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As banks rush to digitize their operations, many have found that closing their local branches can help maintain a high return on an otherwise pricy transformation. European banks, for example, closed over 9,000 branches in 2016, which represents a 4.6% reduction in a single year. According to our calculations, using data from the Swedish Bankers' Association, a full one-quarter of bank branches

in Sweden have shuttered over the past four years. In the United States, the total number of bank branches has dropped by 8.2% since 2013, and shrank by more than 1,700 in 2017 alone. This rapid transformation is also occurring in Asian banks, where services are being digitalized, bank functions are being centralized, and local bank branches are closing down.

Although banks consider this digitalization to be one of the main methods to increase their competitiveness, it may disrupt the relationship between banks and their venture clients. In Sweden, for example, the portion of approved bank loans to small and medium-size enterprises has decreased by 15% over the last 10 years, and roughly 60% of all ventures in need of external financing have reported difficulties in accessing financing for their investments

Many of the effects of this rapid digital change on entrepreneurship still remain unclear. But our research finds that this ongoing transformation has clear downsides for entrepreneurs in general and women in particular. It turns out that women entrepreneurs who seek to finance their ventures using bank financing are increasingly forced to find solutions elsewhere. And compared to men, women entrepreneurs are pushed into desperate and extreme types of financing.

In the past, banks' financing of entrepreneurs has typically been dominated by relationship-based lending, in which personal meetings between an entrepreneur and a lender were at the heart of the assessment. These meetings allowed for the exchange of important information about the business model, intangible assets, future prospects, and more. This information was seldom documented formally or expressed in writing, but it allowed for an assessment of the entrepreneur's willingness to repay the loan; their current and previous behaviors (for example, how they've run past businesses or how they've set and achieved goals); and their experience, merits, and ambitions — pieces of information that are generally considered to be strong indicators of a venture's future performance. Having access to this kind of information enables lending to young and small ventures, which generally lack historical financial records. The practice of relationship-based lending generally requires banks and ventures to be in close proximity to one another.

In recent years, however, digitization has led a majority of banks to turn to another model to make funding decisions: a transaction-based model. As opposed to meeting with entrepreneurs, this model is largely based on financial reporting information, credit scoring, and the quality of accessible assets as collateral. Early in our research process, we suspected that gender might matter when it comes to who is approved and who is denied based on this type of reporting. Studies show that women have lower access to capital, for example. And that even when they are approved for financing, they face more demanding credit terms compared to men. The origin of these biases has been linked to gender stereotyping, where men entrepreneurs are perceived as being more ambitious and having more entrepreneurial potential than women. Such stereotypes are automatically activated when a person's gender is identified — even on paper — and can significantly influence perceptions about whether an entrepreneur is financeable. This can also sway decisions to approve or reject loans to women and men entrepreneurs.

In 2017, we launched a research project in order to learn more about the effects of banks' lending model transformations. We targeted a random sample of Swedish entrepreneurs (both men and women) who were applying for bank financing. We approached a total of 605 people and had a response rate of 24%. At the core of the study, we analyzed the extent to which the entrepreneurs were forced to engage in a total of 20 different informal economic activities to handle their need for financing. They include not paying taxes or invoices on time, breaking credit agreements, the use of undocumented workers and trades in services. We combined this data with alternative and complementary secondary bank data in order to control and mitigate confounding effects of the size, type, and age of the ventures; their capital need; and the educational level of the entrepreneur and employees.

Our results show that women face increased difficulty in accessing bank financing, and specifically that women's entrepreneurship suffers heavily from the recent transformation among banks. In short, women entrepreneurs showed more of a need to engage in informal economic activities than men.

Why? Gender provides an "implicit background identity" for a banker when assessing an entrepreneur. This identity can bias financing decisions. But if the banker meets with the entrepreneur, that identity may change. Thus, a lack of interactions between banks and entrepreneurs allows for initial stereotypes to frame bankers' perceptions of entrepreneurs, which may be amplified when no actual social interactions occur that could change these stereotypes.

There's an argument that the centralization of financing decisions could improve conditions for women entrepreneurs; human distance and computer algorithms may solve the problems with human interference. Our findings call this into question, however, as the women entrepreneurs in our study were often placed outside the formal economy for financing their ventures.

To begin to address this issue, banks may need to revisit their recent rapid change in decision models to strive for equal opportunities when financing entrepreneurship. Women entrepreneurs, for their part, also must be selective when choosing a bank, carefully considering the bank's decision model and building relationships with bankers in an attempt to overcome stereotyping and gender-biased access to financing. What is clear is that we need to know more about what business opportunities are lost — as well as how and why this loss occurs — when banks adopt transaction-based lending models.

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