can therefore enable consumers to obtain greater underlying value by switching, rather than merely reducing an impediment to switching. A standard switching-cost interpretation would miss the intertemporal unbundling mechanism that is central to our paper. This is easiest to see in our personalized-pricing extension, where we can focus on a single consumer. In this two-period Bertrand setting, reducing an exogenous, common switching cost would raise first-period prices and lower second-period prices, leaving discounted profits and consumer surplus unchanged. By contrast, in the same setting, we show that when portability improves products and induces switching in equilibrium, it benefits both firms and harms consumers.

Farrell and Klemperer (2007, Section 2.8) review endogenous switching costs, including firms' incentives to create lock-in and to facilitate switching. Caminal and Matutes (1990) show that commitments to loyalty discounts can raise equilibrium profits. These switching costs arise from forgone discounts rather than real resource costs, whereas our portability commitments change the underlying benefits of the rival's service when consumers switch.

More closely related to our mechanism, Matutes and Régibeau (1988), with horizontal differentiation, and Einhorn (1992), with vertical differentiation, show that mix-and-match compatibility can soften price competition and raise firms' profits, potentially at consumers' expense. In Einhorn's shared-quality-leadership case, compatibility separates competition over components in which different firms have an advantage, preventing those advantages from offsetting each other in competition between complete systems. Our intertemporal unbundling mechanism applies a similar logic to successive purchases linked by customer data. Both of these compatibility papers restrict the outcome to full compatibility or incompatibility. In our model, each firm independently controls whether its own customers can transfer their data to the rival, so unilateral portability need not imply bilateral portability. Sequential price competition also creates a role for consumer foresight absent from these static compatibility models: we show incentives to offer portability depend on future total surplus with forward-looking consumers but future joint profits with myopic consumers.

Finally, our paper relates to work on data sharing between competitors. Hagiu and Wright (2023) study an infinite-period model in which customer usage improves firms' products, but analyze a symmetric data-sharing policy and its consumer-surplus effects rather than firms' unilateral incentives. Bhargava et al. (2026) show that a specialist firm may share data with a generalist entrant in an interdependent market to make the entrant less aggressive. Their paper shares our point that giving a rival access to data can soften direct competition, but it studies data sharing across markets rather than data portability across time.

3 Baseline model

Two firms A and B compete in prices over two periods to serve a unit mass of consumers. Firm $i \in \{A, B\}$ incurs constant marginal cost c_i each time it serves a consumer. In period 1, each firm sets a single price p_i for all consumers. In period 2, firms may condition prices on which firm a consumer bought from in period 1, so each firm can set one price for repeat customers and a different price for switching customers.

We use a general model of differentiation that allows for both horizontal and vertical differences between the firms. Specifically, in period 1, consumers' utilities before subtracting prices are $v_A - \alpha_A x$ for firm A and $v_B - \alpha_B(1 - x)$ for firm B. Consumers differ in x , which is distributed on $[0, 1]$ with cumulative distribution function F and a positive, continuously differentiable density f on the interior of its support. We assume that F and $1 - F$ are log-concave² and that

$$\alpha_A > 0, \quad \alpha_A + \alpha_B > 0.$$

²A sufficient condition is that the density f is log-concave.

These assumptions imply that A is relatively more attractive to low- x consumers and B to high- x consumers. They allow α_B to be negative, provided $\alpha_A + \alpha_B$ remains positive. No symmetry is imposed on the distribution, the firms' utilities, or their costs. We also assume that utilities are large enough that the market is covered: every consumer buys from one firm or the other in each period.

This formulation generalizes Schmutzler (2025) by allowing a nonlinear F . It encompasses horizontal differentiation, where some consumers prefer each firm at equal prices, as well as vertical differentiation, where all consumers prefer the same firm at equal prices. To see the distinction, compare the difference in net utility between A and B at equal prices. This difference equals $v_A - v_B + \alpha_B$ when $x = 0$ and $v_A - v_B - \alpha_A$ when $x = 1$. Consumers' rankings differ when the former is positive and the latter negative, capturing horizontal differentiation. If both are positive, all consumers prefer A at equal prices; if both are negative, all prefer B at equal prices. If F is the uniform distribution and $v_A = v_B$ and $\alpha_A = \alpha_B > 0$, then this becomes the standard symmetric Hotelling model of differentiation.

In period 2, the data generated by an initial purchase improves the original supplier's offering to that consumer, for instance via AI-enabled personalization and customization. If firm i has access to a consumer's data, v_i increases to $v'_i > v_i$ in period 2. Without portability, only the customer's original supplier has access to their data and can offer this higher utility in period 2. If a firm offers data portability, its period-1 consumers can also make the data available to the rival firm, which can then offer its own higher data-enabled utility in period 2. For those consumers, both firms can then offer their respective data-enabled services. Alternatively, if a regulator mandates portability, both firms must provide it to their customers, so v_i increases to v'_i for both firms and all consumers in period 2. Data is specific to each consumer, so obtaining one consumer's data does not improve the service offered to other consumers buying from the same firm. In this baseline setting, portability is fully effective and costless.

A key simplifying assumption is that, conditional on the initial supplier and its portability decision, expected period-2 payoffs per consumer—both firms' profits and consumer net utility—are independent of period-1 locations and prices. These expectations are evaluated when consumers choose their initial suppliers. Thus, expected period-2 net utility is the same across consumers considering a given initial supplier, although their realized utilities may differ. For any fixed portability choices, period-1 prices affect aggregate continuation payoffs only by changing the measure of consumers won by each firm and hence the customer data they may have access to.

For instance, these assumptions hold if utilities have the same form in period 2 as in period 1, except that each firm's utility parameter v_i is shifted up to v'_i for consumers whose data it

has access to, while each consumer's location x is drawn again in period 2, independently of the period-1 location.³ The new draws have distribution G on $[0, 1]$, which may differ from F . We impose the same regularity and log-concavity conditions on G as on F . Write β_A and β_B for the period-2 differentiation parameters, which may differ from α_A and α_B . For this differentiated specification, we assume $\beta_A > 0$ and $\beta_A + \beta_B > 0$. The general model also allows no differentiation in period 2, so $\beta_A = \beta_B = 0$. In this special case, firms engage in asymmetric Bertrand competition in which one firm may serve the whole market. This illustrates the possibility that period-1 locations just capture perceived brand differences that disappear once consumers become informed about the products.

Period-2 competition generates per-consumer profits for the two firms and expected net utility (consumer surplus) for each of the two groups, depending on which firm they purchased from in period 1. For A's period-1 customers, these payoffs are denoted $\pi_A(A)$, $\pi_B(A)$, and $u(A)$ if A does not offer portability, and π_A^P , π_B^P , and u^P if A offers portability. For B's period-1 customers, they are $\pi_A(B)$, $\pi_B(B)$, and $u(B)$ if B does not offer portability, and π_A^P , π_B^P , and u^P if B offers portability. The portability payoffs are the same for either initial supplier because portability gives both firms access to the consumer's data. Define

$$S(j) = \pi_A(j) + \pi_B(j) + u(j), \quad S^P = \pi_A^P + \pi_B^P + u^P.$$

These are total expected continuation surpluses: they equal the expected utilities of the services actually purchased, net of their production costs. Conditional on which firm serves each consumer, prices determine only how surplus is divided between firms and consumers. Finally, in period 2, we exclude prices below marginal cost, since such prices are weakly dominated by pricing at cost.

We assume that the parameters are such that each firm serves a positive share of consumers in period 1 in equilibrium regardless of the firms' portability decisions. Let A's share be s_A and B's share be $s_B = 1 - s_A$. Initial margins may be negative because serving a consumer can generate subsequent profit. With positive marginal cost, a negative margin need not imply a negative monetary price.

The timing is as follows. In period 0, the firms independently and simultaneously choose whether to commit to making the new data generated by their period-1 customers portable. A portability mandate requires both firms to make the period-0 commitment. In period 1, the firms simultaneously set prices, and consumers choose suppliers. In period 2, firms simultaneously set their prices for each customer group, and consumers choose suppliers again, transferring their data if they switch from a firm that offers portability. Firms and

³The approach of assuming independent draws of consumer location across periods has also been used in the switching cost literature, including Cabral (2016), Rhodes (2014) and Lam (2017).

consumers are forward looking, with a common discount factor $0 < \delta < 1$.

3.1 Discussion of model assumptions

An AI assistant provides a useful example of the asymmetries captured by the model. One firm may start with an advantage because of its existing product, integrations, or information already held about users. A rival may have an algorithm that makes better use of the new data generated through a user’s interactions. Thus, the initially more attractive firm need not be the firm that can provide the better data-enabled service. Our main interest is in this reversal of advantage. Different marginal costs, such as different inference costs, provide a counterweight to differences in service quality. As we will see, what matters for each firm is the utility net of cost.

A common price in period 1 and separate prices for new and returning customers in period 2 capture a natural way for subscription providers to compete for users. Data affect the services those users receive, while the price within each customer group is the same. Promotional discounts for switching customers are commonly used in many subscription settings, and can be expected to arise in the AI assistant market as well. In an extension, we allow firms to offer fully personalized prices, so each consumer can be offered a different price—something AI could enable in the future alongside product personalization.

Finally, we assume that the portability decision is credible when consumers choose their initial suppliers. For an AI assistant, an established data export facility and a contractual promise to keep new user data transferable can support this commitment. Portability concerns prospective data generated by new customers, rather than a decision to release an inherited stock of data from past usage. Section 7 discusses this commitment issue further.

4 Baseline results

A firm’s decision to offer portability depends on how it affects competition in both periods. Forward-looking consumers anticipate its effects on the services and prices they will receive in period 2, and take these into account when choosing their initial supplier.

To illustrate the analysis, suppose neither firm offers portability (the analysis for the other three possible cases is very similar). In period 1, since consumers are forward looking, the indifferent consumer x is defined by

$$v_A - \alpha_A x - p_A + \delta u(A) = v_B - \alpha_B (1 - x) - p_B + \delta u(B).$$

When the two firms have positive market shares in period 1, these are

$$\begin{aligned} s_A &= F\left(\frac{v_A - v_B + \alpha_B + p_B - p_A + \delta(u(A) - u(B))}{\alpha_A + \alpha_B}\right) \\ s_B &= 1 - s_A. \end{aligned}$$

This implies that firm A's discounted profit at the start of period 1 is

$$\begin{aligned} &(p_A - c_A) s_A + \delta(\pi_A(A) s_A + \pi_A(B) s_B) \\ &= (p_A - c_A + \delta(\pi_A(A) - \pi_A(B))) s_A + \delta\pi_A(B), \end{aligned}$$

which A maximizes over p_A . Meanwhile, firm B's discounted profit is

$$(p_B - c_B + \delta(\pi_B(B) - \pi_B(A))) (1 - s_A) + \delta\pi_B(A),$$

which B maximizes over p_B . The difference between a firm's second-period profits from the two customer groups accounts for the fact that it may also earn period-2 profit from consumers who initially buy from its rival.

The discounted profit expressions are similar when one or both firms offer portability. The only difference when firm $i \in \{A, B\}$ offers portability is that $\pi_A(i)$, $\pi_B(i)$ and $u(i)$ are replaced by π_A^P , π_B^P and u^P . We use superscript d to denote the second-period payoffs associated with the firms' portability choices. For consumers who initially buy from firm j , $(\pi_A^d(j), \pi_B^d(j), u^d(j), S^d(j))$ equals $(\pi_A(j), \pi_B(j), u(j), S(j))$ if j does not offer portability, and $(\pi_A^P, \pi_B^P, u^P, S^P)$ if it does.

Write each firm's net values without and with data as

$$w_i = v_i - c_i, \quad w'_i = v'_i - c_i, \quad i \in \{A, B\}.$$

Define

$$\Omega^d = w_A - w_B + \delta(S^d(A) - S^d(B)), \quad (1)$$

where $w_A - w_B = (v_A - v_B) - (c_A - c_B)$. Thus Ω^d combines the initial difference in net values with the discounted difference in total second-period surplus between consumers who buy from A in period 1 and those who buy from B. We maintain the assumption that both firms have positive first-period shares. We can prove the following lemma.⁴

⁴Proofs of this lemma and all other model-related results stated in the paper appear in the Appendix or the Online Appendix, as detailed at the start of the Appendix.

Lemma 1. *The firms' discounted profits from the perspective of period 1 can be written*

$$\begin{aligned}\Pi_A &= H_A(\Omega^d) + \delta\pi_A^d(B) \\ \Pi_B &= H_B(\Omega^d) + \delta\pi_B^d(A),\end{aligned}\tag{2}$$

where $H_A(\cdot)$ is a strictly increasing function and $H_B(\cdot)$ is a strictly decreasing function. A 's period-1 market share also increases with Ω^d .

Lemma 1 provides a compact way of writing a firm's total discounted profit as a function of second-period outcomes under the firms' portability decisions. Holding the rival's portability decision fixed, A obtains higher first-period market share and earns higher discounted profit when offering portability if that raises Ω^d ; B does the same if offering portability lowers Ω^d . In A 's profit expression, the final term concerns its second-period profit per consumer who initially bought from B . This term depends on B 's portability decision, which determines whether A can access those consumers' data. It therefore remains unchanged when A compares offering portability with not offering it. The corresponding reasoning applies to B .

For example, if $F(\cdot)$ is the uniform distribution on $[0, 1]$ and $-2\alpha_B - \alpha_A < \Omega^d < 2\alpha_A + \alpha_B$ (so both firms have positive first-period shares), then

$$\begin{aligned}\Pi_A &= \frac{(2\alpha_B + \alpha_A + \Omega^d)^2}{9(\alpha_A + \alpha_B)} + \delta\pi_A^d(B) \\ \Pi_B &= \frac{(2\alpha_A + \alpha_B - \Omega^d)^2}{9(\alpha_A + \alpha_B)} + \delta\pi_B^d(A).\end{aligned}$$

The expression for Ω^d in (1) and Lemma 1 lead to the following conditions for each firm to benefit from offering portability.

Proposition 1. *With forward-looking consumers, a firm weakly prefers to offer portability if and only if doing so weakly increases the total second-period surplus (consumer surplus plus joint profits) generated by its first-period customers. Thus A weakly prefers to offer portability if and only if*

$$S^P \geq S(A),$$

and B weakly prefers to offer portability if and only if

$$S^P \geq S(B).$$

Strict inequalities give strict preferences, and equality gives indifference. Neither condition depends on the rival's portability decision.

The result implies that both firms offering portability is an equilibrium if and only if $S^P \geq S(A)$ and $S^P \geq S(B)$; it is the unique equilibrium in the firms' portability decisions if both inequalities are strict. The economic mechanism at work is an intertemporal unbundling effect: data portability separates the firm that has the initial advantage from the firm that can create the greatest data-enabled value in period 2.

To unpack the intertemporal unbundling effect, write NN for neither firm offering portability and PN for A offering it alone. Without portability, a consumer's initial choice also determines which supplier can use the data generated by that relationship. A firm with an initially attractive product may face a rival whose algorithm can make better use of the data later. In particular, if A has an initial net-value advantage $w_A > w_B$, but $S(B) > S(A)$, A's relative advantage in competing for period-1 consumers without portability is

$$\Omega^{NN} = w_A - w_B - \delta[S(B) - S(A)].$$

The second term reflects the disadvantage of tying the consumer's data to the initially preferred supplier. In this situation, A, by committing to offer portability, allows B to use its better algorithm even for consumers who buy from A in period 1. Whenever this increases total second-period surplus for A's period-1 customers, A's relative advantage in period 1 rises by $\delta[S^P - S(A)]$ to

$$\Omega^{PN} = w_A - w_B - \delta[S(B) - S^P],$$

thus expanding its initial share and increasing its discounted profit.

A's portability allows consumers to buy from A in period 1 and then obtain B's improved service in period 2 if they prefer it. A may lose second-period profit when its customers switch to B. But B can then earn profit from those consumers without winning them initially, giving it less reason to compete aggressively in period 1. This can make A better off despite losing customers later. For an AI assistant provider, making conversation histories fully transferable can reduce the initial discount it may otherwise need to offer users when another AI assistant provider could later make better use of this information. With bilateral portability, the initial supplier no longer affects either firm's access to data or the expected second-period payoffs. Initial price competition therefore takes the same form as in a one-period market. A firm's initial advantage is no longer offset by its disadvantage in generating future surplus.

When consumers differ in their preferences in period 2, both firms may still serve customers in period 2. Then price differences across the two firms may also induce some consumers to switch firms even though their original supplier still creates more net value for them. For example, access to a user's conversation history need not make a rival AI assistant equally good at the user's current tasks, yet if the rival AI assistant offers a lower subscription

price it may still induce the user to switch. Thus, portability changes how heterogeneous consumers are allocated across the two firms in equilibrium, which can either reinforce the surplus-increasing effect of offering portability, or offset it.

To illustrate these two effects more explicitly, consider the differentiated specification described in Section 3 in which consumers draw new locations in period 2. Write period-2 utilities before prices as

$$\tilde{v}_A - \beta_A y \quad \text{and} \quad \tilde{v}_B - \beta_B(1 - y),$$

where $\tilde{v}_i$ is v_i or v'_i depending on whether firm i has access to data. Here y is the new location draw, independent of the period-1 draw, with the same distribution G in each initial customer group. The utility improvement from data for firm $i \in \{A, B\}$ is $v'_i - v_i$, which also equals the increase in net value, $w'_i - w_i$.

Consider A offering portability. Among A's period-1 customers, those with period-2 locations below y_A buy from A without portability. With portability, the corresponding cutoff becomes y_P where $y_P \leq y_A$: giving B access to the data improves its service and weakly increases its second-period share. A cutoff y_P equal to zero or one means that one firm serves the whole group. For A's period-1 customers, comparing the net value generated at each period-2 location y with and without A's portability gives

$$\begin{aligned} S^P - S(A) = & \underbrace{(v'_B - v_B)[1 - G(y_A)]}_{\text{gain for consumers choosing B in period 2 under both policies}} \\ & + \underbrace{\int_{y_P}^{y_A} [w'_B - \beta_B(1 - y) - w'_A + \beta_A y] dG(y)}_{\text{net-value change for consumers induced to switch}}. \end{aligned} \quad (3)$$

The first term is positive whenever B already serves some of A's period-1 customers. A's portability allows B to offer them higher net value. The second term compares the data-enabled net values for those who now switch from A to B. It is positive if B creates more net value than A, on average, for the consumers whom portability induces to buy from B instead of A in period 2. The second term can be negative when equilibrium prices induce consumers to buy from B even though A would create more net value for them. The corresponding decomposition for B exchanges the firm labels. Thus the general condition for whether portability increases total surplus, and so is profitable to offer, depends directly on this combination of data gains and a switching effect.

When G is uniform, the conditions determining which effect dominates are particularly simple.

Corollary 1. *Suppose G is uniform, and both firms serve a positive share of each period-1*

customer group in period 2, with and without portability. The period-1 distribution F need not be uniform. With forward-looking consumers, a firm strictly prefers to offer portability when period-2 product differentiation is sufficiently strong relative to the difference between its net value with data and its rival's average net value with and without data. Specifically, A strictly prefers to offer portability if and only if

$$\frac{7\beta_A + 2\beta_B}{5} > w'_A - \frac{w_B + w'_B}{2},$$

and B strictly prefers to offer portability if and only if

$$\frac{2\beta_A + 7\beta_B}{5} > w'_B - \frac{w_A + w'_A}{2}.$$

At least one firm always strictly prefers to offer portability, meaning there is no equilibrium in which both firms withhold it.

If $\beta_A = \beta_B = t > 0$, $w_A > w_B$ and $\frac{3t}{5} \geq w'_B - w'_A > 0$, bilateral portability is the unique equilibrium in the firms' portability decisions.

The first two conditions show that offering portability is profitable when period-2 product differentiation is sufficiently strong relative to the firm's advantage over the average of its rival's net values with and without data. Strong differentiation limits how many consumers change their period-2 supplier when portability improves the rival's service. This limits the scope for losses from inefficient switching to outweigh the direct surplus gain from that improvement. A smaller net-value advantage also helps. Holding B 's improvement from data fixed, a smaller net-value advantage for A means that more of A 's period-1 customers would choose B in period 2 even without portability. More consumers therefore receive the direct net-value gain from B 's access to their data as shown in the first term in (3). For consumers induced to switch, the net-value loss is also smaller, or equivalently the net-value gain larger, so the second term in (3) is larger.

In the final period-2 Hotelling case, A has the higher initial net value, whereas B has the higher net value once both firms have data. The stated bound makes the Hotelling differentiation parameter large enough relative to firms' data-enabled net value difference so that the direct surplus gain outweighs any switching loss. Both firms therefore strictly prefer to offer portability.

The assumption in Corollary 1 that both firms serve a positive share of each customer group in period 2 is essential to the conditions stated in the corollary, and is consistent with product differentiation being sufficiently strong relative to their differences in net value. At the other extreme, product differentiation can be sufficiently weak relative to differences

in data-enabled net value that one firm serves everyone under portability. We retain the assumption that firms share the market in period 1.

Corollary 2. *Suppose G is uniform. With forward-looking consumers, a firm that serves everyone under portability is indifferent about offering it, while its rival strictly prefers to offer it. Specifically, if*

$$w'_B - w'_A \geq \beta_A + 2\beta_B,$$

such that B serves everyone under portability, then A strictly prefers to offer portability, and B is indifferent. If instead

$$w'_A - w'_B \geq 2\beta_A + \beta_B,$$

so A serves everyone under portability, then B strictly prefers to offer portability, and A is indifferent. In either case, bilateral portability is an equilibrium, and there is no equilibrium in which both firms withhold portability.

If $\beta_A = \beta_B = t > 0$, these conditions reduce to

$$|w'_A - w'_B| \geq 3t.$$

The firm with the lower data-enabled net value strictly prefers to offer portability, while the other firm is indifferent.

To see the intuition, suppose B serves everyone under portability. The corollary's condition ensures that B creates more net value even for the consumer most favorably located for A . With equal period-2 differentiation parameters, B 's data-enabled net-value advantage is at least $3t$, whereas its greatest disadvantage due to location is only t . Any loss from being less well matched to B is more than offset by B 's data-enabled net-value advantage for each consumer who switches. Strong differentiation in Corollary 1 limits the scope for switches that reduce net value. Here, the data-enabled advantage is sufficiently large relative to differentiation that every induced switch raises net value, even if the whole group switches.

Among A 's original customers, switching to B raises the total surplus generated for each consumer. For those already buying from B without portability, access to their data improves B 's service in period 2 and also raises total surplus. A therefore prefers to offer portability by Proposition 1. For B 's original customers, B serves everyone with or without portability and its service is unchanged. B 's portability decision therefore leaves their total surplus, and its own discounted profit, unchanged.

This case makes intertemporal unbundling particularly clear. If A has the initial advantage, offering portability removes its future-surplus disadvantage from initial competition,

since its customers can obtain B's service later. A then earns its profit entirely from initial sales, while B serves consumers in period 2.

4.1 Consumer surplus and a portability mandate

Even though a firm may offer portability because it raises total second-period surplus per first-period customer, consumers need not be better off. Portability also changes first-period prices as firms compete to attract consumers. To make the consumer-surplus comparison more transparent, throughout this subsection we assume that F is uniform and compare bilateral portability, denoted PP , with no portability, denoted NN . Write CS^d for expected discounted consumer surplus across all consumers under outcome $d \in \{NN, PP\}$.

With uniform initial locations, A's first-period market share is

$$s_A^d = \frac{\alpha_A + 2\alpha_B + \Omega^d}{3(\alpha_A + \alpha_B)}. \quad (4)$$

Under NN , $\Omega^{NN} = w_A - w_B + \delta[S(A) - S(B)]$. Under PP , both firms can use each consumer's data regardless of the initial supplier, so $\Omega^{PP} = w_A - w_B$. The comparison below accounts for the resulting changes in both prices and market shares. It does not require the period-2 distribution G to be uniform.

$$\begin{aligned} \frac{CS^{PP} - CS^{NN}}{\delta} &= S^P - \frac{S(A) + S(B)}{2} \\ &\quad - [\pi_B^P - \pi_B(A)] - [\pi_A^P - \pi_A(B)] \\ &\quad + \frac{[S(B) - S(A)]\{2(w_A - w_B) - (\alpha_A - \alpha_B) - \delta[S(B) - S(A)]\}}{18(\alpha_A + \alpha_B)}. \end{aligned} \quad (5)$$

The first term is the simple average increase in total second-period surplus for the two groups of initial customers. The next two terms are the additional second-period profits each firm earns from consumers who initially bought from its rival. These profits reduce the need to compete for consumers in period 1 and work against consumers. The final term accounts for the asymmetry in initial competition and the change in market shares. It vanishes when the two initial suppliers generate the same total second-period surplus without portability, $S(A) = S(B)$, and can otherwise work in either direction. Thus the overall effect depends on the gains from data, the resulting second-period profits, and initial competition.

Stronger conclusions are possible when G is also uniform, as in Corollary 1, and we additionally impose unchanged differentiation across periods.

Proposition 2. *Suppose F and G are uniform, the differentiation parameters are the same*

in both periods, and both firms serve a positive share of each period-1 customer group in period 2, with and without portability. Consumer surplus is strictly lower under bilateral portability than under no portability if either of the following conditions holds:

(i) *Product differentiation is sufficiently strong relative to the combined utility improvement from data:*

$$2(\alpha_A + \alpha_B) \geq (v'_A - v_A) + (v'_B - v_B).$$

(ii) *Both firms weakly prefer to offer portability: $S^P \geq S(A)$ and $S^P \geq S(B)$.*

In particular, consumer surplus is lower whenever bilateral portability is the unique equilibrium in the firms' portability decisions.

Proposition 2 provides two sufficient conditions for bilateral portability to lower consumer surplus. Unlike the first condition, the second condition does not place any restriction on gains from data. It shows that, in this uniform case, restricting attention to an equilibrium in which both firms offer portability is enough to sign the consumer-surplus comparison. Uniqueness is not needed. The conditions in Corollary 1 state exactly when each firm prefers to offer portability in terms of differentiation and net values.

The key mechanism behind the reduction in consumer surplus is the reduced incentive of firms to compete for the initial purchase. Without portability, acquiring a customer gives a firm exclusive access to the data that customer generates. With bilateral portability, each firm can earn second-period profit from that customer even if the customer initially buys from its rival. Under either sufficient condition, this weakening of initial competition outweighs the benefit consumers receive from wider access to data. For AI assistants, portability can therefore improve the service available from a new provider while leaving users worse off overall if higher initial subscription prices more than offset that benefit. A key simplifying assumption is that differentiation parameters are unchanged across periods and both location distributions are uniform. Consumers therefore respond equally strongly to price differences in the two periods. If differentiation parameters or location distributions instead differ, data access can have a larger or smaller effect on second-period surplus and profits relative to its effect on initial competition. These changes can magnify the consumer losses identified in Proposition 2 or offset and even reverse them.

When firms can credibly commit to portability, a mandate cannot benefit forward-looking consumers under the uniform-distribution, unchanged-differentiation, and positive-share assumptions of Proposition 2. If both firms already offer portability, the mandate is redundant; this is the unique voluntary outcome when both inequalities in condition (ii) are strict. If only one firm offers it, requiring the other firm to offer it strictly lowers consumer surplus.

On the other hand, if credible voluntary commitments are unavailable, a mandate instead moves the market from NN to PP . Consumer surplus then falls strictly if the combined data gains do not exceed $2(\alpha_A + \alpha_B)$, as in condition (i), or both firms would weakly prefer to offer portability if they could commit, as in condition (ii). In the latter case, regulation helps firms make the commitments they would choose if they could, but harms consumers.

5 Myopic consumers

The assumption of forward-looking consumers played a key role in Proposition 1, where firms can earn higher profits by offering portability. Specifically, we assumed consumers anticipate that their initial supplier will use their data to improve its product for them and that future price competition will adjust accordingly. In reality, however, consumers may not anticipate the value of this increased personalization or its consequences for competitive pricing. This seems especially true for individual users making modest expenditures, as opposed to business users making large purchases who may be more sophisticated.

When consumers are myopic, the same analysis used in Section 4 applies, except that the expressions for Ω^d exclude the consumers' expected second-period net utilities contained in $S(j)$ and S^P . Consumers choose their initial supplier using only current net utility, so the indifferent consumer satisfies

$$v_A - \alpha_A x - p_A = v_B - \alpha_B(1 - x) - p_B.$$

Firms remain forward looking, and the period-2 pricing equilibria for each initial customer group are unchanged. Replacing total second-period surplus by the two firms' joint second-period profits gives

$$\tilde{\Omega}^d = w_A - w_B + \delta [\pi_A^d(A) + \pi_B^d(A) - \pi_A^d(B) - \pi_B^d(B)].$$

The profit formulas in Lemma 1 therefore become

$$\Pi_A = H_A(\tilde{\Omega}^d) + \delta \pi_A^d(B), \quad \Pi_B = H_B(\tilde{\Omega}^d) + \delta \pi_B^d(A),$$

with the same functions H_A and H_B . We maintain the assumption that both firms have positive first-period shares under every portability outcome, now with myopic consumers. Then Proposition 1 applies exactly as before, after dropping consumer utility from the second-period surplus expressions.

Proposition 3. *With myopic consumers, a firm weakly prefers to offer portability if and only if doing so weakly increases the joint second-period profits generated by its first-period customers. Thus A weakly prefers to offer portability if and only if*

$$\pi_A^P + \pi_B^P \geq \pi_A(A) + \pi_B(A),$$

and B weakly prefers to offer portability if and only if

$$\pi_A^P + \pi_B^P \geq \pi_A(B) + \pi_B(B).$$

Strict inequalities give strict preferences, and equality gives indifference. Neither condition depends on the rival's portability decision.

The decision to offer portability now depends on the firms' joint second-period profit generated by the firm's original customers, rather than total second-period surplus. Consumers' future gains no longer increase their willingness to pay for the initial purchase.

Recall that with forward-looking consumers, the intertemporal unbundling effect generally has two channels. First, the rival may compete less aggressively in period 1 when portability raises the payoff it obtains after losing in period 1; in that case, it need not win the consumer initially to benefit from its data advantage in period 2. Second, the adopting firm can charge more in period 1 because forward-looking consumers anticipate higher continuation surplus when their data can be used by the firm that creates greater value with it. With myopic consumers, the second channel disappears. The private incentive to offer portability therefore depends on whether the softer-rival effect in period 1, when present, is large enough to offset the loss from strengthening the rival in period 2. This is equivalent to whether future joint profits are higher with portability, because each firm is willing to offer a period-1 subsidy equal to its discounted profit gain in period 2.

One would normally expect portability to reduce joint profit by helping a lagging rival catch up, making the firms more evenly matched in period 2. But the rival may use the data well enough to leapfrog the original supplier. If the rival's new advantage is sufficiently large, portability can instead make competition more asymmetric and raise joint profit. These considerations drive the results in Corollary 3.

Corollary 3. *Suppose G is uniform, and both firms serve a positive share of each period-1 customer group in period 2, with and without portability. With myopic consumers, a firm strictly prefers to offer portability if and only if giving the rival access to data makes the firms' second-period shares of its original customers more unequal. Specifically, A strictly*

prefers to offer portability if and only if

$$\frac{\beta_A - \beta_B}{2} > w'_A - \frac{w_B + w'_B}{2},$$

and B strictly prefers to offer portability if and only if

$$\frac{\beta_B - \beta_A}{2} > w'_B - \frac{w_A + w'_A}{2}.$$

Equality gives indifference, and reversing an inequality gives a strict preference to withhold portability. Even allowing equality, the two offering conditions cannot both hold, so bilateral portability is never an equilibrium.

With uniform period-2 locations, the firms' joint second-period profit is lowest when their market shares are equal and increases as they become more unequal. If the rival already serves the larger share of a firm's original customers in period 2, then offering portability extends the rival's lead and increases joint profit. The more natural case, however, is where the rival serves the smaller share of a firm's original customers in period 2 without portability. Then for joint profits to increase, the rival must overtake the original supplier by more than that firm's original lead. Simply narrowing the gap, or reversing the ranking with a smaller gap, reduces joint profit.

The inequalities in Corollary 3 are written in the same form as those in Corollary 1, with the same net-value comparisons on the right but lower thresholds on the left. Each condition for a firm to want to offer portability is therefore more demanding with myopic consumers. Moreover, adding the two weak offering conditions would require $w'_A + w'_B \leq w_A + w_B$, contrary to positive gains from data. The firms therefore cannot both offer portability in equilibrium here, whereas both may do so with forward-looking consumers.

5.1 Consumer surplus and a portability mandate

We again compare consumer surplus under bilateral portability (*PP*) with the case where neither firm offers portability (*NN*). Consumer surplus includes the expected discounted net utility consumers actually obtain in period 2, even though myopic consumers ignore it when choosing their initial supplier. Throughout this subsection, suppose F and G are uniform, differentiation is unchanged across periods, and both firms serve a positive share of each period-2 customer group under all relevant pricing equilibria. First-period market shares

have the form in (4), with $\tilde{\Omega}^d$ replacing Ω^d . In particular,

$$s_A^{NN} = \frac{\alpha_A + 2\alpha_B + \tilde{\Omega}^{NN}}{3(\alpha_A + \alpha_B)}, \quad s_A^{PP} = \frac{\alpha_A + 2\alpha_B + w_A - w_B}{3(\alpha_A + \alpha_B)}.$$

The change in consumer surplus is

$$\begin{aligned} CS^{PP} - CS^{NN} = & \delta [u^P - s_A^{NN}u(A) - (1 - s_A^{NN})u(B)] \\ & - \frac{\delta}{3} [(v'_A - v_A) + (v'_B - v_B)] \\ & + \frac{\alpha_A + \alpha_B}{2} \left[\left(s_A^{PP} - \frac{1}{2} \right)^2 - \left(s_A^{NN} - \frac{1}{2} \right)^2 \right]. \end{aligned} \tag{6}$$

The first term is the gain in second-period consumer surplus. The second captures the loss of initial discounts as firms no longer compete to obtain exclusive access to a customer's data. The final term accounts for changes in initial prices and market shares associated with asymmetry between the firms. Both first-period prices rise under bilateral portability, while expected second-period net utility rises for either original customer group.

Proposition 4. *Suppose consumers are myopic, F and G are uniform, and all differentiation parameters are the same ($\alpha_A = \alpha_B = \beta_A = \beta_B = t > 0$). Maintain positive first-period market shares under each portability outcome, and suppose both firms serve a positive share of each period-1 customer group in period 2, with and without portability. Suppose both inequalities in Corollary 3 are reversed strictly, so neither firm offers portability in the unique equilibrium.*

- (i) *Bilateral portability strictly reduces consumer surplus if the firms' utility improvements from data differ by no more than a factor of three:*

$$v'_A - v_A \leq 3(v'_B - v_B) \quad \text{and} \quad v'_B - v_B \leq 3(v'_A - v_A).$$

- (ii) *Bilateral portability strictly increases consumer surplus if B 's utility improvement from data is sufficiently greater than A 's, relative to product differentiation:*

$$v'_B - v_B \geq 3(v'_A - v_A) + 3t.$$

The same conclusion holds with the firm labels reversed.

Both cases in Proposition 4 involve higher first-period prices under bilateral portability. The difference between them concerns how much data improves each firm's service. When

these improvements are not too different, as in case (i), the additional second-period benefit is insufficient to compensate for the higher initial prices. A mandate therefore harms consumers even though neither firm offers portability voluntarily.

In case (ii), B benefits much more from data than A. Together with the other assumptions, this condition implies that A has the higher initial net value, whereas B has the higher net value when both firms have data. Portability separates the initial purchase from access to the service that makes better use of data. Consumers who initially choose A can then obtain the much larger improvement in B's service, and the second-period benefits outweigh the higher initial prices. Nevertheless, both firms withhold portability: giving the rival access to their original customers' data makes the firms' second-period shares of those customers more equal and reduces their joint profit. With myopic consumers, firms do not capture the future consumer benefits through initial willingness to pay. A mandate therefore benefits consumers in this case.

The two conditions are sufficient, not necessary; they do not determine the consumer-surplus comparison for every pattern of data gains. Both results rely on uniform location distributions, unchanged differentiation across periods, and the maintained positive market shares. The loss result in case (i) also holds when differentiation parameters differ between firms (i.e., $\alpha_A \neq \alpha_B$), provided they remain unchanged across periods. Neither result requires a small discount factor. Thus, firms' unwillingness to offer portability is not by itself a reason to impose a mandate: under the stated assumptions, a mandate harms consumers in case (i) and benefits them in case (ii).

6 Extensions

6.1 Personalized pricing

We now allow firms to personalize prices in both periods, motivated by AI's potential to personalize prices alongside products. This extension isolates the intertemporal unbundling mechanism. Given access to data in period 2, personalized price competition assigns each consumer to the firm creating greater net value. It therefore avoids the inefficient second-period allocation of consumers that can arise with common prices in the baseline.

Firms observe each consumer's values and compete separately for each consumer, so we no longer impose a location model. Retaining the baseline timing, firm-specific costs and portability commitments, let $w_i = v_i - c_i$, $w'_i = v'_i - c_i$ and $W_i = w_i + \delta w'_i$. Here, we focus

on a forward-looking consumer (v_A, v_B, v'_A, v'_B) for whom the firms' advantage reverses:

$$w_A > w_B \geq 0 \quad \text{and} \quad w'_B > w'_A,$$

with $w'_i > w_i$ (which follows from our baseline assumption that $v'_i > v_i$).

Start with forward-looking consumers. In period 2, asymmetric Bertrand competition allocates the sale to the firm offering the higher net value. The losing firm prices at cost and earns zero, the winner earns the difference in net values, and the consumer receives the lower net value. Without portability, each firm is willing to subsidize the initial purchase up to its discounted second-period profit, at which point its offer gives the consumer W_i . Thus the firm with the higher W_i wins both periods and sets its initial price to match the rival's best offer, yielding

$$\Pi_A^{NN} = \max\{W_A - W_B, 0\}, \quad \Pi_B^{NN} = \max\{W_B - W_A, 0\},$$

and $CS^{NN} = \min\{W_A, W_B\}$. If $W_A = W_B$, either initial allocation, or any sharing of tied consumers, gives both firms zero discounted profit and gives the consumer discounted surplus $W_A = W_B$.

If A offers portability, the consumer buys from A initially and from B in period 2, whether or not B also offers portability. Discounted profits become

$$\Pi_A^{PN} = \Pi_A^{PP} = w_A - w_B, \quad \Pi_B^{PN} = \Pi_B^{PP} = \delta(w'_B - w'_A).$$

If $w_A - w_B > \delta(w'_B - w'_A)$ (equivalent to $W_A - W_B > 0$), A would have won both periods without portability. By letting the consumer switch to B, A no longer has to compensate for its inferior data-enabled offering when competing for the initial purchase. If $w_A - w_B < \delta(w'_B - w'_A)$, B would instead have won both periods. A's commitment to portability allows A to win the initial purchase while preserving B's access to the data and its period-2 advantage. In either case, B has less reason to subsidize the initial purchase because it can serve the consumer later without acquiring the consumer first. This result cleanly isolates the upside of portability: it separates A's initial advantage from B's advantage with data. Each firm's discounted profit rises by $\min\{w_A - w_B, \delta(w'_B - w'_A)\} > 0$. For this consumer, A strictly prefers to offer portability and B is indifferent, regardless of the rival's policy.

More generally, consumers can differ arbitrarily in their configurations (v_A, v_B, v'_A, v'_B) , subject to nonnegative initial net values, $w_A, w_B \geq 0$, and $w'_i > w_i$. Each firm makes a single portability decision covering all its customers. The following result accounts for each firm's profits across these different consumers.

Proposition 5. *With forward-looking consumers, personalized pricing, and nonnegative initial net values ($w_A \geq 0$ and $w_B \geq 0$), each firm weakly prefers to offer portability, regardless of the rival's policy. For a given consumer, A's preference is strict if and only if*

$$w_A > w_B \quad \text{and} \quad w'_B > w'_A,$$

and B's preference is strict if and only if the two inequalities are reversed. Bilateral portability is an equilibrium. If each firm has a positive measure of consumers for whom its preference is strict, bilateral portability is the unique equilibrium in the firms' portability decisions.

As in the baseline model with non-personalized prices, the incentive to offer portability reflects its effect on total second-period surplus. With personalized prices, Bertrand competition assigns each consumer to the firm creating the highest available net value. Offering portability therefore maximizes this surplus for the firm's initial customers, at $\max\{w'_A, w'_B\}$. With forward-looking consumers, the same intertemporal competition logic as in the baseline then implies that each firm weakly prefers to offer portability. In the example above, A's commitment raises second-period surplus from w'_A to w'_B , whereas B's leaves it unchanged. Personalized pricing thus eliminates the inefficient switching that can make portability unprofitable in the baseline.

Returning to the ranking-reversal example, bilateral portability deprives consumers of the benefit from competition between the firms' offsetting advantages. As a result, competition separates across periods and $CS^{PP} = w_B + \delta w'_A$, so

$$CS^{PP} - CS^{NN} = -\min\{w_A - w_B, \delta(w'_B - w'_A)\} < 0. \quad (7)$$

The same consumer-surplus outcome obtains when only A offers portability.

With myopic consumers, the incentives to offer portability instead depend on joint second-period profits, since consumers ignore future surplus when choosing their initial supplier. Portability mandates can then benefit consumers. Separately, relaxing the assumption of nonnegative initial net values, a mandate can eliminate trade when both initial net values are negative and portability removes the future profits needed to finance introductory subsidies.

6.2 Imperfect data portability

Ported data may be less useful than data generated through a firm's own customer relationship. We capture this by modifying the baseline model to let portability from A increase B's utility parameter from v_B to $v_B + \theta(v'_B - v_B)$, where $\theta \in [0, 1]$ is an exogenous measure of portability effectiveness. The same rule applies to portability from B. The

original supplier still obtains the full improvement $v'_i - v_i$ from its own customer's data. Thus $\theta = 0$ is equivalent to withholding portability, while $\theta = 1$ gives fully effective portability. Each firm chooses whether to offer portability at the given effectiveness level, and offering it remains costless. We retain the baseline assumptions of non-personalized prices, firm-specific marginal costs, and period-2 locations independent of period-1 locations.

The analysis with partial portability then follows the same steps as with full portability. Let $S(\theta; i)$ denote total second-period surplus per consumer who initially purchased from firm $i \in \{A, B\}$ when that firm offers portability with effectiveness θ . Second-period outcomes can now differ across the two initial customer groups even when both firms offer portability. However, the reasoning in Lemma 1 and Proposition 1 still applies: $S(A)$ and $S(B)$ become $S(0; A)$ and $S(0; B)$, while S^P becomes $S(\theta; A)$ or $S(\theta; B)$ according to the initial supplier. Thus, with forward-looking consumers, firm i weakly prefers to offer portability if and only if $S(\theta; i) \geq S(0; i)$, irrespective of its rival's decision. With myopic consumers, the condition from Proposition 3 becomes $\pi_A(\theta; i) + \pi_B(\theta; i) \geq \pi_A(0; i) + \pi_B(0; i)$, where $\pi_j(\theta; i)$ is firm j 's second-period profit per initial customer of i when the latter firm's portability has effectiveness θ .

To clearly see the effect of portability effectiveness θ , we use the differentiated specification described in Section 3 and further assume that G is uniform. We maintain market coverage and positive first-period shares under every portability outcome and effectiveness level considered. Both firms also serve a positive share of each period-1 customer group in period 2 without portability; this ensures positive shares under partial or full portability as well.

Proposition 6. *With uniform period-2 locations, greater portability effectiveness θ makes each firm more willing to offer portability: once a firm weakly prefers to offer it at a positive effectiveness level, it strictly prefers to offer it at every higher level for which the maintained assumptions hold. For $0 < \theta \leq 1$, $i \in \{A, B\}$ and $j \neq i$,*

(i) *With forward-looking consumers, firm i weakly prefers portability if and only if*

$$w'_i - w_j - \frac{\theta}{2}(w'_j - w_j) \leq \frac{7\beta_i + 2\beta_j}{5}, \quad (8)$$

(ii) *With myopic consumers, firm i weakly prefers portability if and only if*

$$w'_i - w_j - \frac{\theta}{2}(w'_j - w_j) \leq \frac{\beta_i - \beta_j}{2}, \quad (9)$$

With forward-looking consumers, bilateral portability is an equilibrium if and only if (8) holds for both $i = A$ and $i = B$, and is the unique equilibrium if and only if both are strict.

With myopic consumers, bilateral portability is never an equilibrium for $\theta > 0$.

Each firm's portability decision therefore follows an effectiveness threshold, which may lie outside $[0, 1]$. Increasing effectiveness improves the service available from the rival in the second period. Small improvements can induce consumers to switch even though the original supplier still creates more net value for them; larger improvements can make those switches beneficial. Thus the gain from offering portability need not increase at every effectiveness level, even though a firm never switches from preferring portability to withholding it as effectiveness rises. For example, if $\alpha_A = \alpha_B = \beta_A = \beta_B = t > 0$, $w_A = w_B$, $v'_A - v_A = v'_B - v_B = 12t/5$, and consumers are forward looking, the firms strictly prefer to withhold portability for $0 < \theta < 1/2$ and to offer it for $1/2 < \theta \leq 1$. Setting $\theta = 1$ recovers Corollaries 1 and 3.

More effective portability also raises expected second-period consumer surplus within each customer group whose original supplier offers it. Forward-looking consumers value this gain when choosing their initial supplier, so each firm's condition to offer portability is less demanding than with myopic consumers. This gain does not, however, establish an increase in total discounted consumer surplus, since first-period prices and market shares also change.

7 Managerial implications

We organize the managerial implications around four key questions.

7.1 When to offer data portability?

Our model provides some clear managerial guidance on when firms should adopt data portability. When launching a new product, firms should offer portability if their target consumers are forward looking and portability increases total future surplus per initial customer. This is particularly relevant for business customers, such as purchasers of B2B software, where decisions often involve substantial expenditures and relatively sophisticated decision-makers, such as procurement officers. Total future surplus is most likely to increase when horizontal differentiation between firms is either very low, so one firm's advantage with access to customer data outweighs differences in consumers' preferences and allows it to serve the entire market under portability, or when it is sufficiently strong relative to a firm's advantage over the average of its rival's net values with and without data.

By contrast, if consumers are myopic and do not factor in the risk of lock-in as the product they purchase becomes increasingly customized to their needs, the corresponding criterion is whether offering portability increases the firms' joint future profit from the firm's initial

customers. This is typically a more demanding requirement because portability can make the firms more evenly matched competitors and reduce their joint profit. It can nevertheless be satisfied when access to data allows the rival to overtake the original supplier by a sufficiently large margin.

While our model is most relevant to firms introducing a new product and choosing whether to adopt portability from the outset, firms may also consider offering portability despite already serving customers and holding their associated data. They must therefore decide how portability should apply to their existing user base. If firms can implement different portability regimes across consumers, they should offer data portability to new (forward-looking) consumers when it increases total future surplus per new customer, while withholding it from existing customers, provided that doing so does not undermine the credibility of the data portability offered to new consumers. One way to operationalize this approach, without explicitly discriminating across consumers, is to apply portability only to data collected after the introduction of the policy, so the policy is not applied retroactively. If instead firms must adopt a uniform portability regime across all consumers and all data types, then, provided portability is profitable for new (forward-looking) consumers, firms should adopt it when the share of new (forward-looking) consumers is sufficiently large relative to locked-in consumers, and not adopt it otherwise.

7.2 How to commit to data portability?

Many firms already provide some form of limited data portability, which partly reflects existing regulation. The GDPR, for example, gives individuals a right to receive personal data they have provided to a firm in a structured, commonly used, machine-readable format within one month of the request. The more recent EU Data Act (2025) adds business-facing access and switching rights in specific contexts, including connected products and data processing services. Thus, inside Europe, the managerial question is not whether a firm should provide a minimal export function, but whether it should make a credible commitment to effective portability beyond baseline regulatory compliance. This might include offering a real-time API for immediate data transfer and providing configuration or customization metadata that goes beyond raw user-generated data.

Outside the EU, the regulatory baseline is more uneven. Many jurisdictions do not impose a general requirement to offer data portability to business users, and portability rights for individuals are usually limited to personal data, as is the case in California. But it is costly for global firms to maintain separate EU and non-EU portability regimes. Our results suggest that offering data portability can have strategic benefits for firms, especially

when they serve business users. These benefits may tip the cost-benefit tradeoff in favor of standardizing on a more generous data portability offering globally.

For a firm to benefit from offering such data portability, it must announce the policy *ex ante* and stick to it. In reality, as in our model, firms have an incentive to promise portability, but then to renege *ex post* when consumers actually seek to switch. The key managerial question is how a firm can sufficiently raise its own cost of renegeing to make the commitment believable.

Public disclosure of a portability policy can contribute to its credibility. Announcing the policy clearly on the firm’s website, in user-facing documentation, and through marketing communications increases awareness and thus the reputational cost of reversal. Embedding portability within the firm’s stated mission, for example, by emphasizing consumer control and ownership of data, can further elevate the reputational stakes. Firms may also join industry initiatives that standardize data transfer processes, such as the Data Transfer Initiative, founded by Apple, Google, and Meta. Participation typically requires firms to define which data can be transferred and how it can be accessed, increasing transparency. While membership does not legally prevent reversal, it can raise both the reputational and coordination costs of deviating from the stated commitment.

A stronger approach is contractual commitment. Firms can incorporate explicit data portability provisions into their user agreements, specifying the categories of data covered, the format of delivery, and any applicable timelines. Clear contractual language increases legal exposure if the firm later restricts portability. Indeed, firms could go further and try to lobby regulators to mandate data portability at the industry level. However, given the general tension highlighted by our analysis between firms’ and consumers’ interests regarding data portability, this strategy would only succeed if regulators do not appreciate the tradeoffs identified in this paper. Indeed, regulations that penalize firms for not following through on their data portability promises would help protect consumers from paying higher prices *ex ante* for benefits that are not provided *ex post*. However, such regulations may also have a negative indirect effect on forward-looking consumers by facilitating data portability commitments and thereby raising initial prices and reducing consumer surplus.

Finally, firms can create partial technological commitments. The weakest version is to provide EU users with downloadable files in widely used, machine-readable formats, such as JSON, CSV, or XML. This may amount to little more than baseline compliance where data portability regulation applies. A stronger commitment would be to make portability operationally useful and applicable globally, for example, by offering well-documented real-time APIs, recurring exports, or direct transfer tools that allow users anywhere to move data without relying on slow manual requests. Such measures do not make the commitment

irreversible—APIs can be deprecated, formats changed, or access restricted—but they raise the engineering and reputational costs of withdrawal and make the portability promise more credible.

7.3 How to handle different types of data?

In principle, our model covers a spectrum of applications, depending on the source of the improvement in a firm’s product for consumers. At one end of the spectrum are products that become more useful to each consumer mainly because that consumer adds more data over time, while the underlying product stays largely unchanged. Examples include B2B software products, such as Salesforce, whose customer-relationship management software can be customized to the workflows of business users. For such products, meaningful data portability requires more than a download of the business records stored in the system. Enterprise customers also need the structure that makes those records useful in another system: custom objects and fields, page layouts, reports, workflows, permissions, and other configuration metadata. Salesforce allows customers to export Salesforce data as CSV files, either manually or on a recurring schedule, and its Metadata API allows customization information, such as custom object definitions and page layouts, to be retrieved.⁵ These tools go beyond mere regulatory compliance. Large enterprise customers are especially aware of lock-in risk and may require vendors to demonstrate that exit rights are operationally meaningful rather than merely contractual. In this sense, Salesforce’s portability tools can be interpreted as a strategic commitment: by making both customer records and key configuration metadata exportable, the firm reduces the risk of the enterprise’s data being stranded if it wants to switch, thereby making adoption more attractive *ex ante*.

At the other end of the spectrum are products that use data on an individual consumer to improve the product’s performance for that individual over time, often through AI-driven personalization. Eight Sleep provides an example. Its smart bed dynamically adjusts mattress temperature throughout the night to optimize sleep. Over time, the system learns which temperature adjustments are most effective for a given user under varying physiological and environmental signals, including body movements, heart rate, respiratory rate, snoring, room temperature, and sleep stages. The more the individual uses the product, the more data it collects to refine these adjustments.

For this type of product, meaningful data portability would require exporting the full data history, including both user data (e.g., sleep metrics, the underlying physiological and environmental inputs) and data generated by the firm (the corresponding sequence of temper-

⁵See, for example, https://developer.salesforce.com/docs/atlas.en-us.api_meta.meta/api_meta/meta_intro.htm (accessed May 5, 2026).

ature adjustments generated by its algorithm). This would go beyond the standard GDPR baseline by encompassing not just user-provided data, but also firm-generated outputs that may reflect proprietary optimization logic. While Eight Sleep allows users to view a broad set of sleep and environmental metrics through its app, it does not provide access to the algorithm’s historical temperature adjustments, nor does it offer a simple mechanism for downloading comprehensive machine-readable datasets. Accordingly, although users can access substantial user-facing information (consistent with GDPR requirements), Eight Sleep has not committed to portability with respect to inferred data, which would be required to enable a rival to replicate individualized temperature optimization for a switching consumer.

Firms such as Eight Sleep may be reluctant to provide inferred data because it is not required under the GDPR or for strategic reasons (e.g., if consumers are mostly myopic about future competition). They may also worry that sharing their proprietary algorithms’ outputs reveals more about their optimization processes than is strictly necessary to serve the switching user. A similar issue arises for AI-based services. For example, ChatGPT allows individual users to export their conversation history. In principle, a rival service could use that history to reconstruct conversational context and provide continuity for a switching user. However, detailed interaction logs may also contain information that facilitates broader model improvement or fine-tuning, potentially benefiting the rival beyond the individual user who ports the data.⁶

For its large enterprise customers, OpenAI provides many additional tools that may be helpful if they switch model providers. For example, it allows workspace administrators to access, export, and audit a broad set of workspace data, including prompts, uploaded files, generated outputs, conversation history, shared workspace content, usage metadata, and workspace configuration information.⁷ For U.S. enterprise customers, this is not simply a narrow GDPR-style right to receive personal data provided by the data subject. Customers can preserve a richer record of how employees have used the system, including outputs and configuration information that help sustain organizational workflows after switching.

More generally, the key managerial issue is the extent to which portability would require disclosing data that reflect the firm’s own proprietary processes, rather than solely the user’s contributions. When it is technically or economically difficult to separate user-specific data (needed to preserve service continuity) from firm-generated data (which may confer broader competitive advantages), firms should be more conservative in adopting data portability.

⁶For example, it is alleged that this is in part how DeepSeek was able to train its model at a fraction of the training cost of its U.S. rivals. See <https://www.reuters.com/world/china/openai-accuses-deepseek-distilling-us-models-gain-advantage-bloomberg-news-2026-02-12/>

⁷See OpenAI, “New compliance and administrative tools for ChatGPT Enterprise” (July 18, 2024), and OpenAI Help Center, “Data access for your managed ChatGPT account” (accessed May 13, 2026).

7.4 Should data portability be mandated?

Existing regulation in Europe already mandates some forms of data portability. The GDPR gives individuals portability rights over certain personal data, while the EU Data Act adds business-facing access and switching rules in specific contexts, including connected products and data processing services. From a global regulatory perspective, the question is whether EU-style regulations should be adopted elsewhere, and whether Europe should consider further strengthening or perhaps softening its existing regulations.

Our analysis implies that data portability mandates are most clearly worth considering when consumers are myopic. When consumers are forward-looking, firms may already have incentives to offer effective data portability voluntarily, and mandating portability can reduce consumer surplus by enabling firms to charge higher initial prices. Even with myopic consumers, however, the consumer welfare effects of a data portability mandate are ambiguous. As shown in our model, one case in which a portability requirement benefits myopic consumers is when one firm's improvement from data is sufficiently greater than its rival's, relative to product differentiation, even though neither firm offers portability voluntarily.

A different and less drastic regulatory intervention is to police firms that promise to offer data portability but then renege. Such behavior is harmful because consumers end up paying more upfront but do not obtain the full promised benefits when actually attempting to port their data. As shown in our model, such bait-and-switch practices transfer surplus from consumers and rivals to the firm that engages in them, so policing them should be beneficial for consumers. However, policing these practices may have a subtle negative effect: stronger penalties for reneging make it easier for firms to commit credibly to portability, which may reduce consumer surplus when consumers are forward looking, as discussed earlier.

8 Concluding remarks

This paper shows that data portability has more subtle competitive and strategic implications than is often assumed. With forward-looking consumers, a firm benefits from committing to portability precisely when doing so increases total future surplus per initial customer. Intertemporal unbundling provides an important reason for why this can happen: an initially advantaged firm can give its customers access to a rival's stronger data-enabled service, reducing the need to compensate for its own future disadvantage when competing initially. It can thereby earn more from its initial advantage even if its customers later move to the rival. Because this can soften initial competition, consumers may nevertheless be worse off.

Myopic consumers, by contrast, ignore the future downside of having their data tied to the firm they initially choose, and so do not require compensation for the lock-in that non-portability creates. This weakens the firm’s incentive to offer portability: because the firm can no longer charge consumers more for removing future data lock-in, voluntary portability is no longer necessarily profitable, even when it would be efficient.

The managerial and policy implications therefore diverge across markets. Firms have the strongest private reason to make portability operationally meaningful for users who take future switching options into account, such as large enterprise customers evaluating adoption and lock-in risk *ex ante*. By contrast, in markets dominated by individual consumers who are less likely to account for future portability benefits, firms may have weaker incentives to offer broad portability voluntarily beyond what regulation requires. This creates a natural rationale for focusing portability requirements on individual-consumer settings, as existing regulation largely does. However, our analysis also identifies cases in which mandated portability can reduce consumer surplus and may even undermine market participation.

Our analysis suggests several promising directions for future research. One is how data portability affects firms’ incentives to invest in improving their ability to extract value from customer data (e.g., via better algorithms). This becomes particularly interesting in the context of AI markets if data portability inherently carries some risk of leaking proprietary information to rival firms. Another important direction is to endogenize the credibility of portability commitments. In practice, firms may promise portability *ex ante* while degrading it *ex post* through cumbersome export processes, weakened APIs, incompatible formats, delayed transfers, or the withholding of important metadata. This raises the question of whether repeated interactions with successive cohorts of users could allow endogenous reputational concerns to substitute for regulatory enforcement of portability commitments.

9 Appendix

This appendix gives an abbreviated proof of Lemma 1 and proofs of Propositions 1 and 3. The full proof of the lemma and proofs of all remaining model-related results in the text appear in the Online Appendix. Sections A and B of the Online Appendix cover the results with non-personalized prices for forward-looking and myopic consumers, respectively; Sections C and D of the Online Appendix cover the personalized pricing and imperfect data portability extensions, respectively. Throughout the proofs, we replace “data portability” with “DP” and define $\alpha = \alpha_A + \alpha_B$, which measures the rate at which a consumer’s relative utility changes with its period-1 location.

9.1 Abbreviated proof of Lemma 1

Fix the firms' DP choices. The assumptions on continuation payoffs imply that $\pi_i^d(j)$ and $u^d(j)$ are constants when firms choose their initial prices. Define

$$\begin{aligned} q_A &= p_A - c_A + \delta[\pi_A^d(A) - \pi_A^d(B)], \\ q_B &= p_B - c_B + \delta[\pi_B^d(B) - \pi_B^d(A)]. \end{aligned}$$

The indifferent consumer's location is then

$$x = \frac{\Omega^d + \alpha_B + q_B - q_A}{\alpha},$$

where Ω^d is given by (1), and the firms' discounted profits are

$$\begin{aligned} \Pi_A &= q_A F(x) + \delta \pi_A^d(B), \\ \Pi_B &= q_B [1 - F(x)] + \delta \pi_B^d(A). \end{aligned}$$

Since each q_i differs from p_i by a constant, choosing either is equivalent.

The first-order conditions with respect to q_A and q_B give

$$q_A = \alpha \frac{F(x)}{f(x)}, \quad q_B = \alpha \frac{1 - F(x)}{f(x)}.$$

Substituting these into the profit expressions above establishes the lemma's profit formulas, with

$$H_A(\Omega^d) = \alpha \frac{F(x)^2}{f(x)}, \quad H_B(\Omega^d) = \alpha \frac{[1 - F(x)]^2}{f(x)},$$

where x is the equilibrium indifferent location.

Log-concavity of F and $1 - F$ implies that F/f is nondecreasing and $(1 - F)/f$ is nonincreasing. Thus the first-order conditions make q_A nondecreasing and q_B nonincreasing in x . Since $\Omega^d = \alpha x - \alpha_B + q_A - q_B$, the equilibrium location x strictly increases with Ω^d . It follows that $H_A = q_A F(x)$ is strictly increasing and $H_B = q_B [1 - F(x)]$ is strictly decreasing in Ω^d .

9.2 Proof of Proposition 1

Fix B's DP decision. If A changes from withholding to offering DP, $S^d(A)$ changes from $S(A)$ to S^P , while $S^d(B)$ and $\pi_A^d(B)$ remain unchanged. Let Ω^d denote the relative advantage

in period 1 before A adopts. By Lemma 1, A's change in discounted profit is

$$H_A(\Omega^d + \delta[S^P - S(A)]) - H_A(\Omega^d).$$

Since H_A is strictly increasing, A weakly prefers DP if and only if $S^P \geq S(A)$, strictly prefers it if $S^P > S(A)$, and is indifferent if $S^P = S(A)$. Similarly, holding A's policy fixed, B's adoption changes its discounted profit by

$$H_B(\Omega^d - \delta[S^P - S(B)]) - H_B(\Omega^d),$$

where Ω^d now denotes the relative advantage in period 1 before B adopts. Because H_B is strictly decreasing, B weakly prefers DP if and only if $S^P \geq S(B)$.

9.3 Proof of Proposition 3

With myopic consumers, initial demand omits the terms $\delta u^d(A)$ and $\delta u^d(B)$. The firms' profit functions and their first-order conditions are otherwise unchanged. The proof of Lemma 1 therefore applies with $\tilde{\Omega}^d$ in place of Ω^d . Holding B's policy fixed, A's decision to offer DP changes $\tilde{\Omega}^d$ by

$$\delta[\pi_A^P + \pi_B^P - \pi_A(A) - \pi_B(A)],$$

and leaves $\delta\pi_A^d(B)$ unchanged. Since H_A is strictly increasing, this proves A's condition. B's decision changes $\tilde{\Omega}^d$ by

$$-\delta[\pi_A^P + \pi_B^P - \pi_A(B) - \pi_B(B)],$$

and leaves $\delta\pi_B^d(A)$ unchanged. Since H_B is strictly decreasing, this proves B's condition. The same argument establishes strict preference, indifference, and independence from the rival's DP decision.

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