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The Evolution of the USA Bank Branch Network: An Ecological System Dynamic Approach

Executive Summary

With the onset of the technological era, the brick-and-mortar branch network faces new challenges. The relationship between digital banking platforms and branches is akin to the relationships between organisms co-existing in an ecological system. This relationship has been modeled using ecological techniques and its evolution in the long-run has been determined. This study aims to edify the audience about the changes in the features of the U.S. banking industry in the future.

Current Situation

The declining in number of branches

In the last twenty years the number of branches has changed dramatically. As one can see in Figure 1, it grew from about 81,000 in 1994 to more than 99,000 in 2009 and have been decreasing for the last five years reaching 94,725 in 2014. The trend of explosive growth and then decrease is repeated across various US regions in different degrees. Thus, in the Northeast the number of branches went up by 9.6% from 1994 to 2009 before decreasing by 3.6%. More starkly, in the South the growth was much more dramatic (up 30.6%) followed by a larger decrease (-5.2%). A similar decrease of about 5% is seen across urban and rural branches.

The decrease does not seem that large but it is much more significant if branches per capita are considered. After increasing from 309 in 1994 to 326 in 2008 the number stood at 297 in 2014 making it the lowest in at least twenty years.
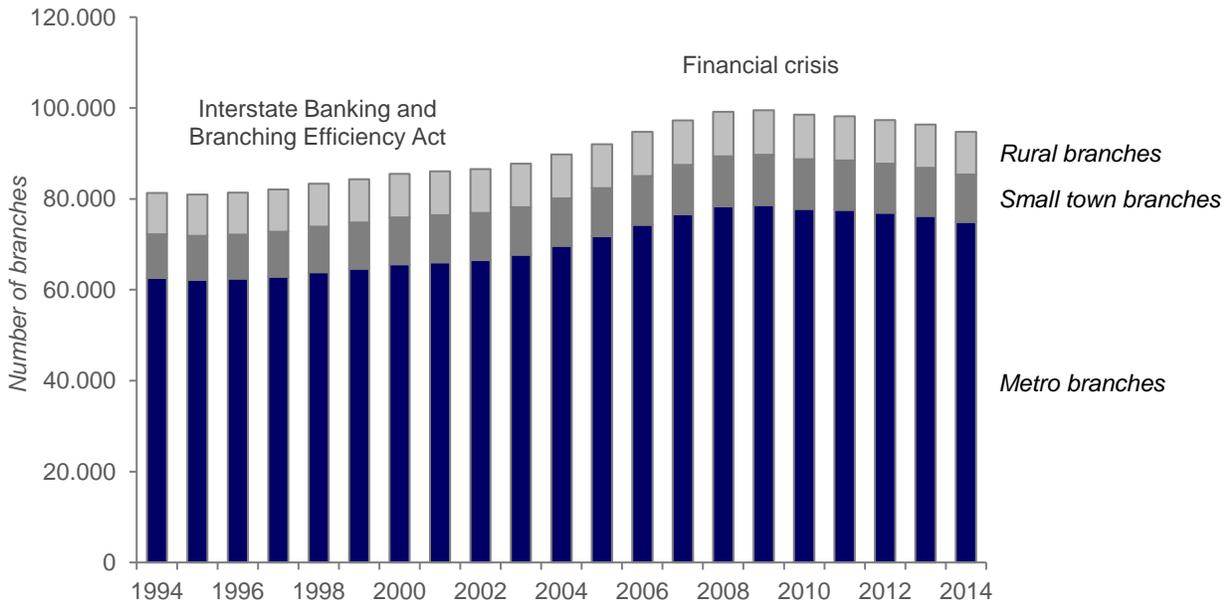

Figure 1: Number of branches in the US

Transactions and everything transaction related

The decrease in number of branches was accompanied by a significant decrease in the number of transactions per branch: from 11,700 branch transactions per month to 6,400 in 2015. But even in 2015 there is a significant number of "easy to do" transactions remaining at the branch: 26% of all branch transactions were check deposits. It is likely that in future similar transactions will continue to move to digital channels.

Online transactions are much cheaper compared to branch ones (17 cents vs 4 dollars) so banks can potentially cut a lot of costs by moving most of the transactions online. But in the last five years the number of branch transactions has stagnated while the number of online/mobile transactions has grown significantly indicating on Figure 2 that the total number of transactions has grown as well increasing banks' total cost despite the decrease in average cost per transaction.
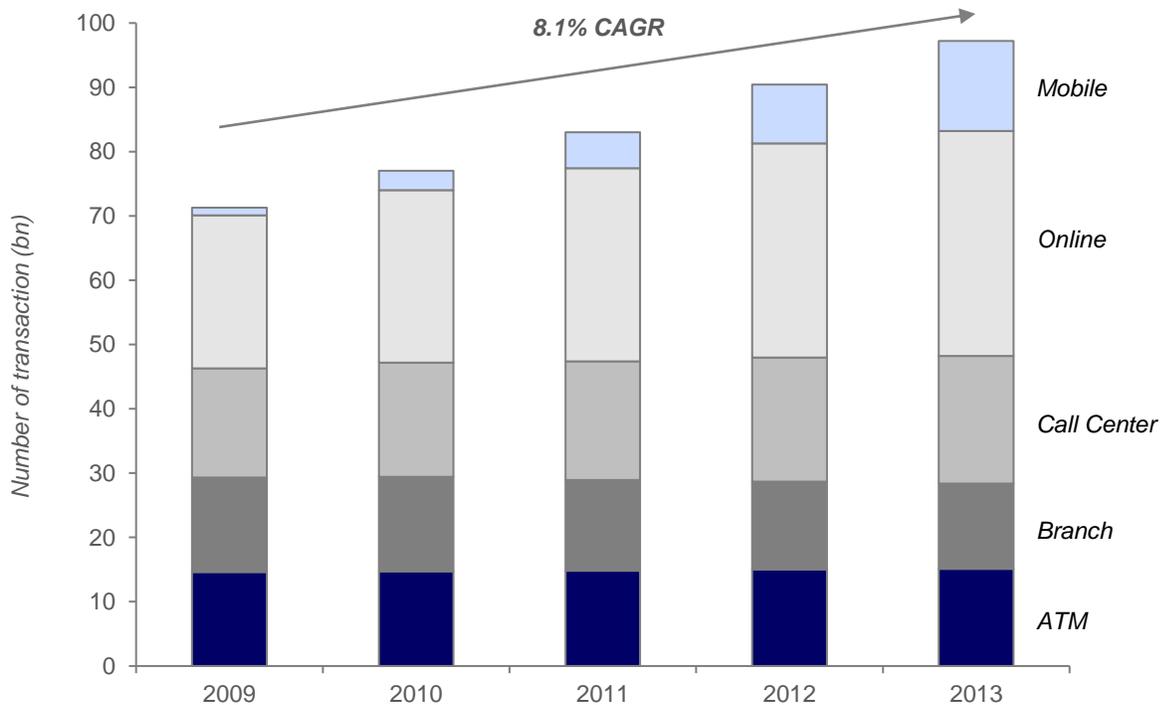

Figure 2: Number of transactions per channel

New technology, regulation, crisis

One of the main reasons for the changes is the advent of new technology completely transforming banking experience for American customers. As internet penetration grew, internet banking became common in the beginning of 2000s followed by mobile banking recently. As it is evident from Figure 3 about 60% of young people were using mobile banking in 2014. As population becomes more internet savvy, these numbers will likely only increase.
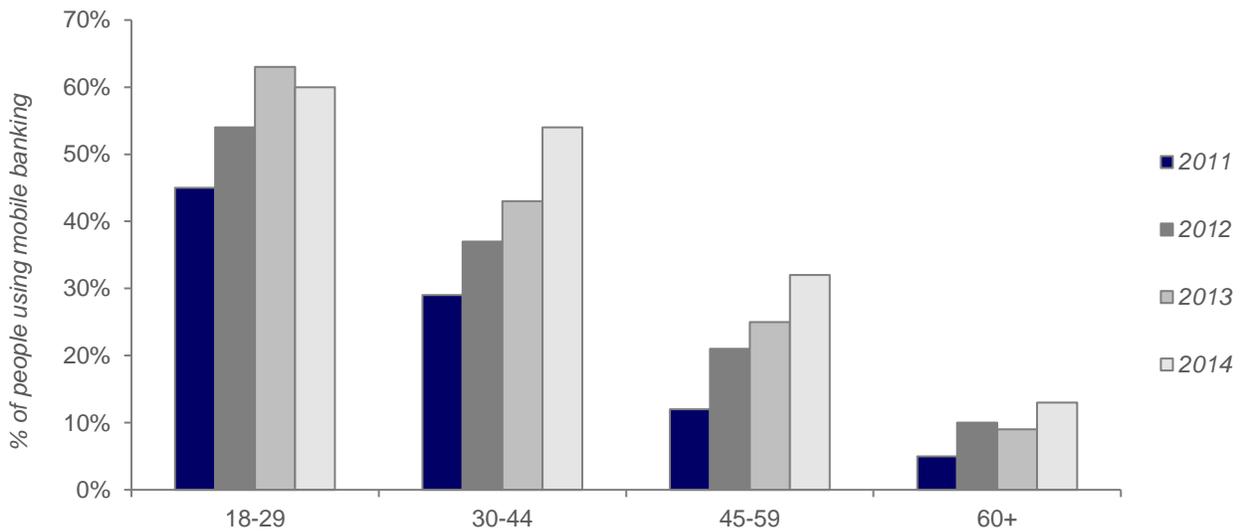

Figure 3: Mobile banking use by age

Regulations have also affected the evolution of bank branches. The dramatic growth in the 90s was partly driven by liberalization of interstate banking which resulted in expansion of banks to other states and a wave of bank mergers. The financial crisis of 2007-08 has stopped the expansion and forced the banks to start thinking about cutting costs and facing the new environment with new regulations (like Dodd-Frank act), new technology and lower net interest margins.

Bank options and reactions

The banking industry has started to react by closing branches or changing the branch in various ways. In the last six years more than 13,000 branches have been closed (excluding the merger related closures). At the same time the new branches are becoming smaller and have less people working there: number of tellers per branch went down from 6.51 in 2005 to 5.48 in 2013.

It is often difficult to close a branch for a number of reasons:

- There are often long term leases which are impossible to break
- It is not easy to find a buyer for a property and one often has to recognize a significant loss on a balance sheet during a sale
- There can be regulatory issues preventing closing branches in underprivileged area

Some banks have started changing the branch model by creating smaller specialized branches focused on sales while limiting the number of big branches. The process of banks adaptation to new reality will take time, effort and successful change management.

Future evolution of number of branches

Regression models

The first model that we developed to explain the changes in the number of bank branches was a linear multivariate regression model. Historical data for the last twenty years (from 1994 to 2014) was used. One issue was looking for a good proxy for mobile and internet banking.

Two sets of variables used in the model: Macro variables (Population, GDP, percentage of rural population) and Technology variables (internet penetration and percentage of people who prefer the mobile channel for banking).

The model showed that Population and Percentage of rural population are two most significant factors positively affecting the number of bank branches in the USA. Technology variables have limited negative effect mainly because the mobile banking is a pretty recent phenomena. It is expected that the influence of technology will grow in future.

- Population: 9.26
- GDP: 0.51
- Percentage of rural population: 7.83
- Number of internet users: -0.58
- Percentage of people who prefer mobile channel for banking: -0.46

Figure 4: Model inputs with relevant regression coefficients

Five scenarios were developed for different values of people preferring mobile banking channel in ten years. Mobile banking is the most uncertain variable in the model as the macro variables are forecasted by government agencies and likely will not deviate much from the forecast.

In Figure 5, one can see that in four out of five scenarios the number of bank branches in the US goes down (from -21.7% decrease in a 40% mobile preference scenario to -49.6% in a 70% mobile preference scenario). If mobile banking will not become a major challenge (25% mobile preference), then the number of branches will actually increase reflecting the increase in population and GDP.
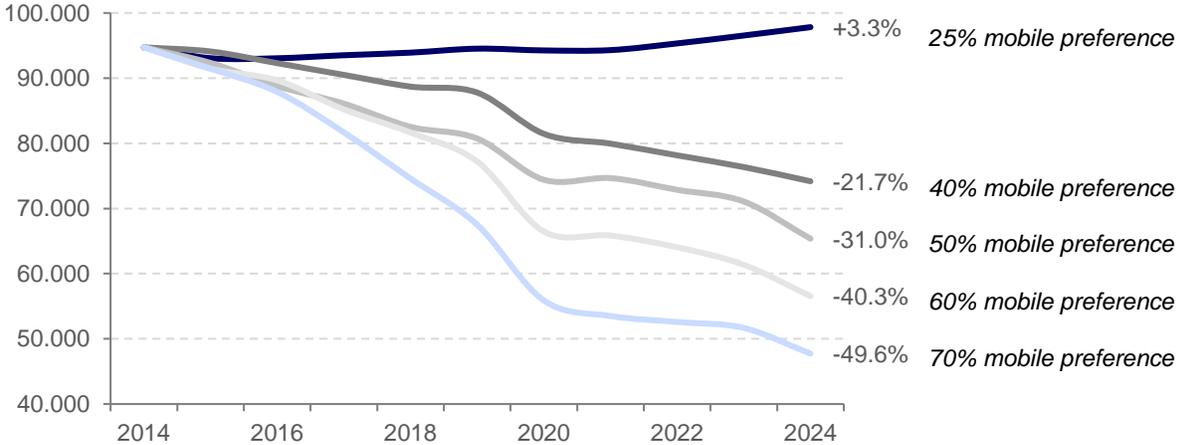

Figure 5: Number of branches for different mobile preference scenarios

Rural areas have historically had more branches per capita mainly because of the lower population density. The advent of new technology only exacerbated the difference as mobile banking is much less prevalent in rural area leading to the higher number of branches. It is also interesting to mention that in the developed model for the number of rural branches mobile banking was not even statistically significant. Subsequently, in the developed scenario the number of rural branches, as illustrated by Figure 6, is predicted to decrease only by about 6% in the next ten years.
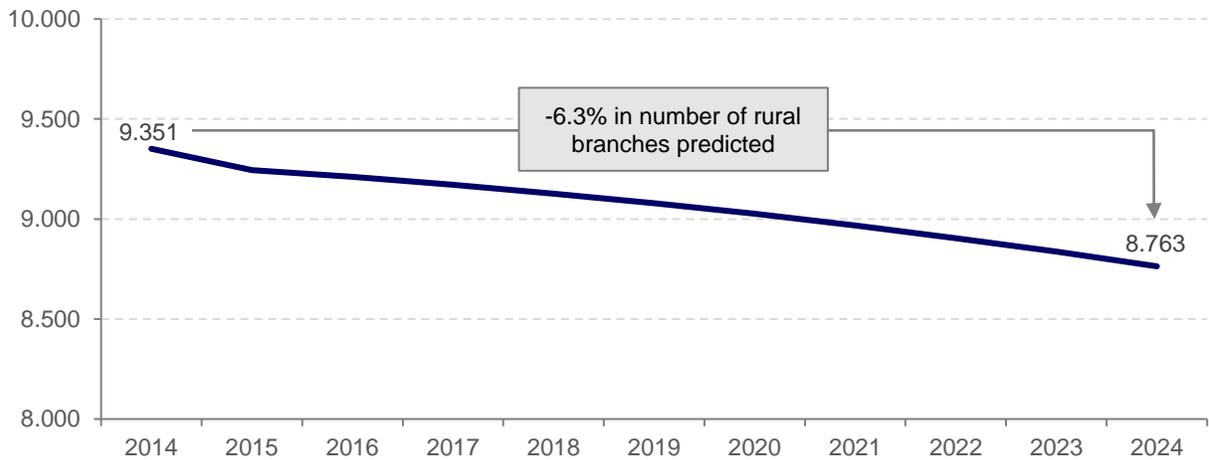

Figure 6: Predicted number of rural branches

Ecological model framework

Mobile and internet banking has emerged a major threat to a traditional model of brick and mortar bank branches. This study looks at the interactions between branches and digital banking as a competition between two species for the same resource and uses the ecological framework to analyze the system.

Main components of the ecological framework:

Bank branches are the main subject of the study and are considered as one of the species, no brand distinction has been made. Digital banking (number of mobile and internet bank transactions is taken as a proxy) is treated as a second competing specie. The resource that two species are competing for is clients and their transactions.

In addition, external factors affecting the system include macro variables (population, GDP and others), technology and regulations have been included.

It is assumed that the interspecies interactions evolve with time and depend on the changes on the environment.

Population

Time
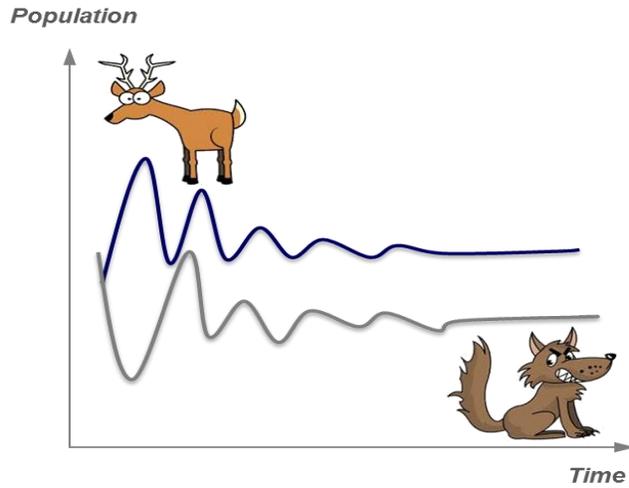
Ecological models

This study looked at three main ecological models for population.

| Malthus Model	Lotka-Volterra Model	Verhulst Model
■ One specie unlimited resources ■ Exponential growth or decline depending on birth and death rates	■ Two species limited resources ■ Two species (branches and mobile/online) competing for the same resources ■ One specie affects the growth of another specie	■ One specie limited resources ■ Introduces Carrying Capacity Cap: natural limit to number of individuals in the population

Lotka-Volterra model as the most realistic and relevant model was finally used in this study. The main input for the model are natural growth rates for both species, carrying capacity (Cap1 and Cap2) and effect of one specie onto the other (Infl12 and Infl21). Depending on the sign of influence coefficients the system configuration can be in one of three modes: symbiosis, predator-prey and competition.

The configuration is very dynamic and can change with the surrounding environment.

Competition	*Predator-prey*	*Symbiosis*
▪ Both influence coefficients are negative ▪ Two species negatively affect each other competing for the same resource	▪ One influence coefficient is positive while the other one is negative ▪ One specie preys on the other	▪ Both influence coefficients are positive ▪ Two species positively affect each other ▪ In our case it would mean that more branches result in more digital banking and the other way around.

There are two potential outcome in these ecological dynamic systems: either the system reaches an equilibrium or one of the species will disappear. Depending on the model parameters one of the two scenarios will occur long term:

Equilibrium scenario: *both species survive*	*Extinction scenario conditions:* *one of the species does not survive*
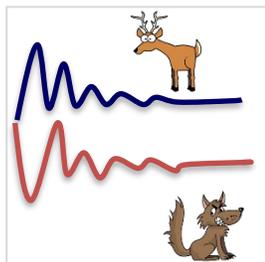
$$\frac{Cap1}{Infl_{21}} > Cap2 \qquad \frac{Cap2}{Infl_{12}} > Cap1$$

$$\frac{Cap1}{Infl_{21}} < Cap2 \ \text{ or } \ \frac{Cap2}{Infl_{12}} < Cap1$$

This study used a Lotka-Volterra system to develop a model for the number of bank branches in the USA. The parameters of the model were assumed to be constant during the last twenty years and calibrated using an Excel Optimizer to get a better fit.

The resulting model, as seen in Figure 7, has shown a very good fit to historical numbers especially in the last five years.
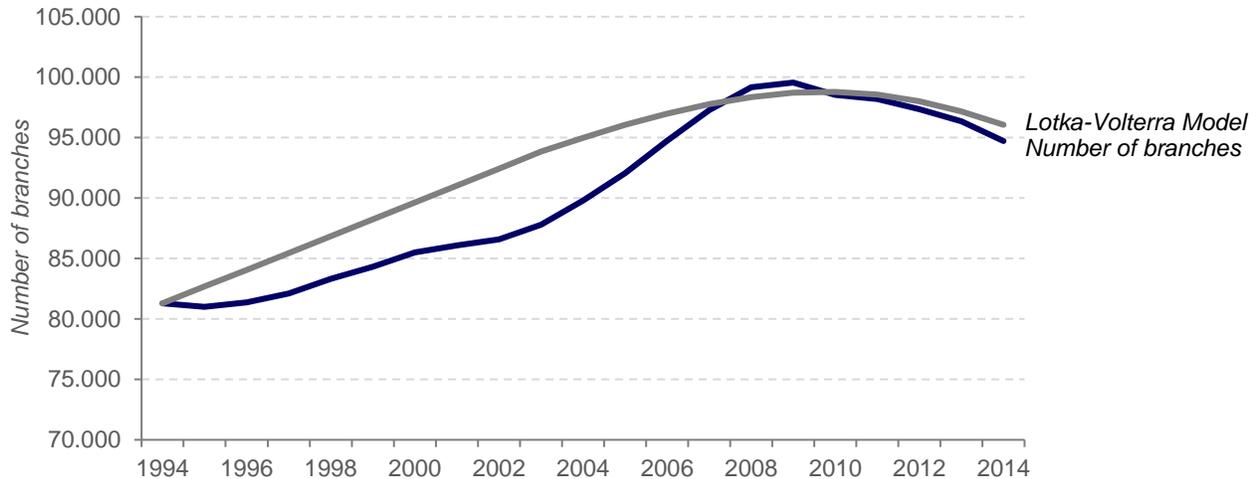

Figure 7: Number of branches (historical vs model)

The two most important results of this model are:

- The system configuration is currently Predator-Prey: i.e. more brick and mortar branches leads to more digital banking, but more digital banking results in less branches
- Under current optimized parameters the system will result in equilibrium and not in branch extinction.

The big question is that what this configuration will look like in the future and will it still result in the equilibrium. Given the fact that some of the easier to move to digital channels transactions have already moved online, it is likely that negative affect of mobile banking onto branches will diminish. More complex transactions are not as easy to move online, and in fact a number of clients still prefer doing them in person at the branch. For example one can see in Figure 8 that the percentage of people who prefer to resolve issues at the branch has been almost constant in the last couple of years. Assuming that the bank branches will be able to adapt and change their model to being more of a sales center, the system will move from a predator-prey to competition configuration.
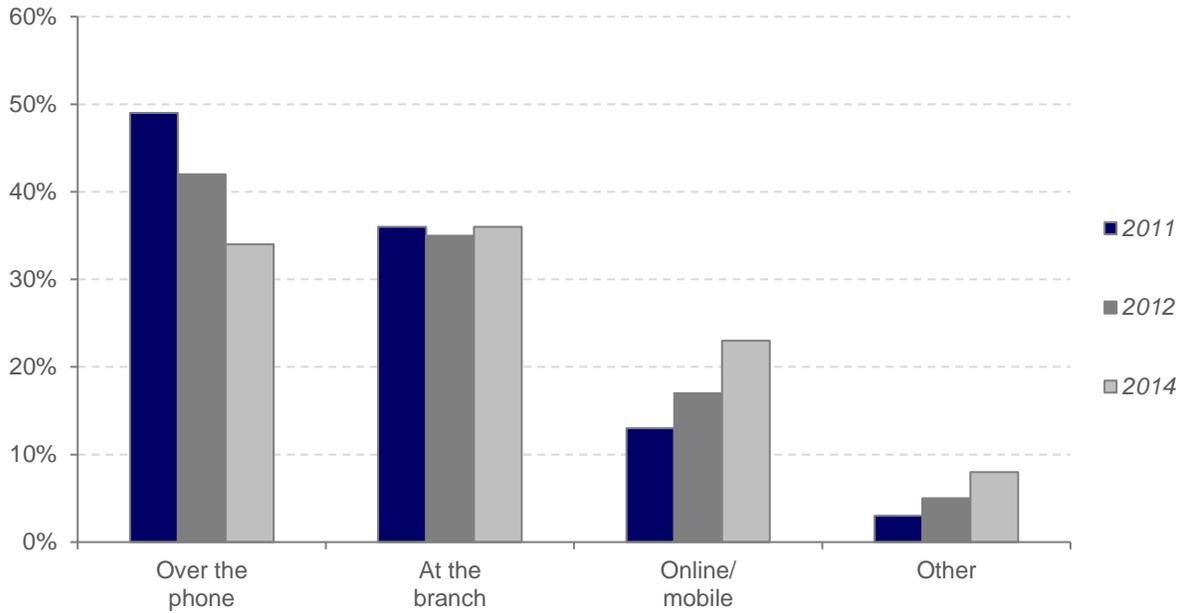
Figure 8: Channel preferences for resolving an issue with an account (% of people)

Branch share has remained constant recently while the increase in mobile/digital is coming at the expense of over the phone transactions

Scenarios

Three scenarios (Figure 9) were developed to model the future development of bank branches:

▪ The first scenario assumes a quick change in branch behavior: branches will focus more on sales and minimize the transactional activity. The system configuration moves from predator-prey to competition fairly quickly. In this scenarios the number of branches in fifteen years goes down around 20% and branches are predicted to survive

▪ The second scenario assumes a slow change in bank branches and slow move from predator-prey configuration to competition. The number of branches decreases by 42% and branches will become extinct eventually in this model. In real life extinction would probably mean not complete extinction but rather a very limited role for bank branches in the future.

▪ The last scenario assumes no changes in branch behavior as the system configuration remains in the predator-prey mode. The number of branches decreased by 51% and branches become extinct.
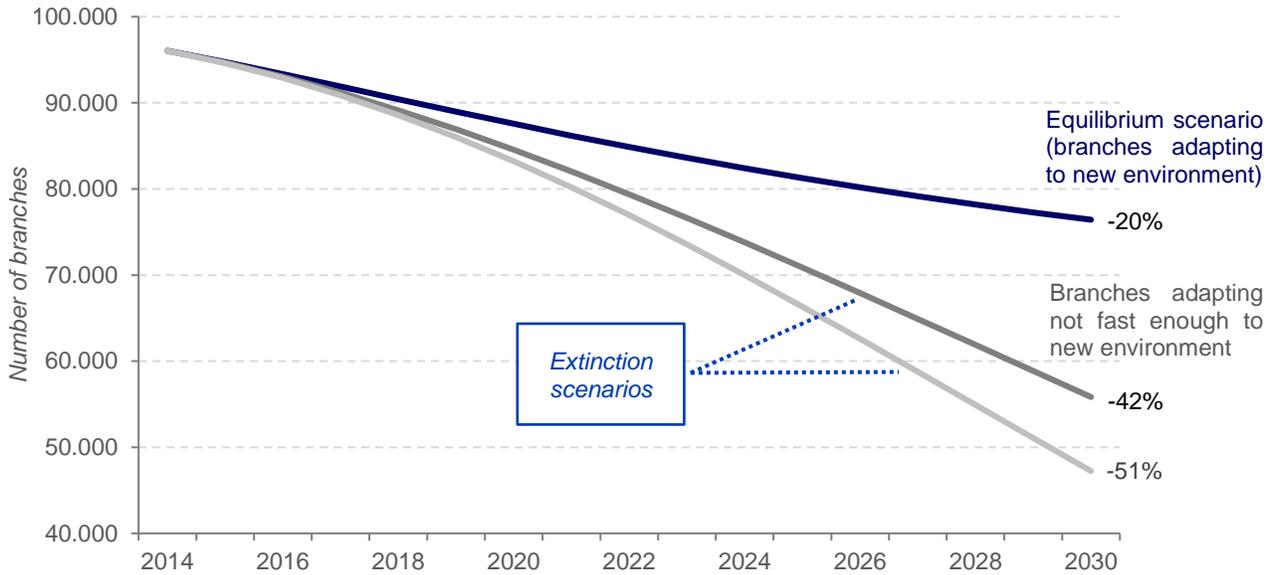

Figure 9: Scenarios for bank branches

Conclusion and suggestions for the branch of the future

The study suggests that number of bank branches will decrease by about 20% in the next fifteen years but the branches will not disappear completely. In order to survive and compete with digital banking, banks have to adapt and change the branch model from mostly focusing on transactions to becoming sales centers.

Banks in future will likely have less employees but they will be much more qualified. The move to the Universal Banker model will continue to drive changes in the branch personnel. Branch design will be changing to better adopt the new model. These new better trained employees will focus on more complex value-adding operations while leaving the majority of transactions to digital channels.

Branches of the future will not only have less employees but they will be much smaller in size adapting to the new environment. Available services will be more sales related but the offerings can be increased by making experts available through digital means. Other options include having mobile offices with agents coming to the client.

Technology, regulations and customer preferences will continue to evolve and banks will have to be flexible and creative to survive and thrive in the new rapidly changing environment.

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